ESSAYS ON THE ECONOMICS OF HIGHER EDUCATION AMONG WOMEN IN INDIA

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'Essays on the Economics of Higher Education Among Women in India' submitted by me for the award of the Degree of Doctor of Philosophy in Arts at Jadavpur University is based upon my work carried out under the Supervision of Professor Amit Kundu, Department of Economics, Jadavpur University and that neither this thesis nor any part of it has been submitted before for any degree or diploma anywhere/elsewhere.

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Executive Summary of the Thesis

Education is universally acknowledged as a vital investment in human capital, playing a key role in alleviating poverty, fostering economic growth, boosting GDP, creating jobs, and improving overall health. Acquiring education involves various stages: Primary (level 1), Secondary (levels 2-3), Post-Secondary non-tertiary (level 4), and Tertiary/higher education (levels 5-8). Tertiary education/ Higher education encompasses all formal post-secondary education, including universities, colleges, technical training institutes, and vocational schools, both public and private. According to the World Bank's 2024 report[1], tertiary education yields the highest economic returns in the educational system, with graduates earning approximately 17% more than their primary and secondary educated counterparts. Various studies (Mincer, 1981; Lucas, 1988; Bogetoft et al., 2007; Núñez and Livanos, 2010) highlighted the role of higher education in fostering human capital and boosting productivity, thereby enhancing economic efficiency (Fischer, 1993; Gregorio, 2004).

India has a rich and enduring legacy in higher education. The Department of Higher Education under the Ministry of Education defines higher education as "the education, which is obtained after completing 12 years of schooling or equivalent and is of the duration of at least nine months (full time) or after completing 10 years of schooling and is of the duration of at least 3 years. The education may be of the nature of General, Vocational, Professional or Technical education". As a developing nation, India aspires to utilize higher education to transform into a knowledge superpower. The rapidly growing middle class, currently comprising approximately 200 million individuals, has fuelled a rising demand for higher education. The AISHE (2021-22) report notes a rise in total higher education enrolment to nearly 4.33 crore in 2021-22 from 4.14 crore in 2020-21 and from 3.42 crore in 2014-15. Despite this growth, higher education remains inaccessible to many, particularly among the poorest and most marginalized, including women. AISHE (2019-20) reports higher male participation at most educational levels, except for M.Phil., Post Graduate, and Certificate levels. Barriers such as poverty, violence, and child marriage hinder young females from accessing higher education and the labour force. Additionally, female graduates face a higher unemployment rate (24.5%) compared to males (13.1%) (PLFS 2021-21). Achieving gender equality is essential for the

[1] https://www.worldbank.org/en/topic/tertiaryeducation

World Bank Group's objectives of eradicating extreme poverty and fostering inclusive prosperity.

In this context, this study has four main research objectives:

1. Identify household-level factors (including state policies) that influence the enrolment decisions of young people in higher education, with a focus on young females.
2. Analyse higher education enrolment across different Indian states and identify factors impacting state-level enrolment rates.
3. Examine the gender gap in technical higher education at the household level and explore factors contributing to reducing this disparity.
4. Investigate the state-level educated unemployment rates and identify factors to mitigate this issue.

Chapter four titled "The Determining Factors of Females' Enrolment in Higher Education Institutions in India" identifies the factors at the household level (including state policies) that affect the enrolment decision of young in higher education focusing on young females. This study considers both Unit Level and State Level data together for determining the factors which affect the enrolment of Youngs in technical education at higher education levels. As State level data is macro data it may be the fact that the macro data initially behaves as a macro level but finally affects the household-level decision-making process also. Hence, the unit-level data have been collected from the NSSO 75th Round Household Social Consumption on Education dataset from July 2017- June 2018 (One academic year) and the state-specific data have been collected from NFHS-4 (State Specific Data), Ministry of Education's Analysis of Budgeted Expenditure on Education (2016-17 to 2018-19) State-wise loan disbursement data by SBI for degree and diploma courses within and outside the country, Bureau of Police Research and Development, Ministry of Home Affairs, Govt. of India. Here, the considered time period is 2017-18. As the dependent variable enrolment in higher education is the binary variable so, applying probit regression technique it is found that the probability of young females' enrolment in higher education is increasing in India. Several household-related factors such as household income, and household location are other household-specific motivating factors which encourage parents of youths both sons and daughters to enrol them in higher education. Among the Hindus and Christians probability of youths including girls' participation in higher education is rising but among the Muslim community it is decreasing and this decreasing phenomenon is also observed for young girls. Higher the distance between households and

higher education institutions youngs are less eager to enrol in higher education. Police protection helps to raise the probability of joining youths especially young girls in higher education. Women empowerment (women's decision-making power) and mothers' education are two important determinant factors which encourage young females to join the higher education system. Also, it is revealed that students (both young boys and girls) are less eager to draw higher amounts of educational loans for enrolling in higher education as the failure to repay sanctioned loan amounts leads them to fall into a debt trap.

Chapter five "Women's Participation in Higher Education in India: An Analysis Across Major States" discusses the state-wise women's enrolment scenario in higher education and identifies the factors which have affected the absolute and relative enrolment of women in higher education. Here the absolute enrolment is measured using the indicator Gross Enrolment Ratio (GER) of women in higher education between the age group 18-23 years old and the relative enrolment is measured using the indicator Gender Parity Index (GPI). Major 16 states are considered here and the data are collected from the All India Survey on Higher Education published by the Department of Higher Education, Ministry of Education, Government of India, Census Report (2011), Hand Book of Statistics of Indian States published by the Reserve Bank of India, Bureau of Police Research Organization report National Crime Records Bureau, Ministry of Home Affairs, Sample Registration System Statistical Report, Office of the Register General and Census Commissioner, India for the time period 2011-2019. The state-wise comparative statistical analysis shows that the values of GER of females are very poor in post-graduation and technical education courses. However, states are better placed in GPI at under graduation level. Also, no states achieve gender parity in technical education. Based on fixed-effect panel data regression, it is found that a significant share of female teachers, higher per capita state domestic product (a proxy for per-capita income) and availability of colleges and girls' hostels are playing important roles in contributing to the GER of females and GPI in higher education in India.

Chapter six titled "Enhancement of Enrolment in Technical Courses at Higher Education Level among Indian Women: Few Policy Prescriptions using Fairlie's Decomposition Method" examines the presence of gender gap in technical higher education at the household level and explores household determinants and state-specific policy variables that may influence parental decisions to register their young girl children in technical and vocational courses at higher education levels in India. The unit-level data have been collected from the NSSO 75th Round Household Social Consumption on Education dataset from July 2017- June 2018 (One

academic year) and the state-specific data have been collected from NFHS-4 (State Specific Data), Ministry of Education's Analysis of Budgeted Expenditure on Education (2016-17 to 2018-19), All India Council for Technical Education, State-wise loan disbursement data by SBI for degree and diploma courses within and outside the country, Bureau of Police Research and Development, Ministry of Home Affairs, Govt. of India. Here, the considered time period is 2017-18. Here, as the dependent variable enrolment in technical education is a binary variable therefore, applying the Probit regression technique, it is found that in India, the probability of enrolment in technical and vocational courses at higher education levels is higher among males than females. Household income, household location, internet availability are key household level determinants that increase the probability of enrolment in technical and vocational courses at higher education level. Using the Fairlie decomposition approach, it is found that better family income, internet availability, and availability of higher education institutions nearer to residential location are key household-level supportive variables that can reduce that gender gap. Furthermore, state-specific policy factors such as the higher amount of state expenditure on technical and vocational courses, better police density can also reduce that gender gap. The Fairlie decomposition result also shows that larger size of sanctioned loans both in amount and number can play the most important role in reducing that gender gap during the time of enrolment.

Finally, Chapter 7 “Analyzing the Unemployment Rate among Women Graduates in India: A Dynamic Panel Approach” observes the situation of educated unemployment rates at the state level and identifies the factors that can help alleviate this issue in our country. It has also identified a few policy prescriptions to tackle that problem. The period is between 2013-14 to 2019-20 and 20 major Indian states are considered for this investigation. As the current period’s unemployment has always impact on the next period therefore, dynamic panel regression is best to apply here. Using the Blundell and Bond Dynamic Panel Regression technique it is observed that factors like higher gross enrolment ratio among women in higher education in general degree courses and higher percentage of females at the age of marriage between the age group of 18 and 20 years are responsible for state-wise higher unemployment rate among graduated women. However, expanding the service sector by creating more employment opportunities for females with technical and professional degrees and an effective marriage age of 21 years and above can reduce the unemployment problem among at least graduated women in India. The study can help policymakers to reduce the unemployment problem among at least graduated women in India.

Table of Contents

CHAPTER 1: INTRODUCTION

Introduction

The term "Education" originates from several Latin words: 'Educare,' 'Educere,' 'Educo,' and 'Educatum.' ‘Educare’ means to bring up or to nourish; ‘Educere’ means to draw out or to manifest; ‘Educo’ means to lead out of and ‘Educatum’ means an act of teaching or instruction. Education is a process that helps shape and mould a person’s knowledge, character and behaviour. Education is a means to obtain entry into the social world while ensuring existence in the physical. Education aims to foster the holistic development of physical, mental, emotional, social, moral, and spiritual aspects of life. While the "physical" aspect is observable and tangible, the "social" dimension necessitates discovery and skills. Education serves as a tool to build knowledge and skills, and it is considered a fundamental human right. The role of education is acknowledged as an essential investment since it reduces poverty, boosts economic growth, increases the GDP of a country, creates employment opportunities, and improves overall health. It delivers large, consistent returns in terms of income, and ensures equity and inclusion. For individuals, education promotes employment, enhances earnings, improves health, and reduces poverty. Globally, education is linked to a 9% increase in hourly earnings for each additional year of schooling. For societies, it drives long-term economic growth, spurs innovation, strengthens institutions, and fosters social cohesion. Due to several policies and initiatives tremendous progress is observed in developing countries in getting children into the classroom and it is also found that more children worldwide are now in school. But the World Development Report (WDR, 2018) highlighted that learning is not guaranteed. Making smart and effective investments in education is critical for developing human capital and ending extreme poverty. The current strategy focuses on addressing the learning crisis, eradicating learning poverty, and equipping youth with advanced cognitive, socio-emotional, technical, and digital skills. The mainstream approach in economics to education is the human capital model which focuses on maximization of the utility function. In contrast, Amartya Sen and Martha Nussbaum have proposed capabilities approach to view various states of well-being including access and use of education. Acquiring education encompasses several stages: primary (level 1), secondary (levels 2-3), post-secondary non-tertiary (level 4), and tertiary or higher education (levels 5-8).[2]

[2] *OECD (2018).* OECD Handbook for Internationally Comparative Education Statistics 2018 Concepts, Standards, Definitions and Classifications: Concepts, Standards, Definitions and Classifications. OECD Publishing. ISBN 978-92-64-30444-4. Archived from the original on 10 December 2023. Retrieved 6 May 2023.

Tertiary education refers to all formal post-secondary education, including public and private universities, colleges, technical training institutes, and vocational schools. A highly skilled workforce, with lifelong access to a solid post-secondary education, is a prerequisite for innovation and growth. Well-educated people are more employable and productive, earn higher wages, and cope with economic shocks better than an uneducated person. Tertiary education benefits both individuals and society by producing environmentally conscious, healthier, and civically engaged graduates. Also, it leads to increased tax revenues from higher earnings, healthier children, and reduced family size which all are helpful to build stronger nations. In short, tertiary education institutions prepare individuals by providing adequate and relevant job skills and preparing them to be active members of their communities and societies.

The economic returns for tertiary education are the highest, with an estimated 17% increase in earnings compared to 10% for primary and 7% for secondary education. These high returns are even higher in Sub-Saharan Africa, at around a 21% increase in earnings for tertiary education graduates. Today, there are around 220 million tertiary education students in the world, up from 100 million in 2000. As the global youth population grows and more students complete primary and secondary education, especially in regions like South Asia, Sub-Saharan Africa, Latin America, and the Middle East and North Africa, the demand for quality tertiary education is increasing. Technical and vocational education and training at the tertiary/higher educational level can effectively and efficiently complement traditional university studies in providing students with skills and knowledge relevant to the labour market.

Achieving gender equality is central to the World Bank Group's goals of ending extreme poverty and boosting shared prosperity. Ensuring that all girls and young women receive a quality education is a human right and a global development priority. Girls' education goes beyond enrolment in schools. It includes ensuring physical safety; having the opportunity to complete all levels of education, acquiring the knowledge and skills to compete in the labour market; gaining socio-emotional and life skills necessary to navigate and adapt to a changing world; making decisions about their own lives; and contribute to their communities and the world. Both individuals and countries benefit from females' education. Higher-educated women are more informed about nutrition and healthcare, marry later, have healthier children, and earn higher incomes, lifting households, communities, and countries out of poverty. They are more likely to participate in the formal labour market and earn higher incomes. A recent World Bank study estimates that the restricted educational opportunities for girls and barriers

to completing 12 years of education result in countries losing between $15 trillion to $30 trillion in lifetime productivity and earnings.

India, with the third-largest higher education system in the world and the second-largest higher education network, provides education and training in almost every discipline. In India, the word "higher education" refers to the tertiary level education that is provided after 12 years of schooling (10 years of primary education and 2 years of secondary education). The Indian higher education system has significantly expanded, with over 1,000 universities and 42,000+ colleges offering top-notch education.

India is a developing country and in today's current knowledge era, we must strengthen our higher education system to achieve our goals. Higher education is crucial for transforming India into a knowledge superpower. To enable India to become a knowledge superpower, education and knowledge resources have to reach out to a large number of people through various means in a seamless way. The growth of the Indian middle class, now approximately 200 million people, has increased the demand for higher education. According to the AISHE (2021-22) report the total enrolment in higher education has increased to nearly 4.33 crore in 2021-22 from 4.14 crore in 2020-21 (increase of 18.87 Lakh, 4.6%) and 3.42 crores in 2014-15 (an increase of 26.5%). There are several issues and challenges in the field of higher education in India. According to Altbach (2005), "India has significant advantages in the twenty-first-century knowledge race". It has a large higher education sector – the third largest in the world in student numbers, after China and the United States. The country is at a pivotal juncture in its socio-economic development, with higher education playing a critical role in shaping its future. Over the past few decades, India has seen a remarkable expansion in higher education, marked by an increase in institutions, diverse fields of study, and enrolment rates. Simultaneously, the economy has transformed, with a growing demand for skilled labour and knowledge-intensive industries necessitating a highly educated workforce. Still, gender disparities persist, hindering India's pursuit of inclusive growth and development. Women, who constitute nearly half of the country's population, continue to face formidable barriers to accessing and harnessing the benefits of higher education. Additionally, even those who manage to enrol often encounter challenges and inequalities when transitioning to gainful employment.

However, despite the growing number of tertiary graduates' challenges remain. Many graduates lack the locally relevant skills necessary for successful integration into the labour market. Additionally, the increasing number of students places a strain on publicly funded higher education institutions, and many countries with limited resources struggle to meet the expanding demands without compromising educational quality. Tertiary education remains inaccessible to many of the poorest and most marginalized groups.

The Gross Enrolment Ratio (GER) in Higher Education for the 18-23 years age group is 27.3 in 2020-21 with a GER for male is 26.7 and for female is 27.9 (AISHE 2020-21). Although these values state that enrolment in tertiary education slightly favours young women, improved learning outcomes are not translating into better work and life outcomes for them. There is a significant gender gap in labour force participation rates. The labour force participation rate among women whose age is 15 years and above and who have a graduation degree is 33.3 whereas for male is 84.4 (PLFS 2021-22). Gender stereotypes communicated through school and classroom environments, as well as faculty and peer behaviour, have a lasting impact on academic performance and field of study choices, particularly negatively affecting young women in STEM disciplines. Factors such as poverty, violence, and child marriage also hinder young females from pursuing higher education and entering the labour force.

In this context, this study will explore the young women in higher education, factors affecting their enrolment in higher education and their enrolment scenario after completing at least a graduation degree.

CHAPTER 2: LITERATURE REVIEW

Literature Review

It is already discussed that the continuing growth of the middle class in India (approximately 200 million people) has led to increased demand for higher education. Tilak and Biswal (2015) have pointed out that supply-side expansion and falling poverty rates have led to an increase in the demand for higher education across India. But still, Higher education remains out of reach for many poorest and most marginalized sections, especially for women. AISHE (2019-20) reports that the percentage share of males is higher than females in almost every level of higher education, except M.Phil., Post Graduate and Certificate. There are various previous studies who shows that females are less likely to enroll in higher education than male. Parsons (2009) states in the developed world, females are more likely to go into university than boys but according to Marshall (2014) in the developing world the picture is different; many girls will not be able to reach secondary school in. In the developing world, there can be many different forms of gender inequality.

Women's enrolment in higher education is hindered due to several reasons. However previous studies also state that women's higher education is important. Khalid (2008) has mentioned that women are crucial to a country's development and the economic survival of their own personal households. Therefore, education is the most important tool for enhancing women's socioeconomic situation and statistically has been associated with better health, lower fertility rate, higher economic growth and better standards of living (Khan, 1993, Khalid, 2008). Jain (2003) reports that the inclusion of girls in as many diverse fields as are available in society must be reinforced and the need for necessary investments in their education must be recognised. If this happened, it would change the overall situation in women's employment and consequently motivate parents and communities to support female education. Summers (1994) also concludes that females' education can impact the next generation of both sexes and probably even further. Unterhalter et al. (2014) have considered that improved female education can contribute to gender equality as a whole through the emergence of a new generation of educated females who are able to participate in political, social, cultural, economic and technological spheres, changed gender norms, attitudes and identities in both sexes, and changed gender relations in a variety of institutions at all levels. Chanana (2007) has said that the increased participation of girls in education would eliminate the gender gap and inequality if underachievement and under-representation were taken care of. However, this

has proven to be false because it is observed that sometimes there are more girls than boys in lower levels of education and yet there is still a huge gap in secondary and further education.

The variety of obstacles that females face in accessing education are also present even in the lower levels of education. It is observed that especially in India, institutional, social, psychological and cultural boundaries limit a female's potential (Jain, 2003, Khalid, 2008). Hence, an inclusive approach is required to improve the situation in India. Women's participation in higher education in India has witnessed significant transformations in recent decades. As higher education increasingly becomes a crucial determinant of socioeconomic mobility and national development, understanding the economics behind women's engagement in this sector is imperative. Little research has been done in India relating to the transition rates for females at further levels of education, i.e. secondary school onward. This literature review aims to provide a comprehensive analysis of existing research on the economics of higher education among women in India, covering various dimensions such as access, enrolment, retention, labour market outcomes, and policy implications. So, in this chapter, we will examine some of the existing research studies surrounding gender and higher education in India.

Access to Higher Education

In the Global South, girls access to education often gets restricted as a result of deep-rooted social and cultural practices, such as preference for a son's education, violence against girls inside the home and in educational institutions, and household duties and domestic obligations (Marshall, 2014). In India, all of the above-mentioned obstructions exist, as well as a number of smaller scale issues that arise, like lack of girls' toilets or lack of female teachers. Access to higher education remains a challenge for women in India, particularly those from marginalized socio-economic backgrounds. Study by Desai and Kulkarni (2008) highlight the influence of socioeconomic factors such as family income, parental education, and geographic location on women's access to higher education. Additionally, cultural norms and gender stereotypes often deter women from pursuing higher education, particularly in rural areas where traditional gender roles are deeply entrenched (Plan International, 2013; UNESCO, 2015). Conservative and outdated local cultural norms and values are also standing as obstacles in the way of females' higher education (King and Hill,1993). Maqsood *et al*. (2012) have reported that parents of a female student consider that coeducation is a major threat to the family honour. As members of a conservative society, families believe that after studying in the coeducation

system, no one will marry their daughters' which strongly influences their opposition to education with boys. Similarly, Channa (2000) has documented the same scenario is present also in India. The Probe Team (1999) finds that the centrality of preparing girls for marriage is pronounced in the north of India where parents have historically held lower aspirations for educating daughters rather than sons. Various research studies documented that the coeducation system limits the enrolment of females in higher education because most of the higher educational institutions have this system. Beside socio cultural norms economic condition is another important determinant of female's access to higher education. The low income and scarcity of financial resources stem poor population to enrol their younger folks for proper education (Muhammad Zia Ullah Khan, 2015). Parental education also plays an important role in young females' enrolment in higher education. Various studies have found different conclusions on whether mother's education has a greater, smaller or no impact on their children's education than fathers' education (Farré, Klein, and Vella, 2009). Studies like Behrman and Rosenzweig (2002) report that a father's education has a larger impact on children's education. On the other hand, a study by Becker, Hubbard and Murphy (2010) found that maternal education is more beneficial to children. Numerous studies indicate that the children of parents with a college education are much more likely to go to college, even when family income is held constant (Haveman and Wolfe, 1995). Mehmood et al. (2018) found that parents are more sensible about their daughter's physical security and the threat of sexual harassment. This fear stops them from sending their daughters to universities and colleges. Efforts to improve access have included government initiatives such as scholarships for girls and reservation quotas in educational institutions (Sperling and Winthrop, 2015).

Enrolment and Retention

Despite improvements in enrolment rates, concerns about retention and completion persist among women in higher education. Family responsibilities, early marriage, and lack of support systems are significant factors contributing to higher participation rates among women (Moorely and Lugg, 2009). There are several reasons behind the low enrolment in higher education; such as the high dropout rates at the primary and secondary level, (Shah, 2005) conservative local culture and customs, poverty, sexual harassment, preference for boy's education over girls, lack of higher education institutions at local levels, and poor governance in universities etc. Lina et al. (2006) have reported that the higher study of females is hampered due to weak transportation systems, travel costs, accompanying costs, opportunity costs,

physical costs and cultural restrictions on the mobility of adolescent girls. Kingdon (2005) reports that for rural households' inequality in educational expenditure within these households is primarily the result of enrolment differentials between boys and girls. Manski and Mundel (2012) reveals that a low-cost, close-to-home higher education institution is considered to be a crucial determinant in a student's decision to continue their education. Research by Beswick (1983, 1985) and others (e.g., Powles, 1986) on the Australian higher education system has highlighted the significance of family attitudes, noting a correlation between parental attitudes and the availability of financial assistance for female students. Generally, women who attend and complete higher education in Australia seem to benefit more from external financial support than from familial aid. Regarding student retention, or the ability to stay in higher education until completing a course or degree, parental support and individual motivation are crucial factors, especially for women. Research by Das et al. (2018) underscores the importance of addressing socio-cultural barriers to retention, such as providing flexible learning options and childcare facilities.

Labour Market Outcomes

The relationship between higher education among women and their labour market outcomes is complex. While education is often considered a pathway to economic empowerment, women in India continue to face challenges in accessing quality employment opportunities. Gender wage gaps, occupational segregation, and discriminatory practices persist despite increases in educational attainment among women (Blau and Kahn, 2017). Women are still concentrated in particular segments of the system (Stromquist, 2001). Singh (2021) has shown that 85% of boys and 57% of girls in India are interested in pursuing their careers in STEM[3] jobs. AISHE report (2019-20) found that around 85% of female students enrol in nursing and only 15% of males are enrolled in the same. On the other hand, in Polytechnic institutes the female and male enrolment is 19% and 81% respectively. So, the data reveals that there is a gender-wise concentration in technical education after completion of graduation. Pampel and Tanaka (1986) argue that women have been excluded from early industrial jobs due to physical limitations, gender discrimination, and the domestic responsibilities associated with large families. During the initial phases of mechanized farming and industrial growth, women tend to leave the formal economic sector to focus on domestic production until the emergence of white-collar jobs that

[3] STEM jobs imply jobs in the filed Science, Technology, Engineering and Maths.

value education. Crucially, women's access to these jobs depends on their educational opportunities during this developmental period (Boserup, 1970). Mammen and Paxson (2000) address this issue using cross-sectional household-level data, finding in India and Thailand that a woman's level of education correlates with the likelihood of obtaining white-collar employment. This suggests that education may influence the upward trend of the U-shaped curve. However, longitudinal and multi-country studies have yet to thoroughly examine the impact of increased female education over time.

The literature on the economics of higher education among women in India highlights the complex interplay of socio-economic, cultural, and policy factors shaping women's educational experiences and outcomes. While progress has been made in improving access to higher education for women, persistent challenges remain in terms of enrolment, retention, labour market integration, and gender equality. Future research should focus on evaluating the impact of policy interventions and identifying innovative strategies to promote inclusive and equitable higher education systems for women in India.

CHAPTER 3: RESEARCH OBJECTIVE

Research Objectives

Women higher education is important for economic development of a country. In the present time they are recognized as the potential resources in the development of community and state. During the Eleventh Five-Year Plan (2007-2012), it became evident that higher education had been neglected. The government, thus, launched a plan for extensive expansion, including the creation of central universities, undergraduate colleges, and research centres. However, the spread of higher education has been uneven across different regions, replacing the pre-colonial indigenous system with a new one that features different languages, curricula, and purposes.

The significance of women as equal to men and as essential human resources was acknowledged, leading to efforts to involve women as equal partners in universities, colleges, and various institutes in India. Women from various socio-economic backgrounds experience significant disparities in their life situations. There are also considerable differences in the status of women across regions, castes, classes, communities, and religions. A woman's status is also influenced by the developmental status of her area (Ranganath, 2007). Religion plays a crucial role in reinforcing the traditional view of women as subordinate to men and under male control. Organized religions such as Hinduism, Buddhism, Islam, and Christianity have never granted full equality to women and have institutionalized their secondary position through written and oral interpretations. Women within the same religion can have vastly different life conditions based on their earning capacity, employment, rural-urban setting, educational level, and more. Within every minority group, some women live below the poverty line (BPL), while others enjoy a higher standard of living. Although the Constitution treats women as equal citizens, societal practices often differ from these ideals, creating a gap between legal equality and societal reality.

India is in demographic dividend situation and according to Indian Census 2015, 10.13% of females in the age group between 15-29 years old belongs to the Indian Population. Women higher education has a significant impact on the next generation by reducing fertility rates and improving health outcomes for children, which in turn affects children's education. Education is a key factor in increasing female labour force participation. Higher-educated women are more likely to find attractive job opportunities with higher wages, and the stigmas associated with employment are often lower for these women (Klasen and Pieters, 2012). Several studies in South Asia document such a relationship (Das, 2006; Olsen and Mehta, 2006), The main objective of this study is to observe the existence of the enrolment gap of young females in higher education

and identify the factors which creates the gap along with identifying those factors which reduce the gap. In this context, this study has the following research objectives:

1. First, an examination is conducted to assess the situation of women's enrolment in higher education in India at the household level. So, the factors influencing the household decision-making process regarding the enrolment of their young children in higher education are identified. This analysis takes into account both household and state-level factors. Although the decision to enrol a young individual in higher education is made at the household level, it is also influenced by various state-level policies.
2. Observing the household scenario next, we will examine the state-level scenario of women's participation in higher education in India. This perspective is important because variations in geographical, and socio-cultural conditions, and proactive state policies result in different enrolment situations for women across states. To analyse this, states will be compared based on the female Gross Enrolment Ratio (GER) in higher education. Additionally, the Gender Parity Index (GPI) will be used to observe the relative state-wise enrolment of women in higher education. Finally, we will identify the factors that influence the GER and GPI for females in higher education to understand the reasons behind the varying state-level enrolment scenarios.
3. Technical higher education plays a crucial role in a country's economic development. It has been noted that women tend to concentrate in specific disciplines within higher education. Fields such as Science, Engineering, Technology, and Management require laboratory and practical work which often scheduled in the evenings. Concerns about daughters' physical safety, security, and perceived difficulty of science subjects' parents often deter their young daughters from pursuing technical higher education. This study aims to investigate whether there is a gender preference at the household level when enrolling young individuals in technical higher education. Additionally, it seeks to identify household-level factors that help reduce the gender gap in technical higher education enrolment.
4. Education and employment exhibit a strong correlation. Researcher Tansel (2001) states that educational attainment has an important effect on an individual's decision to participate in the labour market. Attaining higher levels of education enhances an individual's productivity, efficiency, and skill set. Consequently, higher educational attainment often leads to better-paying employment opportunities, thereby elevating the

standard of living. However, in our country, women's participation in the workforce is impeded by various socio-economic factors. It is commonly observed that in developing nations, the relationship between education and female labour force participation follows a U-shaped pattern. Encouraging female education is known to decrease the fertility rate among women. With reduced fertility rates, women tend to prioritize employment, thereby increasing their likelihood of participating in the labour market, which in turn positively impacts economic growth (Ejaz, 2007; Klasen and Lamanna, 2009). Hence, this study aims to investigate the graduated and above female unemployment scenario in Indian states. It also seeks to compare the state-wise trends of female graduates and above unemployment rate along with the females' completing graduation and above degrees. Finally, the study aims to identify the factors contributing to the reduction of unemployment among female graduates in India.

CHAPTER 4: THE DETERMINING FACTORS OF FEMALES' ENROLMENT IN HIGHER EDUCATION INSTITUTIONS IN INDIA

1. Introduction

The development of a country is measured by the Human Development Index (HDI) in which one of the important components is education. Amartya Sen's entitlement and capability approach offers a unique perspective on education, focusing not just on the availability of educational resources but also on individuals' capabilities to effectively utilize those resources to enhance their well-being and achieve their life goals. Therefore, it is said that education is crucial for the development and progress of a nation by producing an efficient and productive labour force. Acquiring education constitutes various stages: from pre-primary to higher education. Higher education enhances the human capability of a person more. Sclutz (1960) first used the term human capital to reflect the economic value of human capabilities. Various researchers (Mincer, 1981; Núñezand Livanos, 2010) argued that the higher education system of a country creates and accumulates human capital and increases the aggregate productivity of the economy and in that way country experiences improving economic and social development.

The educational system of developing nations is strongly influenced by the nature, magnitude, and character of their developmental process. Being a developing country, the higher education system of India has its roots in the early times as well. Department of Higher Education under the Ministry of Education, Government of India defines Higher Education as “the education, which can be obtained after completing 12 years of schooling or equivalent and is of the duration of at least nine months (full time)”. The education may be of the nature of General, Vocational, Professional or Technical education. One of the most valuable resources in India is labour, which can be effectively used for economic growth by making enough investments in higher education and providing training that would increase the skill and productivity of the labour force. In the modern knowledge-based economy, the advancement of higher education has a significant impact on socio-economic and political growth. All nations around the globe concur that this is a truth. The prime idea of building a knowledge society is the idea of empowering young men and women through education and ensuring that all our delivery systems are built on the premise of the latest knowledge. This can be achieved through enhancing the investment in higher education. According to the All India Survey on Higher Education (AISHE) 2019 report, there are 993 Universities, 39931 colleges and 10725 Stand Alone Institutions in India. The enrolment of youths in the higher education sector in India has increased notably during the last two decades but it is still deficient. The latest National

Education Policy, 2020 targeted doubling enrolment rate in higher education by 2035. The increase in enrolment is determined by the increase in demand for higher education which is an economic decision. The Gross Enrolment Rates (GER) at the higher education level and the country's per capita GDP should have a strong positive link (Anandakrishnan, 2006). While the expansion of the higher education sector has helped the country reach a stage of massification (which is to be celebrated), it is equally important to analyse and identify the winners and losers in the process of expansion. It is required to investigate whether the expansion of the system led to the widening of access to higher education among under-represented groups or widened inequalities.

India is a country where still now more than 80% of the labour force is engaged as informal workers who are deprived of enjoying any social security benefit (Kundu and Roy, 2024) and they consider investment in human capital as a luxury (Roy and Kundu, 2021). In this background, this paper will initially try to identify the household-related factors which can enhance the possibility of enrolment of their sons or(and) daughters in higher education institutions. Next, this paper will try to identify the factors which can enhance the enrolment of young girl children in higher education. Based on these observations, a few policy prescriptions are suggested for further enhancement of the enrolment of Indian young girls in higher education.

2. Literature Review:

The infrastructure and education system of a nation are key factors in its economic development. According to Richardson and Watt (2005), three main factors—social, technical, and external factors—typically influence students' job decisions which indirectly plays a vital role in selecting higher education. Few studies are focusing on determinants of participation in higher education in India.

Aydin and Bayir (2016) conducted a study to examine the impact of demographic factors (gender, family income) influencing enrolment in the Higher Education Institution (HEI) selection. In Indian society, casteism is an important factor behind the selection of higher education. Various studies like Desai et al. (2009), Kundu and Kumar (2015) investigated the disparities in accessing higher education and highlighted the challenges faced by marginalized caste students. Khan (2022) states that over the past decades, the difference in college graduation rates between Higher Castes (HC) and Scheduled Castes (SC), HC and Scheduled

Tribes (ST), as well as between Hindus and Muslims, was maintained and occasionally even widened. Another important reason is that SC had a greater disadvantage than ST in terms of graduating from college when wealth and place of residence were considered (Desai & Kulkarni, 2008). Socio-religious background, eligibility, and financial situation of students are important factors that affect their ability to enter higher education. Bowman and Anderson (1980) believe that a family's financial situation is likely more significant than its religious beliefs. According to studies, parents' desire to support their daughters' education increases with family income. Using longitudinal data Bastedo and Jaquette (2011) depicted that stratification in higher education may persist despite improvements made by low-income students. This is because wealthy students have seen even greater increases than low-income students. Since low socioeconomic level students do not transfer to 2-year or 4-year institutions at the same rate as students from better socioeconomic statuses, it is important to identify the factors students or parents of the students think about when making decisions related to higher education. (Temple, 2009).

Since the fee system used by institutions is directly related to the financial capability of the household income, the direct cost of education is also a significant consideration for families with low or medium incomes (Mattern and Wyatt 2009). Chatterjee and Mishra (2017) examined how the changes in the direct cost of higher education especially tuition fees influence the higher education enrolment rate in India. Students' choices of universities are heavily influenced by university location, city reputation, level of regional development, and more (Uyar, 2018). Kohn, Manski, and Mundel (2014) revealed that a low-cost, close-to-home higher education institution is considered to be a crucial determinant in a student's decision to continue their education. Kusumawati (2013) finds that students' place of residence a high value on the distance between the college and their home since doing so allows them to have closer, more frequent relationships with their families. In contrast, parents of students with low qualifications, and parents of high-achieving students are less concerned with distance and place rather they give higher priority to the institute's academic excellence (Juvekar, 2022).

Richard and David (1967) discovered that the frequency and efficacy of parental educational encouragement decreased with family size. Although in their study family size was used as an additional control variable. Furthermore, they discovered that the larger the family, the greater the reduction in both the frequency with which parents encourage their children to continue their education beyond high school as well as in the effectiveness of a given frequency level of

parental educational encouragement. A study by Desai and Alva (2006) showed the importance of maternal education in influencing household decisions regarding the investment in children's higher education. It has also been demonstrated that parents are more likely to support their daughters' education the more educated they are (Stromquist, 1989). In any event, women's access to higher education is significantly more reliant than men on the identical socioeconomic position of their families. The gap between males and women's educational attainment in universities is narrowing more quickly than it is in elementary and secondary schools, which is a recent development in India and further illustrates the mediating impact of social class on women's education (Ghosh, 1986).

3. Research Objectives:

In today's world, knowledge holds significant power, and individuals become more empowered as they acquire more knowledge. A robust higher education system within a nation has the potential to strengthen its economy. India is known for supplying a highly skilled workforce to the global market. With these considerations in mind, the present study aims to achieve the following objectives:

1. To examine the household-related factors that can play a role in influencing parental decisions regarding enrolling their sons and daughters to higher education institutions. Here besides household-related factors, state-specific factors are also considered and the state-related factors are used as a proxy of neighbourhood effect during the time of decision. It also involves examining governmental policies and initiatives aimed at promoting and facilitating access to higher education. It will also look at whether there exist gender preferences during the enrolment process in higher education
2. To identify the household-related and neighbourhood-related factors that influence a parent's decision to enrol their young daughters in higher education.

4. Data and Methods:

This study uses data from the 75th round of the National Sample Survey Organization (NSSO) Household Social Consumption on Education dataset. Alongside household-related factors, state-specific factors influencing household decision-making as well as investigating the neighbourhood effect are incorporated from diverse sources such as the National Family Health

Survey (NFHS-4)[4], the Ministry of Education's Analysis of Budgeted Expenditure on Education (2016-17 to 2018-19), All India Survey on Higher Education Report (2017-18), State-wise loan disbursement data by SBI for degree and diploma courses within and outside the country[5], Periodic Labour Force Survey (PLFS) Annual Survey report 2017-18 and police density from the Bureau of Police Research and Development, Government. of India. The sample households are initially categorized based on the considered states, with 28 states included, excluding Manipur and Meghalaya[6] and Union Territories. Given the potential variations in state policies, the value of state-specific variables remains consistent for all sample households within a particular state.

The NSSO 75th Round unit-level dataset covers a total of 14,285 FSUs (8097 villages in rural areas and 6188 Urban Frame Survey Blocks in urban areas). This encompasses 11,90,110 households (64519 rural households and 49238 urban households) and enumerates 5,13,366 persons (3,05,904 rural individuals and 2,07,462 urban individuals). The survey includes a total of 267,887 males (1,59,411 in rural areas and 1,08,476 in urban areas) and a total of 245,479 females (146,493 in rural areas and 98,986 in urban areas).

The focus of this study is on a subset of the dataset, specifically, young individuals aged 18-28 years[7], categorized into those currently attending higher education and those who are not. The extracted total sample comprises 1,08,261 young individuals, with 48,910 females (approximately 45%) and 59,351 males (approximately 55%). The NSSO survey covers both quantitative aspects (such as household size and consumption expenditure) and qualitative aspects (including participation in higher education and household location) related to the educational attainment of young household members.

4.1 Possible Factors Influencing Enrolment Decisions in Technical and Vocational Courses in Higher Education in India

The initial objective of this paper is to identify potential factors which can influence a parent's decision for their young children at the time of enrolment in higher education institutions. To do that probit regression technique will be applied here where the outcome variable is binary.

[4] NFHS 4 data is used as this is the latest dataset for the considered time period in this study.
[5] SBI sanctioned loan data only available for all the states & it is considered that as SBI is available all over India.
[6] Due to unavoidability data these two states cannot be considered for this study.
[7] As mainly between this age group (18-28 years) adolescents' studies in technical higher education in India.

It takes the value '1' if the young individuals are enrolled in a higher education level (post 10+2), and '0' if they are not enrolled in a higher education level.

The probable influencing factors are outlined below, focusing on household-related variables derived from the NSSO 75th round datasets. These variables include gender, religion (Hindu, Muslim and Christian), residential status, household size, consumption expenditure, computer ownership, and institutional distance.

1. **Gender:** This variable is crucial for examining the presence of gender preferences among parents when enrolling their children in higher education. Studies like Smith and Jhonson (2010) have discussed the enrolment of young in higher education considering the gender aspect. Kingdon (2002), Kuglen and Kumar (2017), Rammohan and Vu (2018), and Sahoo (2017) suggest that the gender gap in educational attainment stems from disparities in human capital investment within households and that is influenced by the gender of the young child. In patriarchal societies, parents often allocate their earnings for their daughters' marriage, showing reluctance to invest that money in their daughters' higher education. Consequently, daughters are commonly directed towards low-fee government colleges, while sons are enrolled in higher-fee technical or professional colleges (Singh, 2007; Thasniya, 2014). It is required to investigate the updated situation in India. ‘Gender; is treated here as a dummy variable and is assigned a value of '1' if the young individual is female and '0' for male child.
2. **Religion:** Religion holds significant importance in Indian society, with a substantial proportion of households belonging to the Hindu community (79.8%), followed by the Muslim community (14.23%), the Christian community (2.30%), and other communities (3.67%) as per the 2011 Census. In this study, we focus on three main religions: Hinduism, Islam, and Christianity, alongside other religions. If a young individual belongs to the Hindu religion, the dummy variable "Hindu" is assigned a value of "1," while for other religions, it is assigned "0." Similarly, for the Muslim and Christian religions, the variable takes the value "1" if the young individual belongs to the specific religion, and "0" otherwise. It is anticipated that the religion of the household may significantly influence the households during the time of enrolment in higher education institutions. The UGC report (2008) highlighted the challenging circumstances faced by Muslim women during enrolment in higher studies. Additionally, special reservations for young individuals belonging to the Christian or Muslim communities may lead households from these communities to primarily enrol their young in aided Christian or Muslim higher education

institutions.

3. **Caste:** Caste holds significant social importance in the Indian context, as casteism plays a crucial role in shaping the societal structure. Historically, upper-caste individuals have exerted dominance over those belonging to backward castes. Despite various social policies since independence, the status of Scheduled Castes and Scheduled Tribes remained at the bottom of the social hierarchy and have been socially discriminated against, exploited and excluded from the mainstream of society since time immemorial in Indian society. To correct the issues of exclusion, discrimination and imbalance in terms of access to capital assets, employment, education, political participation and other spheres, reservation in institutions among the Scheduled Caste (SC) and Scheduled Tribes (ST) and Other Backward Class (OBC) households have been introduced in Indian institutions. However, still, the situation of SCs and STs has not improved much including "Higher educational Level". It is now required to investigate this effectiveness. If a young individual belongs to any of the mentioned castes, the assigned value is "1"; otherwise, it is "0." Here General caste is used as the reference category.
4. **Resedential_Status:** This variable indicates the location of the young students' residence, distinguishing between rural and urban areas. Given the well-established pattern of development in India, urban areas tend to experience more significant development compared to rural areas, as documented by Sinha (2008) and Agarwal (2009). The concentration of higher education institutions, including general degree colleges, universities, and technical institutions, is notably higher in urban areas. According to the All India Study on Higher Education, i.e. AISHE 2019-20 report, 56.1% of stand-alone institutions are in urban areas. Tilak and Chowdhury (2019) further highlighted that the enrolment of women in higher education from urban areas is four times higher than that from rural areas. In light of these disparities, residing in a rural area may pose challenges for a young individual seeking enrolment in a higher education institution located in an urban area. This variable is represented as a dummy variable, taking the value of 1 if the young person lives in an urban area and 0 if they reside in a rural area.
5. **HH_Size:** The household size is determined by the total number of members in a specific household. It is anticipated that larger household sizes may diminish the possibility of enrolling in higher education due to the associated expenses. Particularly for female students from low socioeconomic status (SES), the situation is more challenging, and they often compete with their male siblings for enrolment in tertiary education, as highlighted

in studies by Kaaya and Waiganjao (2015) and Niu (2017).

6. **Consumption_Expen:** Here, the monthly consumption expenditure (in Rs.) is used as a proxy for the household's monthly income. The decision to enrol a young individual in a higher education institute is heavily contingent on the household's income level. Existing literature on household expenditure on higher education underscores the presence of gender bias in spending, particularly among economically disadvantaged families, as discussed in studies by Tilak and Mazumder (2016). The trend indicates that opting for higher education for students especially young girl students from lower socio-economic backgrounds is challenging. They often find themselves in competition with their male siblings for enrolment in tertiary education, as documented by Kaaya and Waianae (2015) and Niu (2017).
7. **Computer_ownership:** This variable is a binary indicator, taking the value of 1 if the household possesses a computer and 0 otherwise. The computer plays a significant role in every field of life nowadays. In today's global context, the internet has evolved into a major and invaluable source of information for both learners and educators, as highlighted by Makoye (2003). Therefore, the computer along with the internet is the most powerful device that youths can use to learn more skills and abilities in higher education. Using a computer-based learning system young student can enhance their skills when they wish at their homes. On the other hand, an experimental study by Fairlie (2012) found that ownership of a computer in the home has a small positive effect on educational outcomes for college students. Therefore, in this study, it is expected that ownership of computers will encourage parents to enrol their young children in higher education. The same may also happen for their daughter's enrolment.
8. **Instituitional_Distance:** The variable "Distance" is assigned a value of '0' if the distance to the nearest higher education institute is less than 5 km, and '1' if the distance is equal to or greater than 5 km. The proximity between higher education institutes for higher studies and households plays a crucial role in determining whether to send the young to higher education, particularly in rural India. In rural areas, the lack of transport connectivity and concerns related to the safety of young girls may restrict their ability to enrol in higher studies, especially as educational expenditures increase. Studies, such as the one conducted by Lina et al. (2006), have highlighted various challenges faced by females in pursuing higher education, including hindrances due to weak transportation systems, travel costs, accompanying expenses, opportunity costs, physical challenges, and cultural restrictions

on the mobility of adolescent girls. Consequently, it is anticipated that a shorter distance between households and educational institutions would enhance enrolment, addressing some of the barriers associated with transportation and safety concerns.

There are some state-specific factors which can have an impact on the household's decision to enrol a young individual in higher education. Those are used as a proxy to investigate the influence of the neighbourhood effect which can influence the time of taking any household-related decision. Besides that, as each state adheres to distinct policies, the influence on household-level decisions may vary across states. Hence, the following state-specific policy variables are here considered and elaborated below.

9. **Police Density:** This variable is defined as the area in square kilometres per policeman in a specific state during a particular year. The data for this variable is sourced from the report on Data on Police Organizations (2017-2018) published by the Bureau of Police Research and Development, Ministry of Home Affairs, Government of India. Police protection serves as a crucial indicator in gauging the safety and security of a state. This factor significantly influences parents' decisions regarding the enrolment of their young children in colleges. Parents, particularly in India, play a pivotal role in shaping their children's educational choices, and concerns about the physical safety of daughters often act as a deterrent to encouraging their participation in technical education, as noted in research by Channa (2000). It is anticipated that in states where police density is higher, young students, especially young girls, may feel more secure and safe in attending college. This, in turn, is expected to contribute to an increase in the enrolment of young individuals in higher education. This variable is considered a state-specific policy variable in the study. It is also required to consider investigating the neighbourhood effect during the time of deciding.
10. **No._ inst:** This implies the number of higher educational institutes within a state for a specific year (2017-18) and it is a state-specific variable. There are 903 universities, 39050 colleges and 10011 standalone institutions in India (AISHE 2017-18). It is anticipated that in a state, a greater number of higher education institutions will lead to a higher enrolment of young individuals in higher education. These higher education institutions encompass colleges, universities, stand-alone institutions, as well as engineering and medical colleges. It is considered a policy variable as well as to investigate the neighbourhood effect.
11. **State_Expen_HE:** The financial commitment by the state to the higher education level

may significantly influence the enrolment of young individuals in the same. Recognizing that higher education is expensive, individuals from economically disadvantaged backgrounds, especially the youth, often find it challenging to bear these costs. Research conducted by Kaaya and Waiganjao(2015) and Nwojiewho and Deebom (2017), suggested that government initiatives such as scholarship programs can potentially facilitate the admission of female students into higher education. Consequently, it is anticipated that the higher the financial burden shared by the state, the greater the enrolment in higher education.

12. **Loan Amount:** Higher education is widely recognized as costly, particularly technical education, surpassing the expenses associated with typical undergraduate and postgraduate courses (Kosha et al., 2014). Consequently, it becomes challenging for youths coming from economically disadvantaged backgrounds. The prospect of enhanced employability serves as a crucial factor motivating individuals to pursue higher education, thereby making educational loans a significant determinant. Recognizing the importance of facilitating educational pursuits, the Reserve Bank of India (RBI) encourages banks to provide educational loans, designating them as priority sector lending. This study focuses on the amount of loans sanctioned in a state. Data for this variable is extracted from the State-wise loan disbursement by the State Bank of India (SBI) for degree and diploma courses, both domestically and internationally, during a specific year (2017-18) as reported by the Ministry of Finance. This variable is considered a policy variable in the study.
13. **Years of Schooling:** This variable pertains to the proportion of women who have completed 12 or more years of schooling. The data for this variable is sourced from the National Family Health Survey (NFHS-4) conducted in 2015-16. This metric serves as a surrogate for the extent of female education within a specific state. The assumption is that a well-educated mother increases the probability of her household's younger members especially young girls pursuing higher education. Consequently, it is anticipated that in states where a higher percentage of females have completed 12 or more years of schooling, there will be an increased enrolment of young individuals in higher education levels.
14. **Women empowerment:** Percentage of women who usually make specific decisions alone or jointly with husbands. This variable is considered as a proxy of women empowerment which reflects the state-wise unobserved effect. At the household level women's decision-making power is an important determinant of young's participation especially female young's participation in higher education. It is expected that if a woman of a household

has equal decision-making power as her husband that will help to improve the young's enrolment in higher education. It is used to investigate the influence of the neighbourhood effect during the time of making any decision.

15. **Working Population Rate:** This variable is defined as the percentage of the working age population who are working and have at least a higher secondary degree. This variable is collected from PLFS 2017-18 data published by the Ministry of Statistics and Programme Implementation, Government. of India. This variable considers two genders separately: Male worker population ratio and female worker population ratio. In our nation, a considerable proportion of the workforce operates informally, with a higher percentage among males than females. Consequently, it is anticipated that young males entering informal labour after completing their higher secondary education may be less inclined to pursue further education. Conversely, female participation in the workforce is notably lower compared to males. Thus, a lower female workforce participation rate is expected to encourage greater enrolment of females in higher education.

5. Methodology:

First, the household-level factors along with state-specific factors are identified which play an important role when parents decide whether to enrol their young children in higher education in India. The dependent variable is "Enrol_HE". It is a binary variable; if currently enrolled then the value is "1" otherwise "0". As the dependent variable is binary therefore it is best to apply the Probit regression technique to identify the factors affecting a household's decision to send their young children to higher education.

All the independent covariates were tested for possible multi-collinearity through the VIF test (reported in the appendix) before putting them in the regression model. Also, to capture the ethnicity impact we consider two different models for caste and gender.

The following probit regression equation is considered to address the first research problem

Model 1

$$Y_{ij} = \beta_0 + \beta_1 \text{Female}_{ij} + \beta_3 \text{Hindu}_{ij} + \beta_2 \text{Muslim}_{ij} + \beta_3 \text{Chiristian}_{ij} + \beta_4 \text{Resedential\_Status}_{ij} + \beta_5 \text{Consumption\_Expen}_{ij} + \beta_6 \text{HH\_Size}_{ij} + \beta_7 \text{Computer\_owner}_{ij} + \beta_8 \text{Distance}_{ij} + +\beta_9 \text{No\_Insti}_{j} + \beta_{10} \text{State\_Expen\_HE}_{j} + \beta_{11} \text{Loan\_Amnt}_{j} + \beta_{12} \text{Year\_Schooling}_{j} + \beta_{13} \text{Working\_Male\_Pop}_{j} + \varepsilon_{ij} \quad \ldots\ldots..(1)$$

Model 2

$$Y_{ij} = \beta'_0 + \beta'_1 \text{Female}_{ij} + \beta'_2 \text{SC}_{ij} + \beta'_3 \text{ST}_{ij} + \beta'_4 \text{OBC}_{ij} + \beta'_5 \text{Resedential\_Status}_{ij} + \beta'_6 \text{Consumption\_Expen}_{ij} + \beta'_7 \text{HH\_Size}_{ij} + \beta'_8 \text{Computer\_owner}_{ij} + \beta'_9 \text{Distance}_{ij} + +\beta'_{10} \text{No\_Inssti}_{j} + \beta'_{11} \text{State\_Expen\_HE}_{j} + \beta'_{12} \text{Loan\_Amnt}_{j} + \beta'_{13} \text{Years\_Schooling}_{j} + \beta'_{13} \text{Working\_Male\_Pop}_{j} + \varepsilon'_{ij} \quad \ldots\ldots\ldots(2)$$

Here Y_{ij} =1 if the young from the i^{th} household of j^{th} state is enrolled higher education institute (between the age group 18 to 28)

= 0 if the i^{th} household of that reference age group of the j^{th} state is not enrolled higher education institute.

Similarly, after identifying the factors affecting young's enrolment in higher education irrespective of their gender, it is planned to identify those factors that affect female young's enrolment in higher education. Here the dependent variable is Female enrolment in higher education. If female young are currently enrolled in higher education it takes the value"1" between the age group 18 to 28, otherwise "0". As here also the dependent variable is binary then the Probit regression method is used.

The two models are:

Model 1.1

$$Y_{ij}^{F} = \alpha_0 + \alpha_1 \text{Hindu}_{ij} + \alpha_2 \text{Muslim}_{ij} + \alpha_3 \text{Chiristian}_{ij} + \alpha_4 \text{Resedential\_Status}_{ij} + \alpha_5 \text{Consumption\_Expen}_{ij} + \alpha_6 \text{HH\_Size}_{ij} + \alpha_7 \text{Computer\_owner}_{ij} + \alpha_8 \text{Distance}_{ij} + +\alpha_9 \text{No\_Insti}_{j} + \alpha_{10} \text{State\_Expen\_HE}_{j} + \alpha_{11} \text{Loan\_Amnt}_{j} + \alpha_{12} \text{Police\_Density}_{j} + \alpha_{13} \text{Years\_Schooling}_{j} + \alpha_{14} \text{Women\_empowerment}_{j} + \alpha_{13} \text{Working\_Female\_Pop}_{j} + \mu_{ij} \quad \ldots\ldots\ldots\ldots(3)$$

Model 2.1

$$Y_{ij}^{F} = \alpha'_0 + \alpha'_1 \text{SC}_{ij} + \alpha'_2 \text{ST}_{ij} + \alpha'_3 \text{OBC}_{ij} + \alpha'_4 \text{Resedential\_Status}_{ij} + \alpha'_5 \text{Consumption\_Expen}_{ij} + \alpha'_6 \text{HH\_Size}_{ij} + \alpha'_7 \text{Computer\_owner}_{ij} + \alpha'_8 \text{Distance}_{ij} + +\alpha'_9 \text{No\_Insti}_{ij} + \alpha'_{10} \text{State\_Expen\_HE}_{j} + \alpha'_{11} \text{Loan\_Amnt}_{j} + \alpha'_{12} \text{Police\_Density}_{j} + \alpha'_{13} \text{Years\_Schooling}_{j} + \alpha'_{14} \text{Women\_empowerment}_{j} + \alpha'_{13} \text{Working\_Female\_Pop}_{j} + \mu'_{ij} \quad \ldots\ldots\ldots(4)$$

Here Y_{ij}^{F} =1 if the female young from the i^{th} household of j^{th} state is enrolled in a higher education institute (between the age group 18-28)

= 0 if the i^{th} household of j^{th} state is not enrolled in a higher education institute in that reference age group.

The values of each of the state-specific variables are the same for the sample households for the j^{th} state.

6. Result & Discussion:

6.1Determinants of Enrolment in Higher Education

Table 4.1 has identified the household and neighbourhood effect-related factors which are playing possible decision-making factor of a parent during the time of enrolment in higher education,

Table 4.1: Factors Determining General Enrolment in Higher Education in India

Variable		Model 1		Model 2	
		Coefficient	**Marginal Coefficient**	**Coefficient**	**Marginal Coefficient**
Gender (Ref Category male)		0.065*** (0.008)	0.017*** (0.002)	0.660*** (0.008)	0.017*** (0.002)
Religion	Hindu	0.034 (0.022)	0.009 (0.005)		
	Muslim	-0.232*** (0.025)	-0.062*** (0.006)		
	Christian	0.088*** (0.035)	0.023*** (0.009)		
Caste	SC			-0.253*** (0.013)	-0.067*** (0.003)
	ST			-0.268*** (0.018)	-0.071*** (0.004)
	OBC			-0.155*** (0.010)	-0.041*** (0.002)
Resedential_Status (Ref Category rural)		0.252*** (0.010)	0.067*** (0.002)	0.209*** (0.010)	0.056*** (0.002)
Consump_expen		0.356*** (0.009)	0.095*** (0.002)	0.329*** (0.010)	0.088*** (0.002)
HH_Size		-0.046*** (0.002)	-0.012*** (0.0006)	-0.048*** (0.002)	-0.013*** (0.0006)
Computer_Owner (Ref Category not owned)		0.444*** (0.011)	0.119*** (0.002)	0.439*** (0.011)	0.117*** (0.002)
Distance (Ref Category distance less than 5 km)		-0.374*** (0.015)	-0.100*** (0.004)	-0.371*** (0.015)	-0.099*** (0.004)
No_Insti		0.00005*** (0.0000003)	0.00001*** (0.00000008)	0.00004*** (0.0000003)	0.00001*** (0.00000008)
State_Expen (Rs. In thousand)		0.001* (0.001)	0.0004* (0.0002)	0.003*** (0.001)	0.0008*** (0.0004)
Loan_ Amount (Rs. In crore)		-0.001*** (0.0001)	-0.0004*** (0.00003)	-0.001*** (0.0001)	-0.0003*** (0.00003)
Years_Schooling (%)		0.0009 (0.0008)	0.0002 (0.0002)	0.004 (0.0008)	0.0001 (0.0002)
Woking_Male_Pop (%)		-0.010*** (0.0008)	-0.002*** (0.0002)	-0.0119*** (0.0008)	-0.003 (0.0002)
Pseudo R2		0.087		0.088	

***, ** and * indicates level of significance at 1%, 5% and 10 %.

Table 4.1 shows the determinant factors that significantly influence a household's decision regarding whether to enrol their young child in higher education or not. Here, two different models are considered to indicate the individual effects of religion and caste on a young's higher education participation decision.

Both the above models report that the probability of young females' enrolment in higher education is increasing supporting Ghosh and Kundu's (2021) study. Model 2 considering the caste-specific effect, reflects that Youngs from the backward class (SC, ST and OBC) have a lesser chance to enrol in higher education. On the other hand, though Model 1 shows that among the Christian community, the probability of enrolling in higher education is increasing, among the Muslim community the probability of participation is decreasing.

On the other hand, both models have reported that among the households with higher income levels, the young from those households have a greater chance to enrol in higher education. Similarly, household computer ownership helps to increase the chance of young enrolment in higher education. Various studies (Dohmen et al., 2014; Sjoquist and Winters, 2014) showed that higher distance between higher education institutions and home plays a hindering factor behind the participation of Youngs in higher education. This study also proves that distance is a hindering factor behind the probability participation in higher education for those Youngs whose houses are located more than 5km away. Besides this, supporting the previous studies (Bozick and DeLuca, 2011; Leibel and Wolfe, 2018) this study also shows that young from larger household size have a lesser chance to join in higher education than young from smaller household size due to lack of financial constraints.

The state-specific policy variables play an important role in deciding the young's enrolment in higher education. Analysis of the variables "No_Insti" and "State_Expen" suggests that a greater number of higher education institutes and higher state expenditure on higher education increase the possibility of young individuals' enrolment in higher education. Conversely, the model indicates that the coefficient value of the variable "Loan_Amnt" is negatively significant, indicating that a low sanctioned loan amount or subsidized educational loan enhances the probability of young individuals' enrolment in higher education. It is also established that subsidized educational loan is crucial for economically disadvantaged students to access higher education, where the direct cost of education is high. However, it's observed that increased state expenditure decreases the necessity for larger education loans, as these loans impose financial strain on economically disadvantaged groups. Additionally, in a patriarchal society like ours, where a significant proportion of the workforce is informal and predominantly male, the result suggests that a higher percentage of male workers with the highest educational level of higher secondary education decreases the likelihood of young for enrolling in higher education.

6.2 Determinants of Young Female's Enrolment in Higher Education

Table 4.2: Factors Determining Young Females' Participation in Higher Education

Variable		Model 1.1		Model 2.1	
		Coefficient	**Marginal Coefficient**	**Coefficient**	**Marginal Coefficient**
Religion	Hindu	0.093*** (0.033)	0.024*** (0.008)		
	Muslim	-0.211*** (0.038)	-0.055*** (0.010)		
	Christian	0.183*** (0.050)	0.048*** (0.013)		
Caste	SC			-0.265*** (0.020)	-0.069*** (0.005)
	ST			-0.329*** (0.278)	-0.086*** (0.007)
	OBC			-0.154*** (0.015)	-0.040*** (0.004)
Resedential_Status (Ref Category rural)		0.289*** (0.015)	0.076*** (0.004)	0.244*** (0.015)	0.064*** (0.004)
Consump_expen		0.420*** (0.015)	0.110*** (0.003)	0.387*** (0.015)	0.101*** (0.003)
HH_Size		-0.060*** (0.003)	-0.015*** (0.0008)	-0.063*** (0.003)	-0.016*** (0.0008)
Computer_Owner (Ref Category not owned)		0.501*** (0.016)	0.131*** (0.004)	0.498*** (0.016)	0.131*** (0.004)
Distance (Ref Category distance less than 5 km)		-0.323*** (0.023)	-0.085*** (0.006)	-0.321*** (0.023)	-0.084*** (0.006)
Police_Density		0.023*** (0.006)	0.006*** (0.001)	0.032*** (0.007)	0.008*** (0.001)
Years_Schooling (%)		0.013* (0.001)	0.003* (0.004)	0.012* (0.001)	0.003* (0.0004)
Women_Empower (%)		0.006*** (0.001)	0.001*** (0.0003)	0.006*** (0.001)	0.001*** (0.0003)
No_Insti		0.00006*** (0.0000004)	0.00001*** (0.00000001)	0.00005*** (0.0000004)	0.00001*** (0.00000001)
State_Expen (Rs. In thousand)		0.0004* (0.001)	0.00001* (0.0004)	0.006*** (0.001)	0.001*** (0.0004)
Loan_Amnt (Rs. In crore)		-0.001*** (0.0001)	-0.0005*** (0.00004)	-0.001*** (0.0001)	-0.0003*** (0.00004)
Woking_Female_Pop (%)		-0.0008* (0.001)	-0.0002* (0.0003)	-0.001* (0.001)	-0.0004* (0.0003)
Pseudo R2		0.1192		0.1193	

***,** and * indicates level of significance at 1%, 5% and 10 %.

From Table 4.1 it is observed that the probability of young females' participation in higher education in India is higher than males. Table 4.2 has tried to identify the factors which help to increase the participation of young females in higher education. Considering ethnicity as an important determinant, two indicators are included here i.e. Religion and Caste. From Model

2.1 it is observed that among the SC, ST and OBC castes, the probability of females' participation in higher education is lower. Whereas in the case of religion among the Hindus and Christians, the chance of young females' participation in higher education is higher but for Muslims, it is lower. Studies like Ahmend and Khan (2018), and Ali and Abdi (2019) have discussed the access and participation of Muslim young females' participation in higher education and they indicate that socioeconomic and cultural factors are playing as important roles. A study conducted by Drannen and Hanselman (2017) in the US also states that Muslim women are less likely to join higher education than Hindu and Christian women even after controlling socioeconomic factors. This study also documents similar result. Various research studies like Rahaman and Ali (2019), Adeyemi and Oluwafemi (2018), and Khan and Haq (2020) have indicated that socioeconomic factors, cultural beliefs, and educational policies are the main causes behind the disparities between these two religions.

Residential status i.e. where the young females' houses are located: in rural areas or urban areas is an important determinant factor behind the rising probability of females' participation in higher education. Table 4.2 shows that young females whose houses are located in urban areas have more chances to join higher education than young females who live in rural areas. Though the household location is an important determinant factor behind the females' participation in higher education our result also states that if the distance between household and higher education intuition is higher than 5km the probability of young females' participation in higher education reduces. The Table also portrays that the higher the income of the household higher the chance of the young female of the household to join in higher education.

Examining the neighbourhood effect, the first aspect to consider is the safety and security of the state, particularly concerning young females. Parents of young females often express concerns about their daughters' physical safety. Consequently, this study indicates that areas with higher police density have a greater possibility of female enrolment in higher education, as parental fears are assuaged.

Moreover, the presence of a greater number of higher education institutions increases the chances of female enrolment in higher education. Table 4.1 and Table 4.2 have also suggested that increased state spending on higher education, such as offering scholarships or subsidies, reduces the need for large education loans. Consequently, higher loan amounts sanctioned can deter females from pursuing higher education due to concerns about falling into a debt trap.

The role of mothers in households is crucial, as evidenced by various studies (Olivetti and Paserman, 2015; Joseph and Rivera, 2015), including this one, which shows that higher levels of maternal education correlate with increased female enrolment in higher education. Furthermore, women's empowerment is a significant determinant, as empowered women tend to have higher levels of education, including enrolment in higher education. Fontana Monticone (2017) suggests a positive association between women's empowerment, particularly in terms of decision-making power and autonomy, and higher education enrolment among females. Moreover, women's decision-making authority within families has a direct effect on their own family's decisions and an indirect effect on their neighbours' decision-making processes. In this study, women's empowerment is measured by their decision-making authority within the family, and households where women have equal decision-making power as their husbands are more likely to see increased probabilities of young females enrolling in higher education.

Furthermore, the worker-population ratio is another significant determinant. Given that, a large proportion of the population in our country works as informal workers, with female representation lower than male, a lower ratio of female workers increases the likelihood of young females enrolling in higher education. This is because higher education enhances skills, leading to improved prospects of formal employment with better wage structures.

7. Discussion on the Effectiveness of Affirmative Actions like Reservation during the time of enrolment in Higher Education among females.

Affirmative action aims to provide preferential treatment to those belonging to disadvantageous communities. In Indian higher education institutions. 15% and 7.5% of seats are reserved for SCs and ST category students respectively during the time of enrolment. Apart from that, 27% of seats are reserved by the government for OBC Category students. Here an intended beneficiary should have a caste certificate issued by the appropriate authority. Reservation in higher education is done to improve the education level of backward castes as they are always dominated and deprived by the Upper castes. Study by Yadav and Gohil (2020) has shown that young from backward castes have always a lower chance of joining higher education as socio-economic factors, geographical variations and educational policies as key determinants of educational inequalities among backward classes. This study also documents a similar result and indicates that there is always a lower probability of enrolling students from backward

classes, especially young females in higher education which indicates that affirmative action in terms of reservation cannot enhance the possibility of enrolment in higher education among female students belonging to backward communities.

8. Conclusion

This study aims to investigate the factors that drive Indian parents, particularly in the case of young girls, to enrol their children in the higher education system. Using the Probit Regression technique this study has found that the probability of young females joining higher education system comparing with male is higher in India. There are several household-related factors such as household income, household location acts as household-specific motivating factors which encourage parents of youths to enrol them in higher education. It is also observed that a higher worker population ratio among males reduces the possibility of enrolment in higher education irrespective of gender. During the time of enrolment among females in higher education, it is observed that among Hindus and Christians probability of young girls' participation in higher education is rising but among the Muslim community this probability of young females' enrolment in higher education is less. This study also documents that larger the distance between households and higher education institutions discourage youth' parents, especially female youths' parents to enrol their daughters in higher education. An indirect influence known as the "neighbourhood effect" holds significance in this context. When families residing in the same neighbourhood observe a young individual pursuing higher education at a distant institution with aspirations for better job opportunities in the future, it influences their decisions related to sending their own daughter for higher education as well. This study confirms that police protection contributes to an increased likelihood of young girls enrolling in higher education. Also, it is documented that the higher the number of higher education institutions higher the probability of participation in higher education. Women empowerment and mothers' education are two important determinant factors which enhance the possibility among young females to enrol in the higher education system. It is known to us that higher education loans are an important financial support for students from economically backward classes. However, this study indicates a reluctance among students to acquire higher amounts of educational loans for enrolling in higher education due to concerns about the challenges of loan repayment and the risk of falling into a debt trap. Consequently, it is observed that if the government increases its expenditure on higher education through initiatives such as scholarships or subsidies, enrolment in higher education will increase among

women. Furthermore, the study highlights the negative significant impact of workforce participation rates (for those completing higher secondary education) on higher education enrolment, for both males and females. It is observed that an increase in male workforce participation rates reduces the probability of young individuals' enrolment in higher education, and similarly, a decrease in female workforce participation rates enhances the participation of young females in higher education. It is also established that Affirmative action policy like reservation among the backward classes during the time of enrolment in higher education fails to enhance the possibility of Indian women during the time of enrolment in higher education. As a result, the study recommends that the government should undertake more initiatives to enhance safety and security in communities, establish a greater number of higher education institutions, and promote greater awareness of women's empowerment within families and society as a whole. The central government launched a program called “Uddan” for girls’ students’ scholarships and mentored them to join technical higher education institutions. More such policies are required to enhance the enrolment of female students in higher education.

9. Appendix

Appendix 4.9.1: VIF Test Result

Variable		VIF	1/VIF
Gender		1.01	0.993
Religion	Hindu	4.68	0.213
	Muslim	4.33	0.231
	Christian	1.61	0.622
Caste	SC	1.46	0.685
	ST	1.42	0.705
	OBC	1.54	0.651
Resedential_Status		1.34	0.748
Consump_expen		1.69	0.590
HH_Size		1.33	0.751
Computer_Owner		1.27	0.786
Distance		1.04	0.960
Police_Density		1.84	0.542
Years_Schooling		1.75	0.570
Women_Empower		1.55	0.645
No_Insti		3.72	0.269
State_Expen		2.47	0.404
Loan_Amnt		2.97	0.336
Woking_Male_Pop		1.68	0.594
Woking_Female_Pop		1.88	0.531

Appendix 4.9.2: Descriptive Statistics

Variable		Mean	Standard Deviation	Minimum	Maximum
Gender		0.451	0.497	0	1
Religion	Hindu	0.775	0.416	0	1
	Muslim	0.152	0.359	0	1
	Christian	0.251	0.156	0	1
Caste	SC	0.179	0383	0	1
	ST	0.932	0.290	0	1
	OBC	0.412	0.492	0	1
Resedential_Status		0.435	0.495	0	1
Consump_expen		9.274	0.617	5.99	12.24
HH_Size		5.371	2.503	1	68
Computer_Owner		0.232	0.422	0	1
Distance		0.882	0.321	0	1
Police_Density		1.876	1.251	0.01	7.71
Years_Schooling		14.029	5.706	3.9	35.8
Women_Empower		63.813	6.411	51.8	89.4
No_Insti		3103	2514	31	7849
State_Expen		11.121	5.798	3.26	25.95
Loan_Amnt		133.462	65.158	0.61	243.19
Woking_Male_Pop		53.49	5.99	41.6	74.2
Woking_Female_Pop		11.86	6.03	3	43

CHAPTER 5: WOMEN'S PARTICIPATION IN HIGHEREDUCATION IN INDIA: AN ANALYSIS ACROSS MAJOR STATES

1. Introduction

The higher education system of a country is important for its economic and social development. Schultz (1960) first used the term human capital to reflect the economic value of human capabilities. Besides material resources, human resources are essential for the economic and social development of an economy.Researchers such as Mincer (1981) and Núñez and Livanos (2010) explained that the higher education system of a country can create and/or accumulate human capital and increase the aggregate productivitylevel of the economy, which can produce goods more efficiently (Fischer, 1993; Gregorio, 2004).

The educational system of developing nations is strongly influenced by the whole nature, magnitude and character of their developmental process. But higher education in the less developed countries is smaller world than primary and secondary levels of education. Being a developing country, higher education system of India has its own root in the early time as well. Ministry of Human Resource Development of India defines higher education as 'the education, which can be obtained after completing12 years of schooling or equivalent and is of the duration of at least nine months (full time) or after completing 10 years of schooling and is of the duration of at least 3 years. The education may be of the nature of General, Vocational, Professional or Technical education. According to the All India Survey on Higher Education (AISHE) 2019 report, there are 993 universities, 39,931 colleges and 10,725 stand-alone institutions in India.

Higher education is important for everyone particularly so for women. James Emmanuel Kwegyir-Aggrey (1875–1925) mentioned the importance and spread of education among women becauseaccording to him education of a woman is synonymous of education of her family. On the traditional ground, the ideology of promoting female education is evident in various international treaties and conventions. Most of the educational programmes and international conventions such as the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) emphasized on women's education to enhance household nutrition, decline in fertility rate as well as infant mortality and for improving the health and education of children (Goonesekere and Silva-De-Alwis, 2005).

If one looks at the internal distribution of students in the higher education system, there are still significant differences between men and women (Ghara, 2016). Women are still concentrated in particularsegments of the system (Stromquist, 2001). In this study, we want to investigate the

expansion of highereducation among Indian women. For this investigation, we consider Gross Enrolment Ratio (GER) of females in higher education and Gender Parity Index (GPI) in higher education as two indicators to measure the female students' enrolment in higher education in India. The GER and GPI both are importantas they influence transition rates over time (Tilak and Biswal, 2015; UNICEF, 2014).

2. Literature Review:

Gender statistics of an economy like India give an overall indication of what has been happening there since the Millennium Development Goals were set and help us to understand how close they are to achieving the various gender-specific goals set by the United Nations and the Government of India. Women are crucial for a country's development and the economic survival of their households (Khalid, 2008). Therefore, education is the most important tool for enhancing women's socio-economicsituation and statistically has been associated with better health, lower fertility rate, higher economic growth and better standards of living (Khan, 1993). It is observed that in India, institutional, social, psychological and cultural boundaries limit a female's potential (Jain, 2003). Little research has been done in India relating to the transition rates for females at further levels of education, that is secondaryschool onward. This article examines some of the existing research studies focusing on gender and higher education in India. Girl children have to bear the impact of poverty more than boys. Low incomeand scarcity of financial resources hinder poor parents from enrolling their younger generation for proper education (Khan et al., 2015).

The participation of female students in colleges is strongly associated with parental education. Desai et al. (2010) report that illiterate parents think that investment in girls' education is a waste of money and resources because after getting employment son of the house will earn and thus support the family financially whereas parents never consider that their daughters can work and provide financial support to them also (Khan et al., 2011). Various studies have found different conclusions on whether a mother'seducation has a greater, smaller or no impact on their children's education than a father's education (Farré et al., 2009). Studies like Behrman and Rosenzweig (2002) found that a father's education has a larger impact on children's education. On the other hand, in a study by Becker et al. (2010) it was found that maternal education is more beneficial for children.

The Probe Team (1999) has found that the centrality of preparing girls for marriage is

pronounced in North India where parents have historically held lower aspirations for educating daughters rather than sons. Parents think that the marriage of their daughter is their primary responsibility as compared to educate their daughter. Therefore, early marriage practice in Pakistan seriously stops female education, and it needs to stop immediately with a systematic approach from the government and society (Maqsood et al., 2012).

Conservative and outdated local cultural norms and values are also standing as an obstacle in the way of females' higher education. A study by Maqsood et al. (2012) based in Pakistan has reported that parents of a female student consider co-education to be a major threat to their family honor. Similarly, Channa (2000) has documented that the same scenario is also present in India. Therefore, various research studies documented that the co-education system limits the enrolment of females in higher education because most of the higher educational institutions have this system. Mehmood et al. (2018) have shown that parents are more sensible about their daughter's physical security and the threat of sexual harassment. This fear stops them from sending their daughters to universities and colleges.

Female's entry into higher education institutes is also obstructed by lack of higher education institutions on nearby locations. This long-distance hamper female's higher education, which increases the cost of physical and economic expenses. Lina et al. (2006) have reported that the higher study of females in less developed countries is affected due to weak transportation systems, higher travel costs, accompanying costs, opportunity costs, physical costs and cultural restrictions on the mobility of adolescent girls.

In a study, Rani (2002) has indicated that the state and public supports are playing a vital role in the higher education system. Tilak (2009) has said that public subsidies in higher education are an important instrument to protect democratic rights, promote national values and further cooperation instead of competition.

3. Objective:

The objective of this article is twofold:

1. It seeks to make a comparison across states in India of GER of women and GPI in higher education at three levels, namely, under graduation, post-graduation and technical education; and

2. Identify the factors that determine the overall levels of women's participation in higher education in terms of GER of females and GPI. This analysis is carried out for 16 major states [8] in India using data from 2011 and 2019.

GER of females in higher education is a statistical measure constructed by the United Nations. It is used to indicate the capacity of the higher education system to enroll female students of a particular age group. A higher value of GER in females indicates a higher degree of participation whether the pupils belong to the official age group or not. On the other hand, GPI is a socio-economic index. It is used to measure the relative enrolment of females and males in a certain stage of education (primary, secondary, higher secondary, undergraduate, postgraduate, etc.). This index is released by UNESCO. GPI is an important indicator of women's empowerment in society because a narrowing gender gap not only helps to increase female laborers in the labor force but also helps to create a strong position in the household decision-making process, raising voices against child marriage and physical torture by their intimate partner and will improve maternal and reproductive health.

The remaining article is structured as follows: In the second section, we make a comparative analysis of GER of females and GPI in higher education in India across 16 major states, and in the fourth section we use static panel regression and identify the possible factors that can enhance GER of females and GPI in India.

4. Comparison between GER of Females and GPI in Higher Education

Gross Enrolment Ratio of Females:

Gross Enrolment Ratio in higher education in India is calculated for the age group between 18-23 years old. It is calculated as:

GER of females =

$$\frac{\text{Total number of female students enrolled in higher education}}{\text{Population of females in the particular state within } 18-23 \text{ years old}} * 100$$

[8] The special category states and the union territories are not considered here as they get special funds for development of themselves from centre.

Gender Parity Index:

Gender Parity Index[9] in higher education is also calculated for the age group between 18-23 years old. It is measured as.

GPI=

$$\frac{\text{Gross Enrolment Ratio of female students in higher education}}{\text{Gross Enrolment Ratio of male students in Higher education}}$$

As we know, the first one reflects absolute measure of female enrolment and the second one reflects therelative enrolment of females vis-à-vis males in higher education.

4.1: State-wise Comparison of Rank of GER of Females and GPI in Higher Education in India Considering all courses of study

Tables 5.1 and 5.2 discuss how the rankings of the 16 major states of India in terms of GER and GPI in higher education (considering undergraduate, postgraduate and technical education simultaneously) have changed within our concerned period.

Table 5.1: State wise Comparison of Rank of GER of Females in Higher Education in India

State	GER of Females								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	3	3	3	2	3	3	5	7	7
Bihar	15	14	16	16	16	16	16	16	16
Chhattisgarh	13	15	15	14	15	15	15	12	12
Gujarat	7	11	9	11	10	10	12	13	13
Haryana	6	2	2	5	5	6	4	4	4
Jharkhand	16	16	14	15	14	14	14	14	13
Karnataka	4	7	6	6	6	7	7	6	6
Kerala	2	4	4	3	2	2	2	2	2
Madhya Pradesh	12	12	10	10	11	11	10	10	10
Maharashtra	5	5	7	7	7	5	6	5	5
Odisha	11	10	12	12	12	12	11	11	11
Punjab	10	6	5	4	4	4	3	3	3
Rajasthan	9	9	11	9	9	9	9	9	9
Tamil Nadu	1	1	1	1	1	1	1	1	1
Uttar Pradesh	8	8	8	8	8	8	8	8	8
West Bengal	14	13	13	13	13	13	13	14	13

Source: Calculated by the author on the basis of data provided by MHRD, Government of India

[9] Gender Parity Index has some limitations. It never reflects the fact that whether the improve value of GPI is due to increase of females' enrolment in higher education or decrease male enrolment in higher education. This study also shows that improvement in GPI does not indicate that there is an increment in the gross enrolment of female students in higher education

Table 5.2: State wise Comparison of Rank of GPI in Higher Education in India

State	GPI								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	13	12	12	13	14	14	14	16	15
Bihar	11	13	10	12	11	15	13	14	16
Chhattisgarh	15	6	7	8	8	6	6	6	5
Gujarat	5	11	11	14	16	15	16	13	12
Haryana	12	4	6	6	4	4	3	3	3
Jharkhand	4	5	4	5	6	7	8	8	10
Karnataka	3	7	5	4	5	5	5	5	6
Kerala	1	1	1	1	1	1	1	1	1
Madhya Pradesh	8	16	16	15	15	10	9	9	8
Maharashtra	9	8	9	9	9	9	11	10	11
Odisha	10	10	14	11	13	13	12	12	14
Punjab	16	2	2	2	2	2	2	2	2
Rajasthan	14	15	15	10	12	10	10	10	7
Tamil Nadu	6	9	8	7	7	8	7	7	8
Uttar Pradesh	2	3	3	3	3	3	14	14	13
West Bengal	7	14	13	16	10	12	4	4	4

Source: Calculated by the author based on data provided by MHRD, Government of India

Tables 5.1 and 5.2 reflect the absolute enrolment of females and GPI in higher education in 16 major Indian states between the time period 2011 and 2019. It is observed that Kerala's ranking in GER of females in higher education fluctuated from 2011 to 2019. However, the state maintains a consistent position (1st) in the case of GPI ranking. Here we have found that the overall values of GPI of Kerala in higher education are above 1 in our concerned time periods. On the other hand, Andhra Pradesh ranks third in the case of females' enrolment in higher education from 2011 to 2016 (except 2014), and its position has started deteriorating from 2017. But its GPI ranking is very poor in all the considered periods. In terms of female students' enrolment in higher education, Uttar Pradesh's position was 8th in all the considered periods. But if we look at the GPI ranking then this state's ranking was between 2nd and 3rd from 2011 to 2016 and from 2017 there is a drastic fall in GPI ranking; that is, from 3rd it reached 13th place in 2019. Similarly, in terms of the GPI ranking of Punjab, it is observed that it improved its position from 16th to 2nd in 2016. West Bengal's rank is very poor in both of those two indicators.

In the next section, we will compare the Gross Enrollment Ratio (GER) of females and Gender Parity Index in higher education across the major 16 states for different courses, including Undergraduate, Postgraduate, and Technical Education.

4.2 State wise Comparison of GER of Females & GPI in Under-graduate courses

Under Graduate Education is conducted after completion of Higher Secondary Education and prior to Post Graduate Education. According to the Department of Higher Education, Ministry of Education India it is defined as "Programme after 10+2 and generally having the duration of 3/4/5 years, in General or Professional courses".

Table 5.3 and 5.4 illustrate the changing pattern of GER of Females and GPI in Under Graduation (UG) for the major 16 states of India. Here we consider all types of Under Graduate courses simultaneously.

Table 5.3: Changing pattern of GER of Females in Under Graduate courses (UG) courses in the 16 major states of India.

State	GER of Females (in percentage)								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	28.14	29.73	17.49	20.18	20.76	20.26	18.038	19.866	20.658
Bihar	9.08	9.44	9.88	9.56	10.52	10.70	10.944	9.836	10.122
Chhattisgarh	9.04	7.92	8.73	9.51	9.841	10.19	11.046	11.965	12.910
Gujarat	14.31	11.53	12.42	12.89	13.15	13.10	13.328	13.730	13.903
Haryana	16.09	23.00	21.53	20.76	21.85	20.23	19.541	20.900	23.331
Jharkhand	7.371	7.92	10.08	10.39	12.41	12.06	14.026	14.628	14.779
Karnataka	16.03	15.17	16.89	18.01	19.37	19.98	20.579	22.159	22.977
Kerala	18.88	18.17	18.60	20.54	21.35	22.56	24.431	26.279	26.906
Madhya Pradesh	8.881	10.70	10.91	10.56	10.93	11.34	13.480	14.359	15.263
Maharashtra	17.19	17.68	14.50	16.53	18.51	19.04	19.259	20.362	20.986
Odisha	12.48	13.02	12.02	12.47	13.37	14.72	15.260	16.218	15.532
Punjab	10.04	18.73	19.80	20.82	19.64	19.78	20.743	23.757	25.023
Rajasthan	12.98	12.89	12.13	14.59	14.65	15.02	15.689	16.617	18.829
Tamil Nadu	14.55	22.18	24.43	26.22	28.42	28.82	30.567	33.352	33.931
Uttar Pradesh	16.05	14.55	17.45	19.69	21.87	20.92	25.806	22.378	23.107
West Bengal	8.12	9.70	10.90	11.77	12.74	13.07	21.288	14.297	14.888

Source: Calculated by the authors on the basis of data provided by MHRD, Government of India

Table 5.4: The changing pattern of GPI in Under Graduate courses (UG) in the 16 major states of India

State	Under Graduate GPI								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	0.718	0.780	0.767	0.801	0.828	0.830	0.853	0.876	0.852
Bihar	0.673	0.680	0.711	0.720	0.739	0.731	0.816	0.816	0.809
Chhattisgarh	0.697	0.928	0.922	0.924	0.953	0.960	1.041	1.118	1.175
Gujarat	0.788	0.782	0.767	0.767	0.736	0.718	0.830	0.843	0.848
Haryana	0.698	0.892	0.832	0.782	0.864	0.861	1.112	1.1796	1.357
Jharkhand	0.777	0.887	0.939	0.851	0.890	0.897	0.976	1.012	1.018
Karnataka	0.893	0.902	0.950	0.963	0.982	0.997	1.063	1.098	1.074
Kerala	1.276	1.411	1.406	1.336	1.367	1.277	1.352	1.424	1.420
Madhya Pradesh	0.708	0.653	0.655	0.684	0.692	0.731	0.928	0.962	1.000
Maharashtra	0.718	0.791	0.762	0.786	0.792	0.783	0.943	0.983	0.967
Odisha	0.872	0.935	0.837	0.922	0.913	0.921	0.915	0.959	0.907
Punjab	0.582	0.994	1.078	1.077	0.945	0.917	1.162	1.228	1.408
Rajasthan	0.638	0.681	0.628	0.770	0.790	0.812	0.950	0.983	1.059
Tamil Nadu	0.943	1.002	0.992	1.030	1.049	1.020	0.116	1.102	1.090
Uttar Pradesh	1.008	0.830	0.934	0.982	0.914	0.904	1.029	1.078	1.166
West Bengal	0.747	0.740	0.771	0.794	0.844	0.877	0.918	0.977	1.015

Source: Calculated by the authors on the basis of data provided by MHRD, Government of India

From Table 5.3, it is observed that the value of GER of females in under graduation has increased in all the states from 2011 to 2019 except in Andhra Pradesh and Gujarat. Among all the 16 states in India, thevalue of GER of females in UG was highest in Andhra Pradesh in 2011, but after that this value started to decline. On the other hand, the value of GPI (Table 5.4) in Andhra Pradesh is increasing. This may be due to the decline of male students' enrolment is more than female students' enrolment in different undergraduate courses. Females' enrolment in Tamil Nadu initially was 14.55% and gradually it has reached 33.93% in 2019 and achieved gender parity in under graduation. 'Chhattisgarh is a tribal state;a third of the state's populace is dominated by tribal' (2011 Census). However, the state has improved its position in higher education very rapidly. In 2011, the GPI value in UG was 0.69, but from 2012 onwards this state has crossed the GPI value in UG 0.90 and 2019 the value is 1.17. This implies that now there exists gender disparity in favor of females in undergraduate in Chhattisgarh.

4.3. State wise Comparison of GER of Females and GPI in Post-graduate courses

The Department of Higher Education, Ministry of Education India defines post-graduation course of study as "Programme after Graduation and generally having the duration of 2/3 years in General/Professional courses".

Table 5.5 and Table 5.6 describe the changes in GER of Females and GPI in Post-Graduation (PG) course in the sixteen major states of India respectively.

Table 5.5: Comparison between GER of Females in Post-Graduation Courses of Study in the sixteen major states of India

State	GER of Females (in percentage)								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	4.30	4.22	2.48	2.85	3.01	3.15	3.484	3.750	3.657
Bihar	0.35	0.40	0.54	0.63	0.60	0.60	0.616	0.580	0.700
Chhattisgarh	1.13	0.98	1.13	1.32	1.36	1.48	1.602	1.755	1.923
Gujarat	1.57	1.46	1.54	1.63	1.71	2.60	2.314	2.072	2.222
Haryana	2.61	2.90	3.03	3.10	3.19	3.45	3.288	3.368	3.604
Jharkhand	0.83	0.74	0.79	0.89	1.03	1.11	1.280	1.522	1.780
Karnataka	1.45	1.60	1.80	1.97	2.14	2.35	2.550	2.834	2.988
Kerala	2.63	2.60	2.85	3.33	3.44	3.72	3.792	4.048	4.384
Madhya Pradesh	1.51	1.76	1.83	2.17	2.32	2.25	2.211	2.352	2.645
Maharashtra	2.21	2.29	1.93	2.22	2.37	2.43	2.493	2.731	3.265
Odisha	0.700	0.79	0.79	0.81	0.81	0.92	1.031	1.217	1.340
Punjab	1.90	3.11	3.52	4.06	4.15	4.53	4.599	5.056	4.343
Rajasthan	1.41	1.42	1.32	1.83	1.65	1.90	1.659	1.962	2.028
Tamil Nadu	2.11	3.44	3.94	4.16	4.34	4.43	4.547	4.913	5.577
Uttar Pradesh	1.28	1.59	1.65	1.90	2.07	2.48	2.674	2.816	2.598
West Bengal	0.49	0.52	0.48	0.51	0.58	0.60	0.654	0.729	0.805

Source: Calculated by the author on the basis of data provided by MHRD, Government of India

Table 5.6: Comparison of GPI in Post-Graduation Course of Study among 16 major states of India

State	Post Graduate GPI								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	0.705	0.733	0.744	0.771	0.771	0.815	0.520	0.981	0.861
Bihar	0.517	0.594	0.661	0.720	0.720	0.763	0.825	0.943	0.863
Chhattisgarh	0.843	1.130	0.971	0.962	0.962	1.080	1.298	1.377	1.362
Gujarat	0.703	0.852	0.877	0.943	0.943	1.168	1.332	1.405	1.456
Haryana	1.114	1.263	1.317	1.370	1.370	1.509	2.194	2.168	2.190
Jharkhand	0.852	0.879	0.965	1.264	1.264	1.347	1.195	1.387	1.416
Karnataka	0.799	0.868	0.899	0.904	0.904	1.057	1.121	1.249	1.304
Kerala	1.497	1.736	1.893	1.768	1.768	2.066	2.684	3.045	3.120
Madhya Pradesh	0.810	0.698	0.740	0.900	0.900	1.068	1.300	13.285	1.379
Maharashtra	0.743	0.746	0.758	0.827	0.827	0.967	1.085	1.193	1.273
Odisha	0.618	0.810	0.838	1.033	1.033	0.975	0.932	1.039	0.995
Punjab	0.785	1.789	1.987	1.903	1.903	1.978	2.687	2.507	2.474
Rajasthan	0.837	0.820	0.749	1.158	1.158	1.048	1.648	1.578	1.716
Tamil Nadu	0.927	1.065	1.122	1.225	1.225	1.435	0.181	1.775	1.766
Uttar Pradesh	0.904	0.901	1.008	1.143	1.143	1.306	1.525	1.528	1.544
West Bengal	0.784	0.747	1.075	1.166	1.166	1.224	0.927	1.002	1.028

Source: Calculated by the author on the basis of data provided by MHRD, Government of India

Tables 5.5 and 5.6 indicate that females' enrolment in postgraduation of study in India is not impressive. The values of GER of females in this course among the major 16 states in India are very poor. If we observe the state Bihar, then it can be said that very small number of females are enrolling in postgraduation than under graduation. Again, these tables report that in Andhra Pradesh, the Gross Enrolment of females is decreasing from 2011 to 2019, but the GPI value is increasing over all the considered periods. On the other hand, for the state Kerala, though the GER of female values are very poor but it is increasing. It is also observed that like UG, in PG also GPI values in Kerala are above 1 in all the mentioned years and in 2016, the GPI value has crossed the value 2. This may be due to the reason that male students are not interested to enroll in postgraduation rather they are more interested to go to job market. [10]

[10] The Kerala Migration Survey (2014) conducted by Centre for Development Studies, Thiruvananthapuram, reports that several thousand educated youths have moved to the Gulf for searching jobs as government failed to create jobs for the educated youths.

4.4. State wise Comparison of GER of Females and GPI in Technical courses

In this study, technical education includes Diploma, Post Graduate Diploma and Certificate courses According to the Department of Higher Education, Ministry of Education India this course is defined as:

i) Diploma - Programme is generally after 10+2 or after Graduation in General and for Professional courses. It has a duration of 1/2/3 years.

ii) Post Graduate Diploma - Programme is generally after Diploma in General and for Professional courses. It has a duration of 1/2/3 years.

iii) Certificate – It is a Programme similar to Diploma, but is awarded as Certificate by the Institution.

Table 5.7: Comparison between GER of Females and GPI in Technical Education among sixteen major states of India

State	GER_of Females (in percentage)								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	1.70	2.74	1.63	1.62	1.54	1.97	2.466	2.573	2.536
Bihar	0.08	0.09	0.10	0.11	0.11	0.15	0.172	0.239	0.356
Chhattisgarh	0.57	0.64	0.81	0.90	1.01	1.11	1.285	1.398	1.425
Gujarat	1.39	1.11	1.13	1.14	1.14	1.13	1.390	1.525	1.589
Haryana	0.81	1.10	1.21	1.21	1.51	1.41	1.784	1.941	2.098
Jharkhand	0.01	0.01	0.04	0.06	0.11	0.24	0.432	0.582	0.626
Karnataka	3.02	2.85	2.61	2.44	2.44	2.25	2.393	2.460	2.380
Kerala	2.44	2.57	2.48	2.12	2.10	2.07	2.201	2.424	2.385
Madhya Pradesh	0.66	0.31	0.34	2.50	2.12	2.41	1.895	1.449	1.650
Maharashtra	2.01	2.24	2.27	2.16	2.12	1.96	2.027	2.122	2.365
Odisha	0.57	0.51	0.52	0.66	0.88	1.27	1.631	1.643	1.836
Punjab	0.93	1.22	1.52	1.74	2.82	3.14	3.445	3.793	3.398
Rajasthan	0.28	0.37	0.40	0.32	0.37	0.42	0.615	0.777	0.930
Tamil Nadu	1.60	2.47	2.30	2.11	2.20	2.08	2.338	2.261	2.202
Uttar Pradesh	0.14	0.24	0.31	0.37	0.65	0.71	0.870	0.899	1.056
West Bengal	1.04	1.03	1.03	1.01	1.13	1.33	0.664	0.952	1.154

Source: Calculated by the authors based on data provided by MHRD, Government of India

Table 5.8: Comparison between GPI in Technical Education Courses of Study among the sixteen major states.

State	TECHNICAL GPI								
Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Andhra Pradesh	0.793	1.024	0.984	0.902	0.674	0.702	0.331	0.633	0.652
Bihar	0.750	0.387	0.423	0.489	0.421	0.441	0.382	0.451	0.545
Chhattisgarh	0.385	0.634	0.593	0.590	0.650	0.729	0.743	0.762	0.766
Gujarat	0.379	0.338	0.364	0.361	0.411	0.406	0.449	0.498	0.541
Haryana	0.193	0.231	0.234	0.275	0.344	0.390	0.536	0.599	0.602
Jharkhand	0.976	0.568	0.395	0.350	0.269	0.299	0.360	0.436	0.433
Karnataka	0.751	0.675	0.605	0.634	0.598	0.570	0.625	0.679	0.692
Kerala	1.632	1.472	1.017	1.127	0.989	0.901	0.870	0.913	0.863
Madhya Pradesh	0.525	0.152	0.127	0.664	0.598	0.669	0.739	0.539	0.779
Maharashtra	0.614	0.590	0.567	0.510	0.556	0.550	0.650	0.707	0.744
Odisha	0.245	0.277	0.305	0.311	0.310	0.378	0.390	0.404	0.415
Punjab	0.194	0.230	0.272	0.306	0.448	0.494	0.635	0.730	0.787
Rajasthan	0.356	0.326	0.324	0.183	0.176	0.215	0.321	0.369	0.456
Tamil Nadu	0.225	0.299	0.265	0.252	0.281	0.257	0.028	0.245	0.237
Uttar Pradesh	0.544	0.818	0.814	0.676	0.488	0.484	0.544	0.551	0.623
West Bengal	0.281	0.326	0.298	0.284	0.393	0.401	0.359	0.456	0.480

Source: Calculated by the authors based on data provided by MHRD, Government of India

Channa (2000) reported that parents discourage their daughters from opting for science subjects/ technical education considering their daughters' physical security. That is reflected in Table 5.6 and 5.7, where it is observed that the enrolment of females in technical education in the 16 major states in India is very small. For all the states, GER values of females have increased very little from 2011 to 2019. State like Karnataka, the value of GER of females is falling from 2011 to 2019. This implies that females are avoiding to get enrolled in the technical education. It is observed that GPI values in Technical Education are very poor in all the major 16 states in India except Kerala. In Andhra Pradesh, this value is decreasing throughout the above-mentioned time periods. Only in Kerala, GPI is above 1 from 2011 to 2014. But from 2015 its GPI value has started to fall and in 2019 it became 0.86. On the other hand, states like Odisha, West Bengal, Haryana, and Chhattisgarh these values are raising but still those are below 1. This implies that there exists gender disparity in favour of male students in Technical Education in all the major 16 states of India.

5. Sources of data:

The data used in this empirical study has collected from All India Survey on Higher Education (AISHE) published by the Department of Higher Education, Ministry of Education India, RBI Bulletin and Dice Statistics/Census Data and National Crime Records Bureau. Here we have considered 16 major states of India. The study period in this paper is between 2011 to 2019[11].

Factors Influencing GER of Females and GPI in Higher Education

In this section, we try to identify the possible factors which may play an important role to determine the values of GER and GPI in higher education in India. For this, at first, we identify the possible variables which may influence GER of females and GPI in higher education in India, and theoretical justifications for these variables. Below, we list and define the variables along with the theoretical justification:

1. **GER _F**: Gross Enrolment Ratio of Females. It is measured as the ratio of number of females enrolled in higher education institutes to the total number of female population (age group between 18-23 years) in a particular state and in a particular time period. It is expressed as in percentage term. Here we consider overall value of GER of females in higher education of a particular state in any particular year.
2. **GPI**: Gender Parity Index. It is measured as the ratio of GER of females in higher education to the GER of males in higher education in a particular state and in a particular time period. Here also we consider the consolidated values of GPI of different states in different years.
3. **PSDP**: Per capita State Domestic Product at current prices. It is measured as the ratio of Net State Domestic Product and population of a particular state. This variable is considered a proxy of households' income. It is known to us that family income plays a very crucial role in deciding whether the daughter/son of the household will go for higher education or not. Most of the Indian families are low-income earners. They think that it is beneficial for them to educate their son rather than their daughter (Khan et al., 2011; Desai et al. 2010). It is expected that higher family income may encourage the households of a particular state to take the initiative to enroll their daughters in higher

[11] All the variables considered in this study are available from 2011 to 2019.

education. So PSDP may be an important factor which can influence both GER_ females and GPI.

4. **PTR** (class size proxy): Pupil Teacher Ratio. It is the ratio between total number of students who attained the institution and the total number of teachers in the institution of a particular state in a particular time period. It is an indicator of the educational infrastructure of a college. Smaller classes are considered beneficial because they allow teachers to focus more on individual students. So, a higher value of PTR implies that each teacher has to be responsible for a large number of students. It can be said that higher PTR, reduces relative access of students to teachers. Various studies (Blatchford, 2003; Miles, 2011) has reported that smaller class size positively influence the academic achievements of students. In this study it is assumed that low PTR may improve the quality of higher education which may encourage the parents to send their daughters for higher education.
5. **No_Collg:** Number of colleges per lakh population of a particular state. It explains existing number of colleges in a particular state in any particular period. This may be an important factor which can influence GER_ F and GPI. Increased number of colleges may play a significant role to increase the learning opportunities both for female and male students to complete their higher studies. There are 597264 numbers of villages in India. In many cases Higher Education Institutes (college or university) are far away from a village. Therefore, due to the huge distance, it is very difficult for a female student to go to college. On the other hand, parents of the female student don't want to send their daughter to the far away college considering their daughter's safety issue. In that case distance between college and home, hinders the female student to enroll in higher education institutes. So, it is expected that larger number of colleges can reduce the distance from home to college which may in a state encourage females to enroll in higher education.
6. **F_Teacher:** Percentage of Female Teachers out of total teachers working in higher education institutions in a particular state. In a country like India, this may also be an important factor which may influence the females' enrolment in higher education. Indian families are generally conservative. In some conservative communities' parents are not allowed their daughters to be taught by a male teacher (UNESCO, 2006). Beside this, presence of female teachers would provide female students more comfortable and friendly environment and that would put them at ease (Stacki, 2002; There is world,

2017). Hence, it is assumed that greater percentage of female teachers may encourage parents to send their daughters in the higher education institutes.

7. **Hostel_Intake**: Total intake of women students in Girls' hostel in a particular state in a particular year. Providing hostel accommodation may be an important factor for enrollment of female students in higher education. It is observed in many cases that, there is only one college covering 5-6 numbers of villages. A study in India in 2014 by NGO 'Breakthough' on 900 young girls and boys from six states has reported that half of all girls were sexually harassed on the way to educational institutions - including being leered at, pinched or groped (Dhawan, 2016). Therefore, to complete their higher studies availability of girl's hostel may encourage the female students to enroll themselves in higher education who stay far away from the college.
8. **Social_Exp:** Social expenditure of a state is measured as the total expenditure on education, art and culture, public health, family welfare, water supply and sanitation, housing, urban development, welfare of SC, ST and OBC, Labor and Labor welfare, Social security and welfare of a particular state in a financial year. Higher Education helps to grow a country. When a student moves from secondary education to higher education this involves huge cost. One of the main reasons behind it is lack of availability of degree college in nearby locality. To ensure greater participation in various types of economic activities from the economically deprived socio-religious communities', expenditure on higher education is required by the government to reduce the direct cost of education. But it is observed that educations of girls are often lowest budget priority in many countries (There is world, 2017). Educating a girl often increase a country's productivity a contribute to economic growth. So, it is expected that higher the social sector expenditure can enhance the number of colleges in that particular state which can help that state to enhance GER of Females and GPI.
9. **Lit_Male and Lit_Female:** Literacy rate of Male and Female of a state in a particular year respectively. "Lit_Male" is used as proxy of father's education and "Lit_Female" is used as proxy of mother's education. Both are measured using the Compound Annual Growth Rate (CAGR formula). If parents are more educated, then there is a possibility that they may want to send their daughters in higher education. It is always observed that from a family with highly educated parents there is a greater probability that the daughter of this family will go for higher education. Studies like Henries (1974); Biraimah (1987) reports that among the females who enrolled in higher education

institutes, more women than male student's parents especially fathers are highly educated or are in such professions that require high academic degrees.

10. **Crime_Rate**: This variable describes Crime rate against women. It is calculated as the total number of crimes committed against women per lakh female population in a particular state in a particular year. This is recorded crime data. It may influence females' participation in higher education. Parents are always in a fear of their daughters' safety and physical security. It is expected that if the reported crime rate against women in a particular state in a particular year increase that may lead to fall of female students' enrolment in the higher education institutes. If a female student is unsecured in a state, then it may be very difficult for her to go to higher education institutions. So, higher crime rate against women may lower female student's enrollment in higher education institutions.
11. **MYM:** Mean Age of Effective Marriage is an also important variable in this study. Here we consider three age groups of marriage 18, 18-20 and 21 separately.
    - **11.1 MYM_18**: Mean age of effective marriage of females below 18 years old.
    - **11.2 MYM_18-20**: Mean age of effective marriage of females between18-20 years old.
    - **11.3 MYM_21**: MYM_21Mean age of effective marriage of females at 21 years old and above

    Early marriage practice is a big issue for the female education in developing/ underdeveloped country. According to Indian Law, 18 years is the official age of a female's marriage. Parents' main concern is to their daughters' marriage because child marriage reduces the possibility of any suspicion regarding the virginity of young girl (Mathur et. al., 2003). On the other hand, as parents have to pay dowry for their daughter's marriage this dowry amount increases with the increasing age of girls' (IPPF, 2006). So, to avoid such expenditures they prefer to marry their daughters off at an early age. A study conducted by UNICEF it is estimated that 20% of women aged 20 to 24 years old are married before they turn 18 in the world (UNICEF, 2020). It is expected that if a female student is getting married at 18 years, most of the time her education is stopped at that age and due to fewer education skills, they and their families remain in poverty. This variable can be considered as a proxy of women empowerment.

If female student get access to go to higher education institutes, then it is expected that they will marry in a more matured age.

Before moving towards Econometric exercises, initially we can look at the summary statistics table given in Table-9.

Table 5.9: Summary Statistics

Variable	Mean	Median	Standard Deviation	Minimum	Maximum
Year: 2011					
GPI	0.8346	0.791	0.173	0.616	1.335
GER_F	17.414	16.294	6.587	7.473	29.059
PSDP(Rs.)	55303.83	54747.94	22527.85	19111.17	93851.72
PTR	24.906	25	7.620	13	39
No_Collg	25	26	12.499	4	48
F_Teacher (%)	35.591	35.398	8.388	15.621	55.737
Hostel_Intake	127730.2	50670.5	173068.6	4004	629813
Social_Exp	25334.38	23119	13856.68	8346	53834
Lit_Male (%)	76.851	76.640	7.605	60.945	94.380
Lit_Female (%)	55.625	54.714	12.671	34.717	88.118
Cime_Rate	380.532	275.017	252.162	168.011	1132.786
MYM_18 (yrs)	16.475	16.5	0.169	16.2	16.9
MYM_18-20 (yrs)	19.187	19.2	0.145	18.9	19.4
MYM_21 (yrs)	23.525	23.7	0.431	22.7	24.3
Year: 2019					
GPI	1.014	0.97	0.184	0.79	1.4
GER_F	26.618	25.25	9.689	12	48.3
PSDP (Rs.)	137516.9	132459.5	61865.75	40982	236147
PTR	30.25	27	14.215	15	61
No_Collg	29.687	32	13.229	7	53
F_Teacher (%)	41.378	40.333	10.642	21.028	61.26
Hostel_Intake	187388.9	135482.5	157233.9	27276	567735
Social_Exp	84597.81	84985	43374.31	24622	170190
Lit_Male (%)	82.661	81.660	6.077	71.890	95.836
Lit_Female (%)	64.480	64.392	11.101	48.477	91.107
Cime_Rate	67.678	64.507	31.724	16.492	125.905
MYM_18 (Yrs)	16.815	16.85	0.099	16.65	16.95
MYM_18-20 (Yrs)	19.253	19.3	0.128	18.9	19.5
MYM_21 (Yrs)	23.996	23.9	0.493	23.3	24.95

Source: Calculated by the authors on the basis of data provided by MHRD, Government of India

6. Methodology:

Now to identify the possible factors which may affect both GPI and GER of females in higher education in India, we consider the time period from 2011 to 2019.

First multi-collinearity problem among the explanatory variable is checked. This test reports that there is very high correlation between No of College and PTR and Female Teachers and Female literacy. So, the variables are considered separately in our econometric models.

In this study we cannot apply cointegration test as the number of period (t) is very small (9 years). When the period is small the test statistic becomes more oversized with increasing the cross section. So, the test is not appropriate if the time dimension is much smaller than the cross-section dimension (Orsal and Karaman, 2007). Similarly, we cannot apply Dynamic panel regression because the present period GPI or GER of females are not influenced by the past absolute or relative enrolment. Hence, we have to take the help of Static Panel Regression technique.

Before starting the analysis, it is assumed that the variable Number of colleges per lakh population (No_Collg) is an endogenous (correlation with the error term) in nature because of omitted variable biased. It is expected that there are some other factors which may affect both GER_ F and GPI. But due to unavailability of data, these are accommodated in the disturbance term which may be correlated with this variable i.e. E(Error/No_Collg) $\neq 0$. Error term of a panel regression model constitutes two factors-: (i) time invariant factor and (ii) idiosyncratic error term i.e.

$$\mu_{it} = a_i + v_{it} \ldots\ldots\ldots (1)$$

Where μ_{it} denotes the error term of a panel regression model

a_i is the unobservable individual-specific effect

v_{it} is the idiosyncratic error term.

The time-invariant factor (a_i)and the time-variant factor can influence both GER_F and GPI of the i^{th} state. Here a_i accommodates socio-cultural and religious factors of the i^{th} state which can influence the parents to decide whether they send their daughters for higher education or not. Making decisions on the early marriage of their daughters reduces the possibility of women's enrolment in higher education. This can be accommodated by cultural factors. It is observed

that states like Madhya Pradesh, Rajasthan Gujarat etc. The values of GPI are very low in higher education. Actually, in these states, we observe high presence of male dominance in the households (Chowdhury, 2005). This time-invariant factor can accommodate scholarship facilities for women in higher education in that particular state. On the other hand, the time-variant factor includes number of Higher Secondary Schools in that particular area, the percentage of female students who passed in a particular year in a particular state. The higher percentage of female students who passed in the Higher Secondary Examination in a particular state in a particular period may influence enrolment of females in Higher Education mainly at the UG level in that state in that particular period.

The government of a particular state cannot influence the enrolment of students in higher education, but No_Collg in a particular state in a particular period is not the same in all states. There are some state wise differences and following Gowswami (2011) social sector expenditure plays an important role in Human Development and Human Capital formation; this can be explained as increasing the number of colleges and accessibility of higher education for all sections of the people. Therefore, "No_Collg" in any particular state in any particular time period may depend on "Social_Exp[12]" in that state in that particular time period. It is assumed that "Social_Exp" is independent of the time-variant factor. Hence, we consider,

$$\text{No\_Collg}_{it} = f(\text{Social\_Exp}_{it}) \dots\dots\dots\dots\dots (2)$$

Hence, to investigate that whether the assumption about the endogeneity factor is correct or not this study considers Simultaneous Equation Model in a Balanced Panel Regression.

The original regression equation to be estimated is expressed as:

$$\begin{aligned} \text{GER\_F}_{it} = {} & \alpha_{11} + \beta_{11}\text{No\_Collg}_{it} + \beta_{12}\text{F\_Teacher}_{it} + \beta_{13}\text{Hostel\_Intake}_{it} + \beta_{14}\text{PSDP}_{it} \\ & + \beta_{15}\text{Lit\_Male}_{it} + \beta_{16}\text{Crime\_Rate}_{it} + \beta_{17}\text{MYM\_18}_{it} + \beta_{18}\text{MYM\_18}_{it} \\ & + \beta_{19}\text{MYM\_18}_{it} + \varepsilon_{11_{it}} \dots\dots\dots\dots\dots\dots\dots (3) \end{aligned}$$

[12] The variable 'Social_Exp' includes expenditure on education, healthcare and rural development. According to Goswami and Bezbaruah (2011) expenditure on education occupies a major share of total social sector expenditure in a state in a particular year. Hence, we have considered No_Collg in a particular state in a particular periodon the Social_Exp in that state in that period.

To test the existence of endogeneity, we have to consider the following auxiliary equation,

$$\begin{aligned}\text{No\_Collg}_{it} = {} & \alpha_{21} + \beta_{21}\text{Social\_Exp}_{it} + \beta_{22}\text{F\_Teacher}_{it} + \beta_{23}\text{Hostel\_Intake}_{it} + \beta_{24}\text{PSDP}_{it} \\ & + \beta_{25}\text{Lit\_Male}_{it} + \beta_{26}\text{Crime\_Rate}_{it} + \beta_{27}\text{MYM\_18}_{it} + \beta_{28}\text{MYM\_18}_{it} \\ & + \beta_{29}\text{MYM\_18}_{it} + \varepsilon_{21_{it}}\end{aligned}$$

..... (4)

Where, i=1, 2,.16 and t=1, 2,..9.

Initially, we have to go for the Hausman Specification Test.

First, we have to estimate this auxiliary regression equation i.e., Eq. (4) and estimate the residual of the auxiliary equation using the Fixed effect model. Then incorporate the estimated residual value ($\widehat{\varepsilon_{21_{it}}}$) in the Eq.(3) and the new panel regression equation becomes

$$\begin{aligned}\text{GER\_F}_{it} = {} & \alpha_{11} + \beta_{11}\text{No\_Collg}_{it} + \beta_{12}\text{F\_Teacher}_{it} + \beta_{13}\text{Hostel\_Intake}_{it} + \beta_{14}\text{PSDP}_{it} \\ & + \beta_{15}\text{Lite\_Male}_{it} + \beta_{16}\text{Crime\_Rate}_{it} + \beta_{17}\text{MYM\_18}_{it} + \beta_{18}\text{MYM\_18}_{it} \\ & + \beta_{19}\text{MYM\_18}_{it} + \theta\widehat{\varepsilon_{21_{it}}} + \varepsilon_{11_{it}}\end{aligned}$$

..... (5)

Now we estimate the equation (5) again using the fixed effect model because Hausman test (Prob. χ^2= 0.0286) supports this. It is observed that the parameter estimates of the estimated residual that is $\hat{\theta}$ isstatistically insignificant*(*p=0.842). So, we have to do simple panel regression in Eq. (3).

Similar procedure is applied for GPI to check the endogeneity issue and found assumed variable is exogeneous.

Again, we assume that the variable "PTR" is endogenous in nature. Higher PTR means each teacher is responsible to larger number of students and it is very difficult to give attention to each and every student individually. If the number of teachers increases that do not ensure good quality of teaching. Quality of teaching is an important factor that cannot be measured but it is accommodated in the disturbance term. Similarly, here also the number of higher secondary schools, percentage of female students passed in the higher secondary exams in a particular

state in a particular year is accommodated in the time variant error term. So, expenditure on higher education at any point of time at any state may have impact on PTR in that state in that particular time period. It is expected that if government can recruit more teachers or set-up more colleges then Government's expenditure on higher education will increase. Considering this issue, here it is also assumed that PTR_{it} = f($Socia\_Exp_{it}$) and run the Hausman Specification Test. The test reports that PTR is an exogeneous variable in our study for both of the dependent variables "GER_F" and "GPI".

Hence, finally we run the following three balanced static panel regression equations where No_Collg and PTR and F_Teachers and Female literacy are considered separately. The models are presented below.

Model-1:

$$\begin{aligned} GER\_F_{it} = {} & \alpha + \beta_1 No\_Collg_{it} + \beta_2 PSDP_{it} + \beta_3 Hostel\_Intake_{it} + \beta_4 Lit\_Male_{it} \\ & + \beta_6 F\_Teacher_{it} + +\beta_7 Crime\_Rate_{it} + \beta_8 MYM\_18_{it} + \beta_9 MYM\_18-20_{it} \\ & + \beta_{10} MYM\_21_{it} + \in_{it} \ldots . (6) \end{aligned}$$

Model-2:

$$\begin{aligned} GER\_F_{it} = {} & \alpha'' + \beta_1{}'' No\_Collg_{it} + \beta_2{}'' PSDP_{it} + \beta_3{}'' Hostel\_Intake_{it} + \beta_4{}'' Lit\_Male_{it} \\ & + \beta_5{}'' Lit\_Female_{it} + \beta_7{}'' Crime\_Rate_{it} + \beta_8{}'' MYM\_18_{it} + \beta_9{}'' MYM\_18-20_{it} \\ & + \beta_{10}{}'' MYM\_21_{it} + \in_{it}{}'' \ldots\ldots\ldots\ldots\ldots (7) \end{aligned}$$

Model - 3:

$$\begin{aligned} GER\_F_{it} = {} & \delta + \gamma_1 PTR_{it} + \gamma_2 PSDP_{it} + \gamma_3 Hostel\_Intake_{it} + \gamma_5 Lit\_Male_{it} \\ & + \gamma_6 Lit\_Female_{it} + \gamma_7 Crime\_Rate_{it} + \gamma_8 MYM\_18_{it} + \gamma_9 MYM\_18-20_{it} \\ & + \gamma_{10} MYM\_21_{it} + \vartheta_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8) \end{aligned}$$

Similarly, for GPI in Higher education we have to consider the following models:

Model - 4:

$$\begin{aligned} GPI_{it} = {} & \zeta + \theta_1 No\_Collg_{it} + \theta_2 PSDP_{it} + \theta_3 Hostel\_Intake_{it} + \theta_4 Lit\_Male_{it} \\ & + \theta_6 F\_Teacher_{it} + \theta_8 Crime\_Rate_{it} + \theta_9 MYM\_18_{it} + \theta_{10} MYM\_18-20_{it} \\ & + \theta_{11} MYM\_21_{it} + \nu_{it} \ldots\ldots\ldots (9) \end{aligned}$$

Model-5:

$$GPI_{it} = \zeta" + \theta_1"No\_Collg_{it} + \theta_2"PSDP_{it} + \theta_3"Hostel\_Intake_{it} + \theta_4"Lit\_Male_{it} + \theta_5"Lit\_female_{it} + \theta_7"Crime\_Rate_{it} + \theta_8"MYM\_18_{it} + \theta_9"MYM\_18 - 20_{it} + \theta_{10}"MYM\_21_{it} + \nu_{it}" \dots\dots\dots\dots\dots\dots\dots (10)$$

Model - 6:

$$GPI_{it} = \phi + \omega_1 PTR_{it} + \omega_2 PSDP_{it} + \omega_3 Hostel\_Intake_{it} + \omega_5 Lit\_Male_{it} + \omega_6 Lit\_Female_{it} + \omega_7 Crime\_Rate_{it} + \omega_8 MYM\_18_{it} + \omega_9 MYM\_18 - 20_{it} + \omega_{10} MYEM\_21_{it} + \tau_{it} \dots\dots\dots\dots\dots\dots (11)$$

Here also Hausman Test is used to decide between Fixed Effect Model and Random Effect Model. So, if the χ^2 value is significant then that implies Fixed Effect Model is best for this study.

7. Results and Discussion:

Table 5.10: Determinants of overall GER of females and GPI in higher education in India

Explanatory Variables	Explained Variables					
	GER_ F			GPI		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
No_Collg	0.548***	0.510***		0.003	0.004	
Hostel_Intake	0.00001***	0.00002***	0 .00002 ***	-2.13e-07	-1.25e-07	-1.41e-07
F_Teachers	0.476***			0.014***		
PTR			0.140***			-0.0005
PSDP	0.00001*	0.00003***	0.00006***	7.82e-07***	1.44e-06***	1.26e-06**
Lit_Male	0.052	-0.198	0.691	0.001	0.009	0.011
Lit_Female		0.271	0.474		-0.002	-0.003
Crime_Rate	-0.010	0.007	-0.015	0.0008*	0.0008	0.001**
MYM_18	1.057	0.304	1.384	-0.042	-0.060	-0.072*
MYM_18-20	-1.323	-1.093	-1.712	-0.014	-0.014	-0.011
MYM_21	0.312	-0.447	0.548	0.023*	0.023	0.023
Intercept	-20.383	5.672	32.891	0.587	1.007	0.954
F-statistics	48.91***	34.07***	26.48***	14.08***	8.46***	8.14***
R square	0.787	0.720	0.667	0.515	0.390	0.381
Hausman test (χ^2)	*13.24***	*5.86***	*2.84***	*0.951***	*2.85***	*2.26*

***, ** and * indicates level of significance at 1%, 5% and 10 %.

Table 5.10 shows the factors affecting GER of females and GPI in higher education. It reports that only for Model 6 the Hausman test supports the Random Effect Model. But in this study, we have used fixed effect regression for all the six models. There may be some state specific unobserved factors, which mayinfluence the GER _F and GPI in different states. Wooldridge

(2002) mentioned that in some application especially when the unit of observation is large geographical locations (states/provinces). In that scenario it is best to think each of the unobserved effect (ai) as a separate intercept to estimate for each cross- sectional unit. In that case, Fixed Effect Model is best to use. So, in this study to capture the state specificunobserved effect on GER_F and GPI, fixed effect estimation is appropriate.

Here we have found that (Model 1 and Model 2) number of colleges helps to increase the female enrolment in higher education. Beside this all the three models (Model 1, 2 and 3) show that hostel accommodation of female students and PSDP (proxy of households' income) also have positive significant impact on GER of females which supports the previous studies (Olson-Strom and Rao, 2020) but the impacts are very small. On the other hand, it is also found (Model 1) that as a greater number offemale teachers is present in higher education institutions will lead to increase in gross enrolment of female students in higher education which supports the study (Ghara, 2016). Model 3 reports that PTR has significant positive effect on GER of females.

Model 4 to Model 6 are used to show the determinants of GPI in higher education. Here, it is found that in all the three models, PSDP positively and significantly determines the value of GPI. Model 4 alsoreports that percentage of female teachers help to curb the problem of gender disparity in favor of malesin higher education. The variable mean years of effective marriage below 18 negatively determines the value of GPI in higher education for Model 6, which supports the previous studies too. It is also provedthat crime against women is not an obstacle for the expansion of higher education among women.

All the six models show that male and female literacy rate has no significant impact on both GER of females and GPI in higher education.

8. Conclusion:

Higher education has a significant influence on the quality of life among individuals in an economy.Therefore, all the countries in the world are promoting higher education, on the one hand, and are also trying to achieve gender parity in it, on the other hand. In 2005–2006, the Indian government started to bring a separate gender budget. The objective of gender budgeting is to deal with budgetary gender inequality issues. In this budget, special funds are allocated for females' education. The government has recently taken several measures to

achieve gender parity in higher education. For example, the Central Board of Secondary Education (CBSE) has started a project 'UDAAN' under the guidance of MHRD toaddress the issue of low female enrolment in prestigious engineering institutions and the teaching gap between school education and engineering entrance examination. Against this backdrop, this article analyzed data on higher education for 16 major states of India at two points in recent time, that is, 2011 and 2019. The state-wise comparison of higher education at the levels of UG, PG and technical education shows that GER of females is very poor in postgraduate and technical education. States are ina better position in terms of GPI at the undergraduate level. Static panel data analysis reveals that an increase inthe percentage of female teachers in colleges helps to improve the gross and relative enrolment of female students in higher education. This study also shows that per-capita state domestic product, which is usedas a proxy of the per-capita income of a particular state, has played a positive role in improving the GER of females and GPI in higher education. It is also observed that if higher education institutions increase thehostel accommodation for the female students, it will encourage more numbers of them in enrolling. Thisstudy reports that nowadays more girls are enrolling in higher education institutes and the GPI values inhigher education in the major 16 Indian states are now moving towards gender parity.

CHAPTER 6: ENHANCEMENT OF ENROLMENT IN TECHNICAL COURSES AT HIGHER EDUCATION LEVEL AMONG INDIAN WOMEN: FEW POLICY PRESCRIPTIONS USING FAIRLIE'S DECOMPOSITION METHOD

1. Introduction:

The higher education system of a country contributes to building the nation's economy more powerful. Technical education is a part of the higher education system. According to UNESCO and ILO (2002), Technical and Vocational Education (TVE) is a broad term used to refer to two aspects of the educational process that include addition to general education, the study of technology-related sciences and the acquisition of practical skills, attitudes, understanding, and knowledge relating to occupations in various sectors of economic and social life. Uwaifo (2009) mentioned that the Technical Vocational Education program directly impacts national development and prosperity. Dokubo (2010) asserts that the goal of technical and vocational education is to produce skilled labour and no differentiation should be made between the genders in skills acquisition. All India Council for Technical Education (AICTE) was established in 1945 as a national-level apex organization to conduct surveys on technical education facilities and promote development in India. After 1991, immense development in technical higher education was observed. The number of specialised training institutions in India has also increased significantly. Many centrally financed institutions have been established due to the Central Government's responsibility for key policy formulation maintaining continuity in higher education across the nation and addressing unserved regions. AISHE 2017-18 report has shown that there are 10011 no. of stand-alone institutions including technical universities present in India. It is also observed that 40.19 lakh no. of students are enrolled in engineering and technology for higher studies in India.

It is known technical and vocational courses are expensive at the higher education level. According to NSSO (2014) study private expenditure on technical education was about nine times that on general education. As per the Ministry of Education Report 2017, Indian youth whether enrolled in the formal education system or not are largely outside the ambit of vocational education. Ahmed (2016) reports that there is a declining trend in the participation of young people in vocational and technical education globally. Individuals from higher income classes do not prefer vocational education rather they lean towards technical higher education. Singh (2021) has shown that 85% of boys and 57% of girls in India are interested in pursuing their careers in STEM[13] jobs. It is also observed that there is a large gender gap and very poor enrolment of females in technical higher education. AISHE report (2019-20) found that around

[13] STEM jobs implies jobs in the filed Science, Technology, Engineering and Maths.

85% of female students enrol in nursing and only 15% of males are enrolled in the same. On the other hand, in Polytechnic institutes the female and male enrolment is 19% and 81% respectively. So, the data reveals that there is a gender-wise concentration in technical education after completion of graduation. This paper will try to find out possible policy prescriptions that will help to increase the enrolment of Indian women in technical education after reducing the gender gap.

2. Literature Review:

Very few research works still have been done on particularly high-level training like technical higher education in India. Technical higher education includes the preparation of specialized faculty for the motivations behind starting, working with, and carrying out the mechanical improvement of a country and making the fundamental consciousness of mechanical education available to our young people in the general public (Uwaifo, 2009). Social and economic factors play an important role in deciding the enrolment of adolescents in technical higher education. Several researchers have investigated how different socioeconomic elements, for example, guardians' education levels, guardians' occupations, family monetary circumstances, and students' financial expectations from their future jobs impacted their direction concerning enrolment in technical higher education (Esters, 2007; Fletcher, 2012). Chandrasekhar et al. (2019) report that the average share of expenditure on higher education by rural and urban households out of total household expenditure is 15.3 per cent and 18.4 per cent respectively. Lamb (2011) and Polat (2014) observed that normally students' poor monetary status causes them to sign up for TVE[14] because they either can't pay for a college education or they need to join the job market sooner to support their families financially. Lamb (2011) states that "for disadvantaged groups, it is the economic outcomes which make TVE both a source of dependence and a potential source of liberation". Agodini et al. (2004) found that students with low scholarly accomplishment and low training goals were likewise understudies with low financial foundations who were bound to partake in vocational education. Cox et al. (2015) reported that students from lower socio-economic backgrounds prefer comparatively fewer career academies than their economically advantaged peers. Gaunt (2005) to identify economic status, tracked down no huge distinction between non-CTE and CTE monetary status. Family's economic situation and surrounding environment also play a significant part in learners' choice

[14] TVE means Technical and Vocational Education

to sign up for TVET. When the financial situation is considered to enrol in TVETs, students from families with less education are more likely to enrol in TVET than students who live in urban areas with significantly higher background levels in terms of income, lodging costs, and educational attainment, less eager to enrol in TVETs. (Arregle and Mari, 2019, for Kenya). Students from low-income families will undoubtedly miss training more than those from high-income families due to their inability to cover organizations' costs, according to research by Kyungu and Macharia (2017) on the influence of financial status on the guidance of specialized educational programs. Another individual element that impacts students' vocation dynamic comparable to IVET is their gender bias (Dick and Rallis, 1991; Rojewski, 1997; UNESCO, 2011). By and large, in both the West and East, professional training programs were separated into female and male occupations. Appropriately, female understudies transcendently signed up for word-related projects like childcare, social specialist, nursing and clinical aide, family the board, and secretarial positions, while males signed up for car technicians, plumbing, power, carpentry, metal work, and others that necessary difficult work. Around the world, UNESCO (1999) has been dynamic in tending to the gender issue, especially female support, in professional and specialized training.

Guardians play a key part in their youngsters' career development and decision-making (Hughey, 2005; Saiti and Mitrosili, 2005). Various studies (Hossler and Stage, 1992; Law and Arthur, 2003; Awang et al. 2011) have shown the impact of guardians' education level and occupation on students' post-secondary careers and decision-making in general and especially concerning IVET[15] (Awang et al., 2011; Yi et al., 2015; Quddusov, 2013). Nonetheless, there is a lack of studies that explicitly look at the impact of variables on IVET enrolment in higher education. Awang et al.(2011) found that in Malaysia just 2% of guardians with single guys, 2.9% with experts, and 2% with Ph.D. permitted their youngsters to enrol in apprenticeship programs. According to Yole (1986), the professional areas within which the technical and vocational education subjects generally cover at higher education level are Horticulture, Home financial aspects, Business and mechanics and so on. However, farming and carpentry are inappropriate decisions since they don't draw much interest among the students. This is to say that higher occupational guardians would believe that their young children should be specialists

[15] IVET means Initial Vocational Education and Training

in medicine, engineering and so forth disregarding assuming the young would peruse science subjects to accomplish that.

3. Research Objectives:

A Strong Higher Education system within a country can make its economy more powerful. The 12th Five-Year Plan (2012–2017) estimated that only a very small percentage of the Indian workforce in the age group of 19–24 (less than 5%) received formal vocational education whereas in countries such as the USA, the number is 52%, in Germany 75%, and South Korea it is as high as 96%[16]. These numbers only underline the urgency of the need to hasten the spread of technical and vocational education in India. According to the Department of Higher Education in India, the technical and vocational courses in higher education include Graduation, Post-Graduation, Diploma, Post Graduate Diploma, and Certificate courses in different disciplines like engineering, technology management etc. The duration of the course is either one or two years depending on the course structure.

Therefore, the aim of this study is:

1. To identify the household-related factors which influence a parent's decision during the time of enrolment of their young child in an Indian technical college for higher studies after completion of 10+2.
2. Next, it is required to quantify the contribution of each household-related factor for explaining gender discrimination during the time of enrolment in technical higher education institutions in India. Fairlie Decomposition technique will be used to understand the relative contribution of different covariates for the gender gap during the time of enrolment in technical and vocational courses at higher education level institutions. Apart from that, relevant state-specific indicators are also considered so that the government can take necessary actions to increase the enrolment of young women in technical and vocational education at higher studies to reduce gender-wise discrimination in India. This will help us to identify possible policy prescriptions which can reduce the gender gap and help more Indian women to enrol in technical and vocational training in higher education.

[16] https://timesofindia.indiatimes.com/blogs/voices/reimagining-vocational-education/?source=app&frmapp=yes

4. Data and Methods:

NSSO 75th round unit-level dataset of Household Social Consumption on Education is used for this study for household-related factors. Along with the household level factors, some state-specific indicators which may have impact on the household decision-making process are used from different sources like NFHS 4[17], Analysis of Budgeted Expenditure on Education (2016-17 to 2018-19) published by the Ministry of Education, Govt. of India, State-wise loan disbursed by SBI for pursuing degree and diploma courses inside and outside the country during a specific year published by the Ministry of Finance[18] and Bureau of Police Research and Development, Govt. of India for policy indicators.

Sample households are initially segregated based on considered states. Here 28 states are considered except Manipur and Meghalaya[19]. State policies may vary. However, the value of the state-specific variable of a particular state is the same for all the sample households belonging to the state.

NSSO 75th Round unit level dataset consists of 11,90,110 households (64519 rural households and 49238 urban households). In this survey, the total number of people surveyed was 2,67,887 males (1,59,411 males in rural areas and 1,08,476 males in urban areas) and 2,45,479 females (1,46493 females in rural areas and 98986 females in urban areas). From this dataset, initially, we have considered a sample comprising those young who are currently attending higher education between the age group of 18-28 years.[20] Then from those we separate, the young into two groups: Youngs who are currently attending the technical and vocational courses at the higher education level and Youngs who are currently attending general degree courses at the higher education level. The technical and vocational course includes diplomas/certificates (graduate and above) in agriculture, engineering/technology, medicine, crafts and other subjects. Then again, we separate the gender between males and females. Here total sample comprises 11425 young males and women out of which 5752 young children are female (nearly 50.34%) and 5673 young children are male (nearly 49.65%)[21]. That NSSO survey covered both quantitative (consumption expenditure, household size) and qualitative aspects (household

[17] NFHS 4 data is used as this is the latest dataset for the considered period in this study.
[18] SBI-sanctioned loan data is only available for all the states & it is considered that as SBI is available all over India.
[19] Due to unavoidability data these two states cannot be considered for this study.
[20] As mainly between this age group (18-28 years) adolescents' studies in technical higher education in India.

location, enrolled or not enrolled etc.) related to the educational attainment of the household members.

4.1 Possible Factors Influencing Enrolment Decisions in Technical and Vocational Courses in Higher Education in India

Initially, it is required to identify the possible factors that influence a parent to decide the type of higher education for their young children during the time of enrolment in higher education institutions. To do that probit regression technique will be applied here where the outcome variable is binary. It takes the value '1' if the young son or daughter is enrolled in a technical and vocational course at a higher education level (after completion of 10+2) and '0' if the young is enrolled in the general discipline (after completion of 10+2).

The possible influencing factors will be narrated below. The household-related factors (gender, Hindu, residential status, household size, consumption expenditure, internet access and institutional distance) are considered from NSSO 75th round datasets.

1. **Female:** This variable is required to investigate the existence of gender preference among parents during enrolment in the technical and vocational courses at higher education. Researchers like Kingdon (2002), Kuglen and Kumar (2017), Rammohan and Vu (2018), Sahoo (2017) and Kumar and Sahoo (2023) state that the gender gap in educational attainment is driven by intra-household differences in human capital investment based on the gender of the young child. In the patriarchal society, parents save their earnings for their daughters' marriage and are typically not willing to use that money on their higher education. As a result, daughters are sent to low-fee structured government colleges while their sons are sent to high-fee structured technical or professional colleges (Singh, 2007; Thasniya, 2014). This dummy variable is assigned a value of '1' if the young is female and '0' otherwise.
2. **Hindu:** A major percentage of Indian households belongs to the Hindu community (79.8%) followed by the Muslim Community (14.23%), Christian Community (2.30%) and other communities (3.67%) (Census,2011). In our study, we have considered Hindu and other religions. If a young belongs to the Hindu religion then the dummy variable religion is assigned a value of "1" and for other religions, it is "0". It is expected that the religion of the household may play an important role in the choice of higher education institutions especially technical ones for their female young. UGC report

(2008) states that Muslim women seem to be facing the most difficult circumstances during the time of enrolment in higher studies. There are also special reservations for young belonging to the Christian community or Muslim community so household belonging to the Christian community or Muslim community mainly enrol their young in aided Christian higher education institutions/Muslim higher education institutions.

3. **Resedential_Status:** This variable indicates the location of the house of the young students' i.e. rural or urban area. This factor is considered because it is known to us that in India development is observed mainly in urban areas than in rural areas (Sinha, 2008; Agarwal, 2009). A Higher number of higher education institutions like general degree colleges, universities, and technical institutions are found in urban areas rather than rural areas. AISHE 2019-20 reports that 56.1% of stand-alone institutions are located in rural areas. According to Tilak and Chowdhury (2016), the enrolment of women from urban areas in higher education is four times higher than those in rural. So, if a young stay in a rural area it may be difficult for her to enrol himself/herself in a technical institution situated in an urban area. This variable is also a dummy variable. It takes 1 if the young lives in an urban area and 0 if he/she lives in a rural area.
4. **HH_Size:** Total household members of a particular household represent the household size. It is expected that larger size of households reduce the possibility of enrolment in technical and vocational courses for higher education as it is expensive. According to the NSSO (2014) study, private expenditure on technical education was about nine times more than on general education. In the case of female students from low SES[22], the situation is worse, and they face competition with their male siblings to get enrolled in tertiary education (Kaaya and Waiganjao, 2015; Niu, 2017).
5. **Consumption_Expen:** In this study, monthly per capita consumption expenditure (Rs.) is considered as a proxy of a household's income situation. Enrolment of a young in a technical higher education institute always depends on the household's level of income. Literature on household expenditure on higher education also reports the existence of gender bias in household spending on higher education, more prominently among poor families (Tilak and Mazumder, 2016). It is observed that students from higher Socio-Economic Status (SES) prefer to study technical education and the situation is worse for female students from low SES. They face competition with their male siblings to get enrolled in tertiary education (Kaaya and Waianae, 2015; Niu, 2017).

[22] SES implies Socio-Economic Status

6. **Internet Access:** This is a dummy variable. This variable considers two values; value 1 if the household has Internet access otherwise it takes value 0. Today, around the world internet has turned into one of the major wide and resourceful sources of information for learners and trainers (Makoye, 2003). The emergence of the Internet in education had a tremendous impact on teaching and learning. The use of the Internet in the classroom plays a significant mediating function in raising students' satisfaction with their education (Hsieh, 2011). Properly used information from the Internet represents added value to education. Therefore, it is expected that if a household has an internet connection that will increase the enrolment of young in technical and vocational courses as well as reduce the gender gap.
7. **Institutional_Distance:** Distance is assigned a value of '0' if the distance to the nearest technical institute is less than 5 km and '1' if the distance to the nearest technical institute is more than or equal to 5 km. Distance between technical institutes for higher studies and households plays a major role in deciding the type of higher education in rural India. Due to a lack of transport connectivity and young girl safety issues, young girls may not be allowed to enrol for higher studies as education expenditure rises. Lina et al. (2006) have reported that the higher study of females is hampered due to weak transportation systems, travel costs, accompanying costs, opportunity costs, physical costs and cultural restrictions on the mobility of adolescent girls. Therefore, it is expected that if the distance between houses and educational institutions is less that will improve the enrolment.

Some state-specific factors are considered which can also influence the household-level decision to enrol the young child in technical and vocational courses at a higher education level. The state-specific macro variables relevant to this investigation can influence the household-level decision. The state-specific variables are discussed below.

8. **Police Density:** It is measured as an area in sq. km. per policeman in a particular state. This variable is collected from the report on Data on Police Organizations (2017-2018) published by the Bureau of Police Research and Development, Ministry of Home Affairs, Govt. of India. Police protection is an important indicator to capture the safety and security of a state. Parents play an important role in deciding their young children's enrolment in colleges. Indian parents are always in fear of their daughter's physical safety and this fear prevents them from encouraging their daughters to participate in

technical education (Channa, 2000). It is expected that in an area where the police density is higher young students especially young girls feel safer and more secure to go to college which helps to increase the enrolment of the young in higher education.

9. **No._technical_inst:** Number of technical institutes in a state. This is a state-specific variable. This variable is collected from the All India Council for Technical Education website for the year 2017-18. It is expected that if the government takes necessary actions to establish more technical institutions, then it is expected that higher will be enrolment of young in technical higher education. The technical institutions include stand-alone institutions along with engineering and medical colleges.
10. **State_expen_tech:** This is budgeted state expenditure on technical education at higher studies (revenue account). This variable is collected from the report of Analysis of Budgeted Expenditure on Education (2016-17 to 2018-19) published by the Department of Higher Education, Ministry of Education, Govt. of India for the year 2017-18. This expenditure includes administration costs, technical school costs, polytechnic institution's costs, assistance to universities for technical education, assistance to non-government technical colleges and institutions, engineering institutions, scholarships, training and other expenditures. State expenditure on technical education at higher studies is an important determinant factor behind the enrolment of young' in technical and vocational courses. It is known to us higher education especially technical and vocational courses is costly. NSSO's (2014) study shows that private expenditure on technical education was about nine times that of general education.[23] Youngs from poor sections cannot afford the cost. Studies like Kaaya and Waiganjao (2015); and Nwojiewho and Deebom (2017) suggest that government policies such as scholarship facilities may help female students to get admission into higher education. Therefore, it is expected that the higher the cost shared by the government higher be enrolment.
11. **Loan Sanctioned:** It is known to us higher education is expensive. The cost of higher education especially expenditure on technical education is more than that of normal graduate and post-graduate courses (Kosha et. al., 2014). So, it is difficult for a young from an economically backward class to enrol himself/herself in higher education

[23] According to Ministry of Statistics and Programme Implementation, Government of India (June 2014), average expenditure per female student was Rs.3397 in Government Technical Degree colleges, Rs. 4043 in Private aided colleges, and Rs.10558 in purely Private colleges and that was in that academic session only. In Diploma courses that was Rs.2252, Rs.2588 and Rs3206 respectively.

especially technical and vocational courses at higher studies). On the other hand, employability is another reason for enrolling in technical and vocational courses at higher studies hence, it is an important determinant of demanding educational loans. Therefore, RBI encourages banks to make educational loans and these loans qualify as priority sector lending. In this study, two variables[24] are considered: (i) the number of loans sanctioned in a state and (ii) the amount of loans sanctioned in that state. The data are collected from State-wise loans disbursed by SBI for pursuing degree and diploma courses inside and outside the country during a specific year (2017-18) published by the Ministry of Finance. If more loans are sanctioned and larger size of educational loan amounts, it is easy for a young from an economically backward section to make a good career in the future.

12. **Years of Schooling:** This variable takes into consideration the percentage of women who completed 12 or more years of schooling. This variable is collected from the National Family Health Survey (NFHS-4) 2015-16.[25] It is considered a proxy for the spread of female education in that particular state. It is expected that if the mother is educated then it is highly probable that the young of the house will get higher education. Therefore, the higher the percentage of females who completed 12 or more years of schooling, it is expected that higher will be enrolment of young' in technical and vocational courses during higher studies.
13. **Women empowerment:** Percentage of females who have money that they can decide how to use it. This variable is also collected from the National Family Health Survey (NFHS-4) 2015-16. This variable is considered as a proxy of women empowerment which reflects the state-wise unobserved effect. It is expected that if a woman of a household has money in her hand, then she will be a decision maker and can decide whether her young child will enrol in technical education at higher studies or not.

[24] If we look at the variables number of sanctioned loans and total amount of loan sanctioned there is no unidirectional relationship VIF score shown in the appendix indicates that for the number. of sanctioned loan and loan sanctioned amount the values are 2.3 and 3.2 respectively. Besides this, the data reports that in the concerned period i.e. 2017-18 for the state Bihar 4642 no. of loans were sanctioned and the sanctioned loan amount was Rs. 161.10 crore. On the other hand, for the state Karnataka 3439 no. of loans were sanctioned (which was less than Bihar) but the sanctioned loan amount was Rs. 170.62 crore (which was more than Bihar). Similarly, for Gujrat 2052 no. of loans were sanctioned (which was less than Bihar) and Rs. 168.38 crore loans were sanctioned (which was more than Bihar). This implies that there is no correlation or unidirectional relationship between these two variables.

[25] The period for NSSO 75th round data is 2017-18. As the NFHS-4 is the latest data available for the considered period according to the NSSO 75th round data period therefore, we consider NFHS-4 instead of NFHS-5.

5. Methodology:

First, the household-level factors along with state-specific factors are identified which play an important role when parents decide whether to enrol their young children in a technology institute in India after completion of 10+2. Next, it is required to quantify the contribution of each factor identified in explaining the gender discrimination that is observed during the time of enrolment in technology institutes in India. Identification of the factors becomes very important because the Government of India has implemented various new policies which provide various financial support, concessions etc. to bridge the gender gap in higher education. Therefore, the Fairlie decomposition technique is used to identify and quantify the contributions of differences in measurable characteristics to group differences in the outcome variable. The details are discussed below sections.

5.1: Determining factors influencing enrolment in technical higher education after completion of 10 +2 level of education:

As the dependent variable "Enrolment in the technical institute at higher education level" is a binary variable, the probit regression method is the best to apply here.

All the independent covariates were tested for possible multicollinearity through the VIF test (reported in the Appendix) before putting them in the regression model.

The following probit regression equation is considered to address the first research problem.

$$\begin{aligned} Y_{ij} = \alpha_0 &+ \alpha_1 \text{Female}_{ij} + \alpha_2 \text{Hindu}_{ij} + \alpha_3 \text{Resedential\_Status}_{ij} + \alpha_4 \text{HH\_Size}_{ij} \\ &+ \alpha_5 \text{Consumption\_Expen}_{ij} + \alpha_6 \text{Institutional\_Distance}_{ij} \\ &+ \alpha_7 \text{Internet\_Access}_{ij} + \alpha_8 \text{No\_Tech\_Inssti}_{j} + \alpha_9 \text{Police\_density}_{j} \\ &+ \alpha_{10} \text{State\_Expen\_technical}_{j} + \alpha_{11} \text{Years\_Schooling}_{j} \\ &+ \alpha_{12} \text{Women\_empowerment}_{j} + \alpha_{13} \text{No\_loan\_sanctioned}_{j} \\ &+ \alpha_{14} \text{Amount\_loan\_sanctioned}_{j} + \varepsilon_{ij} \end{aligned} \quad \text{.....(1)}$$

Here Y_{ij} =1 if the young from the i^{th} household of j^{th} state is enrolled in a technology institute at a higher education level

= 0 if the i^{th} household of j^{th} is not enrolled in a technology institute at a higher education level but at any non-technical degree course.

Here, the values of each of the said variables: $No\_Tech\_Insti_{ij}$, $State\_Expen\_technical_{ij}$, $Years\_Schooling_{ij}$, $Amount\_loan\_sanctioned_{ij}$ are the same for the sample households for the j^{th} state.

6. Results and Discussion:

The result of the Probit model mentioned in Eq.(1) is presented below.

Table 6.1: Determinants of Enrolment in Technical and Vocational Courses at Higher Education

Variable	Coefficient	Marginal Coefficient
Female (Ref Category male)	-0.073*** (0.018)	-0.003*** (0.0008)
Hindu (Ref Category other religions)	0.096*** (0.023)	0.004*** (0.001)
Residential_Status (Ref Category rural)	0.100*** (0.022)	0.004*** (0.0009)
HH_size	-0.038*** (0.005)	-0.001*** (0.0002)
Consumption_Expen	0.208*** (0.204)	0.009*** (0.0009)
Institutional_Distance (Ref Category distance less than 5 km)	-0.073 (0.046)	-0.003 (0.002)
Internet _Access (Ref Category no access)	0.279*** (0.021)	0.012*** (0.0009)
No_Tech_Insti	0.005 (0.006)	0.0002 (0.0009)
Police_density	0.055*** (0.008)	0.002*** (0.0003)
State_expen_technical (Rs. In thousand)	0.012** (0.006)	0.0005** (0.0002)
Years_Schooling (%)	0.016** (0.007)	0.007** (0.0003)
Women_empowerment (% of women have money in their hand)	0.002** (0.001)	0.009** (0.004)
No_loan_sanctioned	0.003** (0.001)	0.0001** (0.00006)
Amount_loan_sanctioned (Rs. In crore)	0.001*** (0.0003)	0.00005*** (0.00001)

***, ** 1% and 5% level of significance and Standard Errors are mentioned in brackets

The objective of this study is to find the determinants of enrolment of young in technical and vocational education at the higher education level.

It is observed from Table 6.1 that the possibility of females' participation in Technical and Vocational Courses at higher education levels is lower. It reflects the observation of Ghosh and Kundu (2021) where it is identified that in the major 20 states of India, the GER of females in technical higher education is very poor. On the other hand, religion plays an important role in our country in deciding whether the young of the household will enrol in technical and vocational courses at a higher education level or not. The result shows that among Hindu households, the possibility of enrolment of a young in technical and vocational courses at higher education is higher than in other religions. This study documents that household size is an important determinant factor in deciding the enrolment of a young in technical and vocational courses at a higher education level. It reports that young from larger household sizes have a lower chance to join technical vocational courses at higher education levels than young from smaller household sizes. On the other hand, higher household consumption expenditure which is considered as a proxy of household income helps to increase the chance of the young generation's participation in technical higher education. It is observed that low income and scarcity of financial resources hinder the poor population from enrolling in technical education at higher studies (Khan et al., 2015). This study reports that residential status i.e. where the young student stays in the rural or urban area is also a determinant factor. It is known to us that in our country development is observed mainly in urban areas than rural areas. A higher number of higher education institutions like general degree colleges, universities, and technical institutions are generally found in urban areas rather than rural areas. The possibility of enrolment in technical and vocational courses after completion of 10+2 is higher in the urban areas than in the rural areas.

Nowadays, the emergence of the internet in education has a tremendous impact on teaching and learning. Ellore et al. (2014) reported that Internet availability is almost everywhere and most students have access to the Internet on their cell phones. This helps students to broaden their academic information, research and assignments by accessing information worldwide and also enhances easy communication with the academic community (Siraj et al., 2015). Hence, the above result also documents that if a young student has internet access in her/his household that will also increase the probability of enrolment in technical and vocational courses at higher studies.

To capture the effect of state-level unobserved effects, two variables are considered: years of schooling (female) and percentage of women who have money in their hands (which is used as

a proxy of women empowerment). Therefore, Table 6.1 reports that if a higher percentage of females completed 12 or more years of schooling, then that will increase the possibility of young enrolment in the technical and vocational courses. Similarly, if a higher percentage of women save money and have money in their hands that implies they are financially empowered and that will increase the possibility of making their young children's future decisions and with this, the probability of enrolment in technical education will increase at the higher education level.

If we look at the state-specific policy level factors, the above result shows that police density which reflects the safety and security in a state is an important determinant variable here. If police density in the states is higher then that helps to increase the enrolment in TVE during higher studies. Besides this, the sanction of loans also plays an important role here. More number of loans sanctioned with good amounts will help to increase the chance of young enrolment in technical and vocational courses. It is known to us that technical education at a higher education level is expensive. Therefore, state expenditure on technical education also plays an important role. Tilak (2009) has said that public subsidies in higher education are an important instrument to protect democratic rights, promote national values and foster cooperation instead of competition. This study shows if state expenditure increases on technical and vocational courses at higher education level then that will also increase the possibility of young enrolment in technical and vocational courses at higher education, especially those from lower SES.

Vocational and technical education has a significant impact on transforming the economic development process. Women's enrolment in Technical and Vocational Courses at higher studies is important because Vocational and technical education is created to improve the abilities, knowledge, and skills required for work, economic support, and the development of women's empowerment. Having these technical and vocational abilities can considerably aid in empowering women economically. The above regression result already shows that there is a gender gap in the enrolment of young in technical and vocational courses at higher education levels. The Fairlie Decomposition Technique can identify the factors that will reduce the gender gap during the time of enrolment in technical and vocational courses in higher education.

6.1: Fairlie's Decomposition Analysis to quantify the contribution of the explanatory factors influencing the decision of gender discrimination among parents during the time enrolling their son and daughter in Technical and Vocational courses in their Higher Education:

The Blinder-Oaxaca decomposition methodology (Blinder, 1973; Oaxaca, 1973) is a widely used method for determining and quantifying the variables linked to inter-group disparities in mean-level outcomes. However, this technique provides misleading inconsistent estimates when the dependent variable of interest is binary and the group differences cannot be explained by an influential explanatory variable. Therefore, it is best to use the extension of the Blinder–Oaxaca technique i.e. Fairle Decomposition (Fairlie, 2005) which is appropriate for binary models to decompose the gap between gender during the time of enrolment in technical and vocational courses at the higher education level. In this study, the dependent variable "enrolment in technology institute at a higher level of education in India" is binary. Since the independent contribution of each variable in the non-linear decomposition depends on the order in which the variables are introduced in the model, as suggested by Fairlie (2005) to get a robust estimate we have randomized the order of variables. The decomposition method proposed by Fairlie is described in detail in the Appendix.

Table 6.2: Fairlie's Decomposition of gender discrimination in Probability Young Enrolled in Technical and Vocational Courses at Higher Education

Variable	Coefficient	Standard Error	Percentage Contribution
Hindu	-0.0001***	0.00003	-2.56
Residential_Status	-0.0003***	0.00005	-7.69
HH_size	0.0008***	0.00007	20.08
Consumption_Expen (Rs.)	-0.00003**	0.00001	-0.77
Institutional_Distance	0.00016**	0.00006	4.01
Internet_Access	-0.0001***	0.00003	-2.08
No_Tech_Insti	-0.00006**	0.00002	-1.54
Police_density	-0.0003***	0.00009	-7.69
State_expen_technical (Rs. In thousand)	-0.00028***	0.00003	-7.18
Years_Schooling (%)	-0.0001**	0.00004	-2.56
Women_empowerment (%)	-0.00003*	0.00002	-0.77
No_loan_sanctioned	-0.0007**	0.0003	-15.28
Amount_loan_sanctioned (Rs. In crore)	-0.0004***	0.001	-10.12
Pr.(Y!=0/G=0)	0.0202		
Pr.(Y!=0/G=1)	0.0163		
Total Difference	0.0039		
Total Explained	0.0014 (33%)		
Total Unexplained	0.003 (77%)		

***, ** 1% and 5% level of significance

Table 6.1 has already reported a statistically significant gender gap[26] in favour of women during the time of enrolment in technical and vocational courses in higher education. Table 6.2 reports that gender discrimination among the young generation during the time of enrolment in technical and vocational education in their higher studies will be less if the household belongs to a higher income group. Our decomposition result shows an enhancement of income among the households can play a positive role in enrolling girl children in technical and vocational courses in their higher studies. Kaaya and Waiganjao (2015); and Niu (2017) mentioned that among households belonging to lower socio-economic status, young females face competition with their male siblings for getting enrolled in tertiary education. So, if income increases then the daughter will also get the opportunity to enrol in technical and vocational courses at higher education. Table 6.1 documents that among the Hindus probability of enrolment of young in technical and vocational courses is higher. It is documented in Table 6.2 that the gap between young boys and girls in terms of enrolment in technical and vocational courses at higher educational standards is less among the Hindus. Table 6.1 shows that larger household sizes reduce the possibility of enrolment of young children in the technical institute for higher studies. Table 6.2 shows that the larger size of households is the most important cause of the gender gap in enrolment in technical education for higher studies. However, it is expected that if income for larger household size increases, then the gender gap during the time of enrolment in technical and vocational courses will be reduced. The NSSO 75th round survey reports that the direct cost of education in the technical stream is more than the general stream and so it is difficult for economically not-so-rich households to bear that cost (Nwojiewho, Deebom, 2017). Tilak and Mazumder (2016) reported that the attendance ratio in higher education is lowest in the case of women who belong to poor families mainly living in rural areas Therefore, it is expected that if a family's earnings increase then it will bear the larger family cost as well as can spend the earnings on the daughter's higher education.

Rani (2002) has pointed out that state and public support is important in the higher education system, particularly for females. Therefore, it is proved from Table 6.2 that the state expenditure on technical and vocational courses is one of the important policy variables that can reduce the gender gap in technical and vocational education. The state expenditure on

[26] Probability of male student & a female student enrolment in technical & vocational course at higher education level are 0.009 & 0.007 respectively.

technical and vocational education includes stipend costs, administrative costs, and all other costs. It is expected that increasing state expenditure helps to reduce gender during the time of enrolment in technical education for higher studies.

In this study, the most important factors are the number of loans sanctioned and the sanctioned loan amount. These two variables have the highest contribution to reducing the gender gap. If states support formal institutions to sanction more educational loans with better amounts, then that will also reduce the gender gap in enrolment in technical and vocational education, especially for those young females who come from lower socioeconomic classes.

Institutional distance should also be reduced and with this, the police density is another important state-level policy variable that also helps to reduce the gender gap. If more police are recruited and each police has a smaller area under their observation, then it is easy for a policeman/woman to maintain safety and security under his/her territory which encourages parents of young females to send their children to the technical vocational course at the higher educational level. The state-specific unobserved factors related to women like years of schooling and women empowerment also can reduce the gender gap in enrolment in technical and vocational courses at the higher education level.

7. Conclusions and Policy Implications

Enrolment in technical and vocational Courses at Higher Education is costly. In India enrolment in higher education is increasing but for technical higher education, it is not satisfactory mainly among women. This study aims to identify the factors behind the lower enrolment in technical and vocational courses in higher education and also identify those factors which can reduce the gender gap during the time of enrolment in technical and vocational courses at the higher education level. In the case of religion for Hindus, the probability of enrolment in the same is higher and the result documents that among Hindu households' the gender gap is less compared to other religions. It is found that household income, household location and internet access are working as supporting factors to increase the possibility of enrolment of the young generation in technical and vocational courses at higher education and reduce the gender gap there. In this study distance between institution and house plays a strong role. It has been discovered that the probability of a young person enrolling in technical institutions increases with decreasing distance between home and technical institution. On the other hand, state governments need to be more active also to reduce

the gender gap in technical education. The analysis reports that if the value of police density is higher (indicates safety and security in an area) that increases the chance of young enrolment as well as reduces the gender gap in enrolment in technical education in our country. Also, if state governments increase the budgeted expenditure on technical education like increasing the funds for scholarships, and establishing more technical schools and colleges that will also enhance the enrolment of young in technical and vocational courses and reduce the gender gap in India. Also, the study observed that if more percentage of females complete 12 or more years of schooling and if females have money in their hands to decide how to spend, then enrolment will increase in technical higher education gender gap will be reduced. Also, if more educational loans are sanctioned with higher amounts, that will help to create a smaller gender gap. Recently Government of India launched a scheme named PM Laptop Scheme 2023 under which free laptops will be distributed among government-sponsored schools and colleges. Similarly different states like Karnataka and Uttar Pradesh also launch a similar scheme. Besides this PRAGATI (Scholarship for girl students) was launched by the MHRD (currently Ministry of Higher Education) in 2014-15 and implemented by the AICTE to provide encouragement and support to female young to pursue technical education. Therefore, it can be argued that enrolling in technical studies is necessary to develop a strong nation. As a result, the government should increase funding for higher education so that young people, especially young girls from economically or socially disadvantaged homes, can register for technical higher education. The National Education Policy 2020 recommendations highlighted the need for bridging the gender gap and have suggested specific measures like creating the Gender Inclusion Fund to build the nation's capacity to provide quality education for girls. This paper suggests that such a mission of the New Education Policy can be materialized if more scholarships can be arranged among Indian girls which will encourage them to be enrolled in technical and vocational courses for higher education.

8. Appendix

Appendix 6.8.-1: Descriptive Statistics

Variable	Mean	Standard Deviation
Hindu	0.775	0.416
Residential_Status	0.435	0.495
HH_size	5.371	2.503
Consumption_Expen	9.274	0.617
Institutional_Distance	0.882	0.321
Internet _Access	1.559	0.496
No_Tech_Insti	731.636	638.237
Police_density	1.876	1.251
State_expen_technical	2.976	2.163
Years_Schooling	4.475	1.795
Women_empowerment	14.358	5.455
No_loan_sanctioned	2412.039	1438.51
Amount_loan_sanctioned	133.462	65.158

Source: Authors' Calculation

Appendix-6.8.2: VIF Test

Variable	VIF	1/VIF
Hindu	1.04	0.992
Residential_Status	1.30	0.768
HH_size	1.32	0.758
Consumption_Expen	1.62	0.617
Institutional_Distance	1.04	0.959
Internet _Access	1.22	0.816
No_Tech_Insti	1.40	0.716
Police_density	1.24	0.805
State_expen_technical	1.40	0.716
Years_Schooling	1.87	0.534
Women_empowerment	1.21	0.823
No_loan_sanctioned	2.33	0.429
Amount_loan_sanctioned	3.21	0.311

Appendix-6.8.3: Fairlie Decomposition Technique

According to the Standard Blinder-Oaxaca decomposition, Male-Female gap the in the average value of the dependent variable, Y, (here enrolment in a higher education institution) can be expressed as:

$$\bar{Y}^{M} - \bar{Y}^{F} = [(\bar{X}^{M} - \bar{X}^{F})\hat{\beta}^{M}] + [\bar{X}^{F}(\hat{\beta}^{M} - \hat{\beta}^{F})] \quad \text{Eq.2}$$

where $\bar{X}^{j}$ is a row vector of the average value of the independent covariates and $\hat{\beta}^{J}$ is a vector of coefficient estimates for gender j(j = M, F).

Following Fairlie (1999) the decomposition for a non-linear equation, $Y = (X\hat{\beta})$ can be written as

$\bar{Y}^{M} - \bar{Y}^{F} = +$ Eq.3

Here 'F' stands for young girls 'M' stands for young boys and 'N' stands for sample size. In this case, the coefficient estimates $\hat{\beta}^{M}$ for boys are used as weights for the first term in the decomposition and the girls' distribution of the independent covariates $\bar{X}^{F}$ are used as weights for the second term. The alternative expression for the decomposition is used because:

$\bar{Y}$ does not necessarily equal F $(X\hat{\beta})$. An equally valid expression for the decomposition is:

$\bar{Y}^{M} - \bar{Y}^{F} = +$ Eq.4

In this case, the girl's coefficient estimates $\hat{\beta}^{F}$ are used as weights for the first term in the decomposition and the boys' distribution of the independent covariates $\bar{X}^{M}$ are used as weights for the second term.

We define $\bar{Y}$j as the average probability of the binary outcome of interest for gender j and F as the cumulative distribution function from the logistic distribution.

The first terms of Eq.3 and Eq. 4 estimates of the contribution of gender differences in the entire set of independent covariates to the gender gap in the dependent variable (due to group differences in the distribution of X). Estimating the total contribution is relatively simple and needs to calculate two sets of predicted probability by gender gap and take the difference between the average values of the two. The second term represents the part due to the differences in the group processes determining the level of Y. It also captures the portion of the gender gap due to group differences in unmeasurable or unobserved endowments.

Identifying the contribution of group differences in specific covariates to the gender gap is not as straightforward (Fairlie 2005). For simplicity, we first assume that there exists a natural one-to-one matching of a male child and a female child's observations. Using coefficient estimates from a probit regression for a pooled sample $\beta^{*,}$ the independent contribution of Xi to the gender gap can be expressed as:

$$\frac{1}{N^M}\sum_{i=1}^{N^M}(\hat{\alpha}^* + x_{1i}^F\hat{\beta}_1^* + x_{2i}^F\hat{\beta}_2^*) - F(\hat{\alpha}^* + x_{1i}^M\hat{\beta}_1^* + x_{2i}^F\hat{\beta}_2^*) \quad \text{..... Eq.5}$$

Similarly, the contribution of X_2 can be explained as:

$$\frac{1}{N^M}\sum_{i=1}^{N^M}(\hat{\alpha}^* + x_{1i}^M\hat{\beta}_1^* + x_{2i}^F\hat{\beta}_2^*) - F(\hat{\alpha}^* + x_{1i}^M\hat{\beta}_1^* + x_{2i}^M\hat{\beta}_2^*) \quad \text{..... Eq.6}$$

The contribution of each variable to the gap is thus equal to the change in the average predicted probability from replacing the girl's distribution with the boy's distribution of that variable while holding the distributions of other variables constant.

CHAPTER 7: ANALYSING UNEMPLOYMENT RATE AMONG WOMEN GRADUATES IN INDIA: A DYNAMIC PANEL APPROACH.

1. Introduction:

Human capital theories predict that enhanced skills among human beings through higher education increases their chances of earning higher income, and this, in turn, will enhance their workforce participation rate in the secondary and tertiary sectors (Smith and Ward, 1985; Goldin, 1990; England *et. al*., 2004). Following Neoclassical theory one can say that women's participation in higher education can lead to improved employment prospects in the formal sector, resulting in higher earnings due to the acquisition of valuable skills (Chatterjee et.al. 2018). From a macroeconomic perspective, the participation of women in different economic activities is necessary to make an inclusive positive growth rate for the economy. Female education has been substantially expanded in India. Ghosh and Kundu (2021) show that at the higher education level (the education after completing 10+2) the value of the Gender Parity Index in enrolment in most of the major states is either more than 1 or very near to 1. Despite the expansion of higher education among women, the rate of educated women's employment is very low in India. According to the International Labour Organization (2023), the number of working women in India dropped from 24 per cent of the total female labor force to 18 per cent between 2010 and 2020. Mahapatra (2012) has shown that although education has expanded among women, most of them are working in the informal sector where they are deprived of any social security benefit. This means the Indian labor market has not been able to integrate educated women mainly graduated women into formal employment in which an employee can gain all types of social security benefits including Provident fund. The Indian Discrimination Report (2022, released by OXFAM India) stated that women in India, despite possessing the same educational qualifications as men, are discriminated against in the job market due to some social issues and employer prejudice. Hence, in India, unemployment among at least graduated women is a challenging issue. For a long period, the Indian Economy has been facing a gradual decline in the labour force participation rate of females (Kanjilal, Bhaduri and Pastore, 2017). It has also been proved that the relationship between women's education and the labour force participation rate of women is U-shaped (Klasen and Pieters, 2015). According to the Census 2011 report, almost half of the Indian population is women. But in India, the Female Unemployment rate among the educated was 18.55% on average whereas that of the educated males was 9.87% (Periodic Labour Force Survey, 2017-18). Levenson and O'Kane (2019) have reported that in India, 8.7% of urban-educated working-age women are unemployed but among males that is only 4%. It has also been identified that the unemployment rate among rural graduated women is very high and that is 36.8%. India

has a shortage of skilled workforce across various sectors including the service sector. National Skill Development Council over 2010-14 revealed that there would be an additional net incremental demand of 10.9 crores of skilled manpower by 2022-24 in 24 key sectors. So, the growth of a skilled workforce including women is required. Agenor et al. (2015) show that more participation of females in the labour force can enhance the overall growth rate by about 2% over time in India. It is said that a gender-diverse workforce adds tremendous value in bringing in different ideas of innovation and solutions in the workplace. It is also identified that employment generation among women is necessary because it can create a positive impact on the quality of life of the household she belongs to (Subbarao and Raney, 1995; Drèze and Sen, 1991). More employability among women can enhance their empowerment also. With this background, this paper will address the possible causes of the unemployment rate among women in India who have completed at least graduation. Here 20 major states of India are considered as units and the considered period is 2013-2014 to 2019-2020. The unemployment rate in different states among at least graduated women within the concerning periods is considered and initially, a comparative analysis among the states will be done in the context of the unemployment rate among at least graduated women. After that, the possible factors responsible for the higher unemployment rate among highly educated women (whose educational qualification is at least graduate) are identified based on the dynamic panel model. In this research investigation, the unemployment rate of at least graduated women is considered as the dependent variable. It has already been mentioned that all the considered explanatory variables are macro-specific variables where 'state' is considered a unit. As the unemployment rate of a particular state in any particular period is influenced by the same type of unemployment rate of the same state in the previous periods, the lagged value of the explained variable is here considered as an explanatory variable. The help of the Dynamic panel regression model is considered after proper theoretical justifications of choosing it to address our research problems. The other considered explanatory variables will be the Gross Enrolment of Females at the graduation level[27] and in technical courses after completion of 10+2 level, per-capita state domestic product, percentage of females who completed graduation, employment rate among educated males, gross domestic capital formation in the industrial

[27] Gross Enrollment of Females in higher education in a state is defined as:

$$\frac{\text{Total number of female students enroled in higher education}}{\text{Population of females in the particular state within } 18-23 \text{ years old}} * 100$$

sector, gross value added in the service sector, density of Police as a proxy of security among women, percentage of females at the age of effective marriage between the age group 18 to 20 and 21 years and above respectively. The theoretical justifications for considering the mentioned explanatory variables are given in detail in the Methodology section. Based on Dynamic Panel Regression results one can identify the possible reasons for the high Unemployment rate among at least graduated women of India. Only after that, some policy prescriptions will be given which can reduce the unemployment rate among graduated women in India.

The paper is divided into eight sections. Section 2, narrates a brief survey of related kinds of literature. In Section 3, the research objective is mentioned, in Section 4, the sources of data used for this investigation are described, and in Section 5, a state-wise comparison of the percentage of women who have completed at least graduation and above and their unemployment rate will be analysed. In Section 6 the theoretical justifications for choosing the state-specific variables necessary for us to address the research problem will be narrated. The theoretical justification for choosing the Dynamic Panel model to address the research problem will also be addressed. The results of regression results will be analysed in Section 7 and with this, the possible policy prescriptions to check the unemployment rate of at least graduated women of India are mentioned. Conclusions will be analysed in Section 8.

2. Literature Review:

Knowles *et al.* (2002) confirmed that gender equality in education through the enhancement of the spread of education among women increases the human capital stock, making the labour market the most competitive. It can also increase the stock of physical capital (Seguino, 2000). The existing related literature covers the situation of both developing and developed countries. King (1990) found that in Peru, education among women was associated with a decline in their participation rate in the labour force. Jakubson and Psacharopoulos (1992) reported that in Ecuador, schooling had a negligible positive effect on the labour force participation rate among women. Merz (2006) based on her investigation in Germany a developed country had identified that the nature of females' supply of labour has been transformed in such a way that women's employment rate is steadily rising. According to him, transformation in women's employment status depends on characteristics such as women's education, their husbands' working hours, the number of small children in the family etc.). Studies like Reddy (1979); Das and Desai

(2003); Das (2006); and Klasen and Pieters (2015) have found a J or a U-shaped relationship between higher education among women and their joining in the labour force in India. It is expected that an educated woman prefers to marry an educated man and if the family income is good, then there is a possibility that the educated woman has less possibility to join the workforce (Goldin, 1990, England, Gornick, and Shafer, 2012). They focussed on their role in "Status Production". Apart from that, different types of crime against women, both in the private and public spheres or at the hands of known and unknown persons, remain an important issue to restrict women's mobility and engagement in processes of participation in the job market (Bradshaw *et al*., 2013). Tayal and Paul (2022) identified the Indian labour market's inability to effectively absorb the intake of the highly qualified female labour force in the formal sector. As a result of this, their unemployment problem is raised. The same type of observation is mentioned by Menon and Nath (2023). They have identified that educated women in India are facing difficulties related to getting jobs in the formal sector. The Unemployment rate is a macro-specific concept. Various studies (Malinvaud, 1980, 1985; Rowthrron, 1995) suggested that any type of unemployment problem can be solved by capital-generating investment. Ramaditya et al, (2023) based on a field survey in Indonesia had shown that higher education institutions should generate competencies so that graduate students can enter into the job market. Brinton *et. al*. (1995) proved that where the patriarchal norm is less dominant, the substitution factor is stronger than the income factor. But in India, the patriarchal norm plays a dominant role. Abraham, (2013) explained the reason from a different angle and mentioned that the relationship between educational attainment and participation of women in the workforce depends both on the substitution and the income factor. The income factor indicates that better family income discourages at least graduated women from going out for work and prefer to spend time on leisure or homework. The substitution factor indicates that an educated female can get a better-paid job for the same type of work as an educated male and they prefer to be employed for earnings and wants to devote more time to the workplace. If the income effect dominates over the substitution effect, then a high unemployment rate among educated women will be observed (Chatterjee et al., 2018). As it is difficult to segregate voluntary and involuntary unemployment among at least graduated women in India, the combined unemployment rate here can only be considered. Brinton *et. al*. (1995) proved that where the patriarchal norm is less dominant, the substitution factor is stronger than the income factor. But in India, the patriarchal norm plays a dominant role. However, very little work has still been done to identify the proper causes of the unemployment problem among graduated

women in India and how that unemployment rate can be reduced. Here, the state is considered a unit. So, to identify the possible causes of the high unemployment rate among at least graduated Indian women, it is required to identify the state-specific factors responsible for that reason. Some policy prescriptions will then be suggested to tackle that unemployment problem.

3. Research Objectives:

The unemployment rate among graduates in India has fascinated researchers since the 1960s when it was observed that high unemployment among graduates failed to diminish the social demand for university education**.** High unemployment among persons with high education could indicate a lack of sufficient professional and high-level technical jobs. The educated individuals mainly women are not willing to join in low-paid informal jobs. The labour force participation rate among women is always not high in India and the picture is not impressive among female graduates (Singh and Mukherjee 2022). With this background, this study aims to identify possible policies to reduce the unemployment rate among graduated women in India. Here, the state is considered as a unit of unemployment rate among women graduates (and above) and twenty major states of India are considered for this investigation. Here the unemployment rate of at least graduated women in a particular state is measured as:

$$\frac{\text{Total number of women unemployed after graduation in a state}}{\text{Population of graduated women in that particular state}} * 1000$$

In this study, the unemployment rate is calculated as the number of unemployed women graduates per 1000 persons in the labour force (both employed and unemployed)

So, the three main research objectives are:

(i) To do a state-wise comparison of the unemployment rate of women in India who have completed graduation and above

(ii) To determine the factors responsible for the unemployment rate of graduated women in India.

(iii) To prescribe a few possible policy(ies) which can reduce the unemployment rate among at least graduated women in India.

4. Sources of data:

In this study, data on the unemployment rate among graduated women are collected from the "Employment and Unemployment Survey" published by the Ministry of Labour and Employment, Government of India (2013-14 to 2019-20) and from the All India Survey on Higher Education (2011-2017) published by the Ministry of Human Resource and Development (MHRD) currently named as Department of Higher Education, Ministry of Education, Government of India. Other necessary state-specific data are collected from the Handbook of Statistics of Indian States (2014-20) published by the Reserve Bank of India, (2014-20), Report on Data on Police Organizations published by the Bureau of Police Research and Development (2014-2020) and Office of the Register General and Census Commissioner, India (2014-2020). Here, twenty major states of India are considered to address our research objectives because that can minimize heterogeneity among the states. The remaining states and the union territories are dropped because those dropped states are generally getting special financial assistance for development purposes from the Central government which may influence the unemployment rate of graduated women. In this paper, the considered timeline is between 2013-2014 and 2019-2020. The data on the female unemployment rate who have at least graduated is available up to 2020-21. However, state-wise data of some explanatory variables required for this investigation like the percentage of females at the age of marriage, the percentage of females completing graduation and above, and police density are not available till 2020-21. So, in this study, the considered period is kept between 2013-14 to 2019-20.

5. State-wise comparison of women graduates in India and their unemployment rate.

The Ministry of Human Resource Development (MHRD) currently named the Department of Higher Education , Ministry of Education, Government of India has defined Graduation as a Programme taken by a student after completing the 10+2 standard and generally has a duration of 3, 4 or 5 years, in General, or Professional courses. For this comparison, data have been collected from the Employment Unemployment survey published by the Ministry of Labour and Employment in different years (2013-14 to 2019-20) and the Office of the Register General and Census Commissioner. At least graduated women in percentage terms and their unemployment rate in 20 major states of India are presented in Table 7.1 from 2013-14 to 2019-20. It is the unemployment rate of usual status for women aged 21 and above.

Table 7.1a: State-wise Comparison of Graduated and above female unemployment rate and percentage of females completing graduation and above

Periods	2013-2014		2014-2015		2015-2016		2016-2017	
State	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above
Andhra Pradesh	28.2625	8.4	21.281	8.3	14.3	8	27.3	7.8
Assam	27.8321	4.4	22.116	4.1	16.4	3.9	19	4
Bihar	31.3588	5.2	22.829	4.6	14.3	4.5	12.9	4.3
Chhattisgarh	14.7047	6.3	11.402	7.3	8.1	7.1	27.1	7.5
Delhi	37.8931	23.4	19.996	22.8	2.1	22.6	11.45	22
Gujarat	10.9395	10.7	6.269	10.5	1.6	9.8	8.85	9.6
Haryana	31.0222	11.6	19.761	10.9	8.5	10.3	24.15	10.4
Himachal Pradesh	62.9288	14.3	39.614	14.3	16.3	14.5	23.95	15.1
J & K	28.7368	9.2	19.218	11	9.7	9.1	27.5	9.3
Jharkhand	28.6873	5.7	21.593	6	14.5	6	20.75	5.7
Karnataka	10.121	10.2	7.06	11	4	11.1	14	10.7
Kerala	45.1525	21.6	35.476	22.1	25.8	21.8	36.25	21
Madhya Pradesh	19.4409	7.7	11.27	7.6	3.1	7.3	12.65	7.1
Maharashtra	15.2156	12.8	9.807	13	4.4	13.1	10.05	12.8
Odisha	34.2006	7.2	23.5	6.9	12.8	6.7	27.4	6.9
Punjab	24.5673	11.5	17.433	11.4	10.3	11.3	19.9	10.8
Rajasthan	34.2711	8.4	23.985	9.6	13.7	9.7	17.8	9.5
Tamil Nadu	22.2921	16.9	17.096	17.4	11.9	16.8	22.4	17.3
Uttar Pradesh	29.5729	10.1	22.236	9.3	14.9	9.1	14.9	8.9
West Bengal	32.4378	7.2	21.218	6.8	10	6.6	12.75	6.5
India	25.237	10.2	18.068	10.1	10.9	9.9	19.2	9.8

Source: Ministry of Labour and Employment and Office of the Register General and Census Commissioner, India

Table 7.1b: State-wise Comparison of Graduated and above female unemployment rate and percentage of females completing graduation and above

Periods	2017-2018		2018-19		2019-20	
State	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above	Graduated and above female unemployment rate (in %)	Percentage of females completing graduation and above
Andhra Pradesh	40.3	8.125	40.65	10.5	38.8	10.55
Assam	21.6	4.1	27.6	3.4	31.1	3.4
Bihar	11.5	4.65	29.5	3.8	18.2	3.5
Chhattisgarh	46.1	7.05	15.6	7.4	26	7.2
Delhi	20.8	22.7	21.4	21.4	11.7	19
Gujarat	16.1	10.15	7.9	8.4	5.3	8.2
Haryana	39.8	10.8	20.7	10.1	15.1	20.1
Himachal Pradesh	31.6	14.55	30.2	17.5	19	18.3
J & K	45.3	9.65	36.5	9.7	40.7	9.1
Jharkhand	27	5.85	13.8	5.5	17.8	5.3
Karnataka	24	10.75	13.5	11.2	39.6	10.7
Kerala	46.7	21.625	36.3	24.9	37.7	46.1
Madhya Pradesh	22.2	7.425	11.6	6.8	18.6	6.7
Maharashtra	15.7	12.925	22	12.4	11	12.1
Odisha	42	6.925	37.9	7.5	32.3	7.7
Punjab	29.5	11.25	31.2	11.25	19.9	13
Rajasthan	21.9	9.3	26.5	10.3	27.4	10
Tamil Nadu	32.9	17.1	29.6	12.9	22.8	28.5
Uttar Pradesh	14.9	9.35	21.5	8.3	20.5	8
West Bengal	15.5	6.77	14.9	6.3	17	8.2
India	27.5	9.8	25.4	9.9	24.6	9.9

Source: Ministry of Labour and Employment and Office of the Register General and Census Commissioner, India

From Table 7.1a and 7.1b, it is observed that in most of the states, the percentage of women completing graduation and above is poor except in Kerala. It is also observed in 2013-14 Kerala had the highest graduated women unemployment rate i.e. 45.12% and it decreased to 37.7% in 2019-20. In 2014, the unemployment rate of women graduates in Andhra Pradesh was 28.26% where only 8.4% of female students have completed graduate degrees and above in the same year. The unemployment rate for graduates and above women started to decline in the years 2015 and 2016 but increased from 2017 to 2019. It again declined in 2020. In 2018, around 40% of women were unemployed after completing graduation and above degrees whereas the women who completed graduation and above degrees remained around 8% till 2018 and it increased to 10.55% in 2020 but the unemployment rate declined to 38.8% in the same year. On the other hand, in Chhattisgarh, in 2014, it was found that 6.3 % of women had completed graduation and above, and gradually this number increased to 7.2% in 2020. Now, if one looks at the unemployment rate among graduated women, in 2014 that was 14.70% and in 2016 it dropped to 8.1%. Now, if we compare the states Kerala and Chhattisgarh in 2018, it is observed that in both of these two states the graduated women's unemployment rate was around 46%[28] but there was a huge gap between the percentages of females completing graduation and above in 2018. In Kerala, around 22% of females had completed graduation and above but in Chhattisgarh, this was only 7.05% in 2018. Among all the major 20 states only in Maharashtra, the gap between graduated and above female unemployment rate and the percentages of females completing graduation and above is small during all the considered periods. In West Bengal, the picture is different. Here both the indicators' values have decreased from 2014. Here in 2018, a slight improvement is observed in the percentage of graduation among women. In West Bengal, both the percentage of females completing graduation and above and their unemployment rate are low and both are below India's average.

[28]Gross Enrollment of Females in higher education in a state is defined as:

$$\frac{\text{Total number of female students enroled in higher education}}{\text{Population of females in the particular state within } 18-23 \text{ years old}} * 100$$

[28] A case study by WHO (2017) in Kerala it is figured out that there is a large number (287) of nursing institutions in Kerala and the state has an intake capacity of 17600 seats. But unfortunately, it is estimated that about 42% nurses who studies in Kerala migrate overseas and 31% migrates in Delhi. Therefore, high production capacity of nurses within the state suggests that increasing the number of Keralian nurses will find themselves without adequate employment.

So, it is observed from Tables 7.1a and 7.1b that the unemployment rate among at least graduated women is high for a few states of India like Jammu & Kashmir, Karnataka and Andhra Pradesh. If we compare the unemployment rate of graduated women of India between 2013-2014 to 2019-20, it is observed that the unemployment rate is fluctuating in most of the states. The trend line of the unemployment rate among educated women and the percentage of women completing graduation and above in each state are given separately in the Appendix. Now it is required to identify the possible factors which can reduce the high unemployment rate among at least graduated women in India.

6. Methodology and Parameters Related to the Models:

The unemployment rate of a particular state is a macroeconomic variable. Therefore, in this study, the considered explanatory variables which may influence the female unemployment rate of at least graduated women are also macro-specific. Some macroeconomic state-specific variables are used as a proxy of household-specific characteristics that may affect the problem of educated women getting jobs when they want to enter the workforce. The following are considered to address the research objectives. Strong theoretical justifications and sources of data are also mentioned behind choosing that variable

Here the dependent variable is GFU_{it} i.e. Female unemployment rate in the i^{th} state and in the t^{th} period who had at least completed the graduation level. The values of this variable for different states are collected from the "Employment and Unemployment Survey" published by the Ministry of Labour and Employment, Government of India (2013-14 to 2019-20).

The considered explanatory variables are as follows:

1. **$L.GFU_{i(t-1)}$:** This implies the Lagged value of the unemployment rate of females who have completed graduation and above of the i^{th} state in the $(t-1)^{th}$ year. In an economy, many individuals remain unemployed involuntarily in every period. So, in an economy, the unemployment rate among graduated women includes the previous year's unemployed individuals. Due to this reason, the Dynamic panel regression technique should be applied to address the research objectives though confirmation of it will only come after judging the result of the Sargan test.
2. **$GER\_F_{i(t-3)}$:** It indicates the Gross Enrolment ratio of Females in graduation standard in the i^{th} state in the $(t-3)^{th}$ year. This is the ratio of the total number of females enrolled in higher education (after 10+2) to the total population of females

in that particular state in that particular year within the age cohort 18-23 years. This variable is collected from the All India Survey on Higher Education (2011-2017) published by the Ministry of Human Resource and Development (MHRD) currently named as Department of Higher Education, Ministry of Education, Government of India. Higher education raises the productive capacity of the human capital. Iravani and Arvaneh (2012) assert that women with more education backgrounds are more likely to secure well-paying positions. In some major Indian states, the number of female students enrolled in higher education has gradually increased over time (Ghosh and Kundu, 2021). This enhances the supply of women graduates in the job market. It is therefore necessary to investigate whether the unemployment rate among women who have graduated and above is the result of a steady rise in the number of women enrolling at graduation level or above. In India, at least three years are required to complete the graduation level. So here GER_F data is taken after considering three years of lag i.e., it is required to check whether GFU_{it} is influenced by $GERF_{i(t-3)}$ or not.

3. **GER_T_F$_{i(t-3)}$:** This implies the Gross Enrolment Ratio of Females only in Technical Education at Higher education level in the i^{th} state in the $(t-3)^{th}$ year. This variable includes women's enrolment in diploma, postgraduate diploma and certificate courses at higher education level. The enrolment data is collected from the All India Survey on Higher Education (2011-2017) published by the Ministry of Human Resource and Development (MHRD) presently named the Department of Higher Education, Ministry of Education, Government of India. Despite an increase in women's enrolment in higher education, their enrolment in technical education at the higher education level is still not very impressive (Ghosh and Kundu, 2021). A study conducted in 64 it is (Industrial Training Institute) depicts that only 25.6% of female trainees received job offers in 2018-19 (Ernst and Young, 2022). It was also found that 50% of Medium and Small-scale industries and 32% of large companies expressed a reluctance to employ women owing to the need to ensure their security, the risks of involving them in heavy manual labour, and their interest in working in closer proximity to their homes. The Government of India wants to spread technical education among women after their completion at the 10+2 level. It is expected that if more women get the opportunity for technical and professional education and after that employment then that will help to boost the economy. So,

it is required to check whether enhancement of the Gross Enrolment ratio in technical education among women can reduce the unemployment rate among graduated women. The expected sign should be negative.

4. **FG_{it}:** It narrates the Percentage of females completing graduation and above in the i^{th} state in the t^{th} year in the age cohort 21-28. The values of this variable are collected from the Sample Registration System Statistical Report published by the Ministry of Home Affairs, Government of India. It is observed that the educated female unemployment rate is high in India (Levenson, O'Kane, 2019). Accessibility of higher education institutions in different states of India is a major reason behind the gradual increase in the percentage of women who can complete graduation and above. A study by Li Ma (2014) identified that women with higher educational qualifications are willing to get highly-paid jobs. Now it is required to check whether a higher percentage of females completing graduation and above may be an important cause behind the higher unemployment rate among women graduates in India.

5. **$PSDP_{it}$:** It indicates the Per Capita State Domestic Product of the i^{th} state in the t^{th} year at current prices. The values of different considered states of different periods were collected from the Handbook of Statistics of Indian States published by the Reserve Bank of India. The better value of the PSDP of a state indicates the higher value of the State Domestic Product of that state in a particular year. In India, the value of the State Domestic Product depends more on the contribution of the secondary and service sectors where most of the employees are formal. Hence it is expected that a state with better PSDP can generate more employment opportunities among graduated women which can make the expected sign negative.

6. **Female_AEM**: It indicates the percentage of females by age at marriage in the i^{th} state in the t^{th} year. In India, the official marriage age of a woman is 18 years. Indian society follows patriarchal norms. The early marriage age of a woman can be used as a proxy for family hardship and pressure which can create an impact on a graduated woman during the time of deciding to enter the job market. It is often observed that women are restricted from performing several types of activities after marriage and one of the most discussed restricted activities is joining the job market irrespective of the education level after marriage. Dhamija and Roy Chowdhury (2020) have shown that a delay in a woman's age of marriage has no significant

causal effect on their labour market outcome despite marriage delay being associated with higher education among women. Various researchers find that early marriage reduces economic self-sufficiency due to education cessation (UNICEF, 2016; Kyari, and Ayodele, 2014). Nguyen and Wodon (2012, 2014a) based on data from 60 low- and middle-income countries suggested that about 40% of girls in those countries still marry today before the age of 18- 21, (in sub-Saharan Africa,). The practice has been found to have a negative impact on education. On the other hand, researchers have also shown that higher education attainment increases economic self-sufficiency among women which also makes them less dependent on male partners and also increases self-efficacy (Kalamar et. al., 2016; Kabeer, 2016). This study considers two different age groups of Indian women i.e. 18-21 and 21 years and above and the percentage of females by age at effective marriage is represented by Female_AEM_18-21$_{it}$ and Female_AEM _21$_{it}$ respectively[29]. These values of the variables of different states in different concerned periods are collected from the Sample Registration System Statistical Report published by the Ministry of Home Affairs, Government of India. If the effective marriage age is between 18-21 years then there is a higher possibility that a higher percentage of women will get a chance to complete their graduation. However, due to the existence of male dominance within the household, a large section of them cannot enter the job market. Lack of acquired skills which is suitable for getting employed may be another reason for their unemployment even after completion of graduation. So, it is expected that if a higher percentage of women are getting married at the age of 21 years or above then there is a higher chance that they will complete at least graduation and their education level will empower them to raise their voice against her in-laws to join in the job market.

7. **EME$_{it}$:** This implies the Employment Rate among the educated male (at least graduate) in the i^{th} state and the t^{th} year. The necessary data is collected from the "Employment and Unemployment Survey" published by the Ministry of Labour and Employment, Government of India (2013-14 to 2019-20). The educated Male Employment Rate can be one of the important indicators behind the determination of the female unemployment rate among graduate women in India. Indian society is a patriarchal society. The level of the husband's education may affect the woman's unemployment. If the husband attained higher education, in general, it is

[29] 18-20 years is the time period of a woman's life, in which generally a female student is studying at graduation level in a college. Most female students generally have passed their graduation at the age of 21.

expected that his income and household income will be higher which may create an inverse impact on women's participation in the labour market (Widarti, 1998). Educated husbands are likely to earn more as compared to uneducated husbands. Thus, they may want their wives to stay at home to perform household responsibilities, particularly child care (Nguyen and Wodon, 2014). Due to a healthy family income, the woman of that household may have less incentive to work (England et al., 2012). She in that situation may prefer to do household work only. Here the income effect is offset by the substitution effect. If we consider this factor, then the expected sign should be positive. But in this analysis, the state is the unit. If the employment opportunity of educated men in any particular state is high, then it is also applicable to the educated woman which is a pull factor. In this background, the opposite relationship may also be observed where it can be said that a better employment rate of educated men in a state is also associated with better employment of women graduates and the expected sign will be negative.

8. **Police-Density$_{it:}$**: It is measured as an area in sq. km. per policeman in an i^{th} state in the t^{th} year. The source of data for this variable is the report on Data on Police Organizations published by the Bureau of Police Research and Development. Police protection is an important indicator to capture the safety and security of a state. The physical security of the daughters is always a concern among the parents during the time of going out even for employment (Channa, 2000). Hence, a higher crime against women in a particular state in a particular year may discourage women in that state from going out for a job which may lead to an increased unemployment rate among women. It is expected that in an area where the police density is higher young girls feel safe and more secure which helps to increase the employment rate among them.

9. **GCF_IN$_{it-1}$:** It indicates the Gross Capital Formation in the Industrial Sector of the i^{th} state in the $(t-1)^{th}$ year at the current price which is the gross addition of fixed capital in that sector in any state economy in a particular financial year measured here in the current price. The source of data on this variable is the Handbook of Statistics of Indian States published by the Reserve Bank of India. Here, the industry includes (1) Mining and quarrying, (2) Manufacturing and construction, and (3) Electricity, gas and Water Supply. Mallinvaud (1985) gave importance to capital stock for employment creation. Galore and Zaire (1993) have also shown that an

educated person can get a job as a skilled labour either in the secondary sector or tertiary sector only after completing his/her education. It is therefore expected that there will be more potential for employment generation in the secondary sector by capital formation, and a greater number of female graduates would have opportunities to work as skilled labour which can contribute to reducing unemployment. The data is considered here in one period lag as employment generation is required at least one additional period through investment in gross capital in any sector and the expected sign should be negative.

10. **GSV_S_{it-1}:** It indicates Gross State Value Added by Economic Activity at Service Sector at current prices of the i^{th} state in the $(t-1)^{th}$ year. The values of this variable of different states in different years are collected from the Handbook of Statistics of Indian States published by the Reserve Bank of India. The service sector includes (1) Transport, Storage and Communication, (2) Trade, Hotels and Restaurants, (3) Banking and Insurance, (4) Real estate, Ownership of Dwellings and Business Services; (5) Public Administration, and (6) Other Services. It is expected that employment opportunities for educated females can be created by the expansion of the service sector in a particular state. It is used as a proxy for the expansion of the service sector in the state economy in different years of the concerning periods. Here also we consider one period lagged value and the expected sign is negative.

Before moving towards the required econometric exercise suitable to address the research problems, the summary statistics of the above-mentioned variables are presented in Table 2 below.

Here are values for the two time periods i.e. the baseline period (2013-14) and the end line period (2019-20) of our concerning periods are only presented.

Table 7.2: The descriptive statistics of the variables:

Year: 2013-2014				
Variables	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
GER_F_{t-3} (percentage)	18.225	6.807	7.473	29.760
FG_t (Percentage)	10.64	5.122	4.4	23.4
$GER\_T\_F_{t-3}$(Percentage)	0.972	0.842	0.010	3.021
$PSDP_t$(Rs.)	90563.05	46602.520	26948	229619
Female_AEM_18-20	34.18	9.90	12.1 (J&K)	50.5 (Jharkhand)
Female_AEM_21	63.665	10.62	44.1 (Jharkhand)	86.3 (J&K)
EME_t (percentage)	66.714	9.700	38.725	76
Police_Density (area per sq. km.)	1.91	1.09	0.02	3.97
GCF_I_{t-1}(per crore) in Rs.	21271.63	20690.58	869.53	72056.34
GSV_S_{t-1}(per crore) in Rs.	207024.8	158085.4	31531.27	677961.8
Year: 2019-20				
GER_F_{t-3} (percentage)	26.39	10.541	12.8	48.4
FG_t (Percentage)	11.45	6.383	3.4	29.1
$GER\_T\_F_{t-3}$(Percentage)	1.284	1.024	0.001	3.445
$PSDP_t$(Rs.)	165217.7	93835.04	44230	400698
Female_AEM_18-20	26.38	11.98	8.2 (J&K)	50.2(WB)
Female_AEM_21	71.65	13.12	45.1 (WB)	90.7 (J&K)
EME_t (percentage)	82.589	4.116	73.139	89.272
Police_Density (area per sq. km.)	1.62	1.03	0.02	3.59
GCF_I_{t-1}(per crore) in Rs.	23370.2	26044.4	1004.39	88955.14
GSV_S_{t-1}(per crore) in Rs.	411700.6	320549	58396.37	1329929

Source: Authors' calculation[30]

In this investigation, 20 major states of India are considered as panels or cross-sectional units. Stata-12 software is used for estimation.

Before the analysis, the possibility of the existence of multi-collinearity among the explanatory variables has been checked. It is observed that the VIF values of the variables are below 2; which implies the total absence of multi-collinearity among the explanatory variables. It has already been mentioned that in every period, all women graduates are not fully employed and some remain unemployed due to several reasons. Therefore, the current year's unemployment rate among women graduates in a state is also affected by the previous year's unemployment rate in that state. The Dynamic Panel Regression Technique is here applied because of the lagged effect of the dependent variable on itself (Wooldridge, 2010). Here the panel size or the

[30] As few variables are taken as 3 period or 1 period lag in the main model so the descriptive statics are presented according.

number of cross-sectional units i.e. N= 20 and the period t =7. Here N > t which implies the panel data set is a short panel. Harris-Tzavils Unit Root Test for graduated female unemployment (GFU) shows that the estimated value of ρ is statistically not significant which accepts the null hypothesis that proves the explained variable contains a unit root in both the Models and in this panel regression, the Dynamic Panel Regression technique is appropriate for both the model. So, to identify possible state-related factors which can influence the unemployment rate among at least graduated women in different states and in different years, it is required to apply the Dynamic Panel Data regression technique. This dynamic relationship is represented as:

$$\begin{aligned} GFU_{it} = {} & \beta_0 + \beta_1 l.GFU_{i(t-1)} + \beta_2 GER\_F_{it-3} + \beta_3 PSDP_{it} + \beta_4 FEMALE\_AEM\_(18-20)_{it} \\ & + \beta_5 FEMALE\_AEM\_21_{it} + \beta_6 EME_{it} \\ & + \beta_7 Police\_Density_{it} + \beta_9 GCF\_IN_{it-1} + \beta_{10} GSV\_S_{it-1} + \mu_{it} \end{aligned} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where i and t are the number of states and periods respectively where i = 1…20 and t = 2014,…2020

It is also assumed that

$\mu_{it} = u_i + v_{it}$ ……. (1a)

Where, $u_i \sim iid\ (0, \sigma_u^2)$ and $v_{it} \sim iid\ (0, \sigma_v^2)$.

This model also has two features: (i) Time-invariant factors (fixed effect), such as geographical, demography and state-related cultural factors (which are accommodated here as u_i) may be correlated with the explanatory variables. and (ii) Time-variant factor (v_{it}) such as migration of at least graduated females has an unobserved effect on the regressand. In this background, the application of the Ordinary Least square method (OLS) will produce a biased and inconsistent estimator. As GFU_{it} is influenced by μ_{it} then $l.GFU_{it}$ is influenced by μ_{it} and $l.GFU_{i\,(t-1)}$ is correlated with the error term $\mu_{i(t-1)}$. Therefore, $(l.GFU_{i\,(t-1)} - l.GFU_{i\,(t-2)})$ is also correlated with the error $(\mu_{i(t-1)} - \mu_{i(t-2)})$. Since the lags of the explained variable are necessarily correlated with the idiosyncratic error term, OLS and the traditional Static panel model will produce biased and inconsistent estimators to address the above-mentioned research problems. Therefore, Arrelano and Bond's dynamic panel regression method can be applied here. However, the Fixed Effect Model consists of unobserved state-

specific effects (u_i) and observation-specific error terms (v_{it}). In the case of Arrellano Bond Difference GMM (Generalized Method of Moments) Estimation, the first difference is taken to remove the individual-specific effect and the lagged dependent variable $l.GFU_{i\,(t-1)}$ is used as an instrument. They also have shown that additional instruments can be used to avoid bias. From the transformed model, to get an asymptotically efficient estimator of $'\beta_1'$. $l.GFU_{i\,(t-2)}$, $l.GFU_{i\,(t-3)}$ can be considered as instruments in the GMM model. Under GMM, the consistency of estimators depends on the validity of instruments and the Sargan Test. It is used to test the overall validity of the instruments by analysing the sample analogue of the moment condition used in the estimation procedure. The moment condition of the GMM estimator is valid if there is no autocorrelation in the error term. The absence of second-order autocorrelation establishes our estimation procedure. So, the dynamic panel data regression is here applied with lagged independent variables dated (t-2) and earlier, with the lagged changes of endogenous variables as instruments and other exogenous variables.

Arellano and Bond (1991) proposed a one-step estimator and a two-step estimator for the first difference GMM estimator. In the first step of the two-step GMM (Generalised Method of Moments) estimator, the error terms are supposed to be independent and homoscedastic across states and over time. In the second step, to ease the independence and homoscedasticity assumptions of the first step, a consistent estimate of the variance and covariance matrix is formed based on the residuals generated from the first step (Beck and Levine, 2004). Based on these assumptions, even though the two-step estimation is asymptotically more efficient than the one-step estimation, Blundell and Bond (1998) proposed that the asymptotic inferences of the one-step estimators are more reliable because of their correct empirical size distributions. They revisited the importance of exploiting the initial condition in generating efficient estimators of the dynamic panel data model when 't' is small. They considered a simple autoregressive panel data model with no exogenous regressors

$$y_{it} = \delta\, y_{i\,(t-1)} + \sigma_i + v_{it} \ldots (1b)$$

They show that the instrumental variable estimator performs poorly. Hence, they attribute the bias and the poor precession of the first-difference GMM estimator to the problem of weak instruments and characterize this by its concentration parameter. They also showed that the system GMM estimator is more efficient than the basic first-difference GMM estimator. As each system has different strengths, the empirical literature involves many studies employing

one-step and/or two-step estimation techniques. In this study to investigate the robustness of the results, Blundell and Bond's method is followed. Finally, in this study, the following three models are considered to observe the effect of GER_F, FG, and GER_T_F separately on the unemployment rate among at least graduated women along with other explanatory variables. They are considered separately because all those three explanatory variables are closely related and they cannot be considered in a single dynamic panel regression estimation. The three regression Equations are expressed as Model 1, Model 2 and Model 3 respectively.

Model 1:

$$\begin{aligned} GFU_{it} = {} & \alpha_0 + \alpha_1 l.GFU_{i(t-1)} + \alpha_2 GER\_F_{it-3} + \alpha_3 PSDP_{it} + \alpha_4 FEMALE\_AEM\_(18-20)_{it} \\ & + \alpha_5 FEMALE\_AEM\_21_{it} + \alpha_6 EME_{it} \\ & + \alpha_7 Police\_Density_{it} + \alpha_8 GCF\_IN_{it-1} + \alpha_9 GSV\_S_{it-1} + \epsilon_{it} \end{aligned} \quad \ldots\ldots\ldots\ldots (2)$$

Model 2:

$$\begin{aligned} GFU_{it} = {} & \theta_0 + \theta_1 l.GFU_{i(t-1)} + \theta_2 FG_{it} + \theta_3 PSDP_{it} + \theta_4 FEMALE\_AEM\_(18-20)_{it} \\ & + \theta_5 FEMALE\_AEM\_21_{it} + \theta_6 EME_{it} \\ & + \theta_7 Police\_Density_{it} + \theta_8 GCF\_IN_{it-1} + \theta_9 GSV\_S_{it-1} + \vartheta_{it} \end{aligned} \quad \ldots\ldots\ldots (3)$$

Model 3:

$$\begin{aligned} GFU_{it} = {} & \gamma_0 + \gamma_1 l.GFU_{i(t-1)} + \gamma_2 GER\_T\_F_{it-3} + \gamma_3 FEMALE\_AEM\_(18-20)_{it} \\ & + \gamma_4 FEMALE\_AEM\_21_{it} + \gamma_5 EME_{it} + \gamma_6 PSDP_{it} \\ & + \gamma_7 Police\_Density_{it} + \gamma_8 GCF\_IN_{it-1} + \gamma_9 GSV\_S_{it-1} + \varepsilon_{it} \end{aligned} \quad \ldots\ldots\ldots(4)$$

For all the models, based on the Sargan test results it is established that the Dynamic Panel Regression model is suitable here to address our research problems. In all three situations, the Blundell and Bond Dynamic Panel Regression technique is used. The regressions were run in Stata-12.

7. Discussion and Policy Prescription:

Table 7.3 depicts the dynamic panel regression results based on the presented models discussed above.

Table 7.3: Factors affecting the Unemployment rate among women who have completed Graduation and above in India

Explanatory variables	Model 1	Model 2	Model 3
Lagged female unemployment rate (GFU)	0.342*** (0.065)	0.157** (0.069)	0.174** (0.080)
GER of females in higher education (%) (GER_F)	0.594** (0.272)		
Percentage of female graduates (FG)		0.765 (0.508)	
GER of females in technical education (%) (GER_T_F)			-2.756** (1.05)
PSDP (Rs.)	-0.00001 (0.0001)	0.001*** (0.00002)	0.00004** (0.00002)
Female_AEM _18-20 (yrs.)	1.887* (1.136)	1.584** (0.945)	2.788*** (1.119)
Female_AEM _21 (yrs.)	-1.844* (0.789)	-1.924** (0.664)	-3.254*** (1.137)
The educated male employment rate (%) (EME)	-0.328*** (0.062)	-0.235* (00.144)	-0.304*** (0.090)
Police_density	3.901 (5.710)	5.843 (6.204)	0.412 (1.784)
Gross Capital Formation in Industry (per crore) (GCF_IN)	0.0001*** (0.00004)	0.0002** (0.00004)	0.0003*** (0.00005)
Gross Value-Added In-Service Sector (per crore) (GSV_S)	-0.00001*** (0.0000004)	-0.00003*** (0.0000008)	-0.00003*** (0.0000007)
Sargan test	12.505	14.345	10.7

***,**,& * 1%, 5% and 10% respectively, Stand Errors are mentioned in the parenthesis

Here, all three models are estimated using the Blundell-Bond estimator technique. It is observed that in all three models, the values of χ^2 required for the Sargan test are insignificant. This establishes that the instruments are exogenous and all instruments are valid. From Table 7.3 it is observed that lagged female unemployment rate is one of the major determinants of the current period's female unemployment rate among graduate women and that is observed in all the models. This establishes that the Dynamic Panel method is the most suitable estimation method to address the research problems. It also establishes that the unemployment rate among

graduated women of a particular state in any particular time period includes the previous year's unemployment rate.

Model-1 shows that increasing women's enrolment in graduation and above degrees (including all types of courses) creates a gap between the number of females graduating every year and then entering the job market which indicates excess supply in the employment market among educated women (as the demand for educated women in the job market is less than its supply). But Model 3 shows that the Gross Enrolment Ratio of Females in Technical Education at the Higher education level helps to curb the female unemployment rate who are at least graduated. This proves that the expansion of technical education at the graduation level among women can partially control the high unemployment rate among graduated women in India. Models 1 and 2 also indicate that a higher number of educated employed males creates a lower educated female unemployment rate. Here the pull factor is responsible for the labour market. If employment opportunities are growing in the formal sector in which educated persons can get employment as skilled workers, then that is applicable irrespective of gender. In Delhi (whose per-capita State Domestic Product in 2020 is second highest among all the major states), it is observed that the educated male employment rate has increased and the female unemployment rate also has decreased over time.

Expansion of investment in the service sector (Gross Value Added in the Service Sector), plays a significant role in reducing the unemployment rate among educated women, whereas capital formation in the industrial sector (Gross Capital Formation in Industry) fails to reduce the unemployment rate among graduated women. This supports the argument of Gordon (1997) who mentioned that the countries which experienced the largest slow-downs in the growth rate of capital per potential labour hour faced the greatest increases in the unemployment rate. Mehrotra and Parida (2013) have shown that women in India are not able to compete in the manufacturing sector, as most of them do not have proper technical skills suitable for industrial jobs. In this study, the positive coefficient value of the variable Gross Capital Formation in Industry supports their claim. Hence, to reduce the unemployment problem of graduated women of India, more investment in the service sector is required so that more females can be recruited in this and that can be done by enhancement of skill generation in the technical sector through greater enrolment of women in technical higher education.

It is observed that the age of marriage is one of the important factors for the increasing female unemployment rate among graduated women in India. This study considers the percentage of women married in the age group of 18-20 years and 21 years and above. Table 7.3 shows that as more percentage of women get married at the age of 18-20 years' unemployment rate for females who have at least graduated rises. However, if women are getting married at the age of 21 years and above then the problem of unemployment rate among graduated women will be reduced. A study by United Nations Population Funds (UNFPA, 2012) showed that 1 in 7 girls marry before the age of 18 in the developing world. This remains an impediment to young women's engagement in both education and economic activities which makes them unemployed. Early marriage practices directly harm women's ability to access higher education which in turn has a significant effect on their employment opportunities. Therefore, there is cyclical damage to marrying girls at a young age during their participation in the labour force. The SRS (Sample Registration System) data (2020) reveals that in West Bengal, Jharkhand, Chhattisgarh and Madhya Pradesh more than 40% of girls in the age group between 18-21 got married. On the other hand, in Jammu Kashmir, around 91% of females marry at the age of 21 years and above. In India, the minimum age of marriage for a woman is 18 years but recently cabinet has proposed the legal age of marriage should be raised to 21 years supported by the Child Marriage Restraint Act and the Special Marriage Act, 1954 and the Prohibition of Child Marriage Act, 2006. According to our result, if that rule can be implemented then more women can get higher mainly in technical education after completing 10+2 which also enhances their possibility of getting jobs in the tertiary sector.

Therefore, from the above discussion, it can be suggested that if the service sector expands more along with government initiatives to increase the female enrolment in technical education at higher education level then the unemployment rate among the women who are at least graduate can be reduced. Also, the government needs to conduct awareness camps on the importance of higher education and the negative impact of early marriage among women.

8. Conclusions:

This study has shown that during the considered period (2014-2020) for most of the states, the unemployment rate among graduated females did not follow any specific trend. On the other hand, the enhancement of the percentage of female graduates is very small in the considered periods. The above result depicts that gradual enhancement in the Gross Enrolment Ratio of

females in graduation and above and after that little recruitment creates excess supply in the job market which is one of the reasons for the higher female unemployment rate among graduates and above. Better enrolment in technical education at higher studies decreases the graduated female unemployment rate. Therefore, the problem of unemployment among graduated women can only be reduced through the expansion of recruitment of graduated women with technical efficiency in different types of service sectors. A Skill gap study conducted by the National Skill Development Council over 2010-2014, revealed that there would be an additional net incremental demand of 10.9 core skilled manpower by 2022 in 24 key sectors. Out of these 24 sectors, 77% of demand would be concentrated across sectors such as building, construction and real estate, transportation and logistics, beauty and wellness, furniture and furnishing, tourism, hospitality and travel, textile and clothing, retail and handlooms and handicrafts with an incremental demand for manpower of 8.52 crore by 2022. Hence, it can be suggested that if women get the opportunities to enrol in technical and professional education and with this if the demand can be created in the service sector, then that will open up job opportunities for technically skilled women after graduation level and their unemployment problem can be reduced.

It is also proved that one of the important hindering factors behind graduated women's employment is the early years of marriage. Indian society is conservative. So, early marriage practices act as a push factor to increase the educated female unemployment rate in India. But if the government provide some financial assistance for females up to 21 years and above to continue their higher education and organizes awareness programmes among Indian families regarding the importance of higher education among women and the ill effects of early marriage practices then early marriage practices can be checked and unemployment problem among graduated women can be tackled.

9. Appendix:

Fig:1 State-wise Trend Line of Percentage of Females Completing Graduation and above

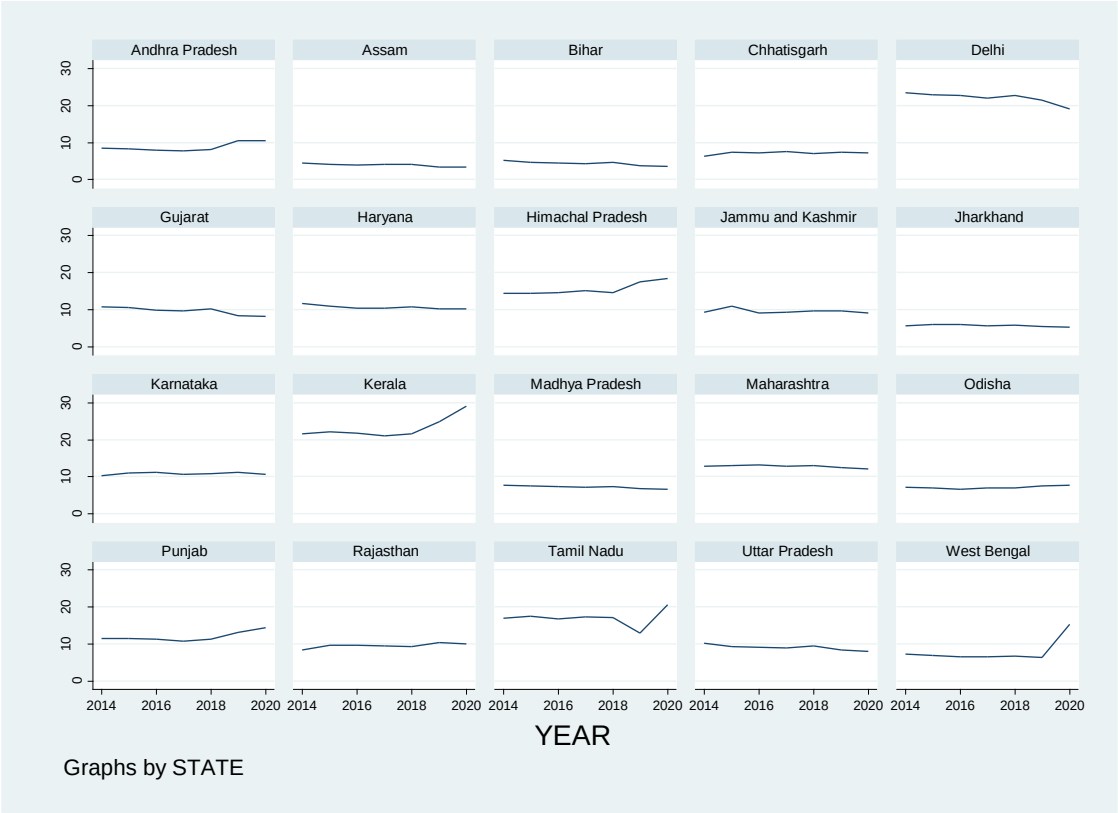
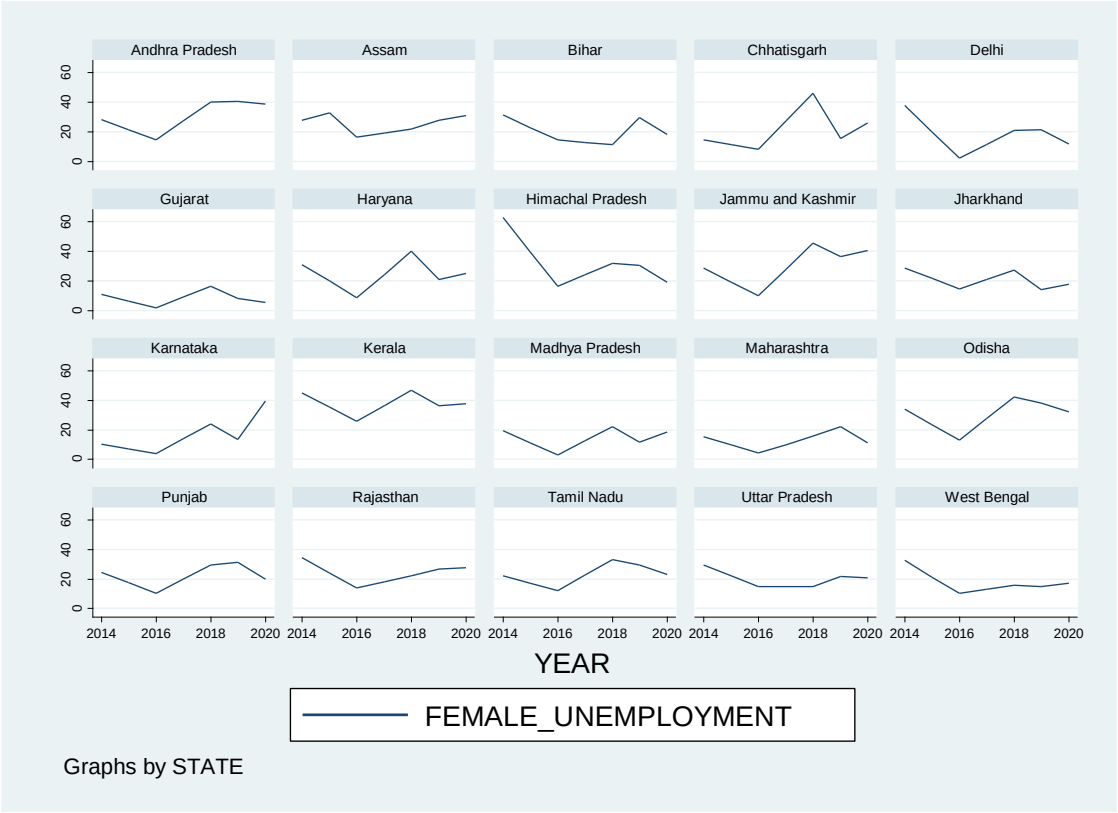


Fig: 2 State Wise Trend Line of Female Educated Unemployment Rate



CHAPTER 8: CONCLUSION

Conclusion

This thesis has explored the complex dynamics of women's higher education enrolment decisions along with their employment in India, examining both the significant progress that has been made and the persistent challenges that remain. Through an extensive literature review and secondary data analysis, the research highlights several key findings. The research indicates that young women's enrolment in higher education is rising at both household and state levels in India. However, social attributes such as religion and caste exacerbate the gender gap in enrolment rates

Analysing the household-level data, it is found that the probability of young women enrolling in higher education is higher among Hindus and Christians, but lower among Muslims. Similarly, if we look at the backward castes the analysis reports that all the young women from backward castes: SC, ST and OBC have a lower chance to enrol in higher education in India. The value of the marginal coefficient shows that young females from the ST community have the lowest possibility compared to SC and OBC to join higher education in India. The location of the household plays an important role in young females' enrolment in higher education in India. Urban household locations significantly increase the chances of young women enrolling in higher education compared to rural areas. On the other hand, greater the distance from a higher education institution, lower is the enrolment possibility of a young female in higher education. Household consumption expenditure which is considered as a proxy of household level income helps to increase the possibility of enrolment of young females in higher education. Also, it is found that presence of a computer boost the enrolment chance of a young woman in higher education.

Besides the household level state policies play a crucial role in supporting young women's enrolment in higher education. It is observed that enhanced police protection in an area increases parents' confidence in their daughters' safety, thereby encouraging enrolment. Also, if mothers are educated, at least completed 12 or more years of schooling and they have decision making power in the household that also improve the enrolment rate of young females in higher education. Because women are the main backbone of the family. If a woman is educated and is the decision maker along with her husband in a household that not only leads to send her daughter in the higher education institution but also have an indirect effect on the neighbourhood families which encourage them to send their daughters in the higher education

institutions. This study documents that increased state spending on higher education, through scholarships and better infrastructure, will further enhance enrolment rates. However, it is found that the higher amounts of sanctioned loans may deter enrolment due to the financial burden on economically disadvantaged households.

Observing at the household level scenario the state-level females' enrolment in higher education is analysed. The result shows that at the state level also Gross Enrolment Ratio of females in the age group between 18-23 years is increasing across the major 16 states in India at the overall higher education (including Under Graduate, Post Graduate). Some states are moving towards Gender Parity in higher education and some states achieved gender parity. After achieving gender parity, now Kerala has Gender disparity in favour of females in higher education. If we analyse the course-wise enrolment rate, then across the major states the result reports that the states are better placed in GPI at under graduation level but perform poorly in post-graduation and technical education courses in the case of both indicators: GER and GPI. In case of technical education all the considered states have gender disparity in favour of males. Based on fixed-effect panel data regression indicates that a significant share of female teachers, higher per capita state domestic product (a proxy for per-capita income) and availability of colleges and girls' hostels are playing important roles to contribute significantly to the GER and GPI in higher education in India.

Despite the improvement in GER of females in higher education, female enrolment in technical courses at the higher education level remains poor, with no states achieving gender parity. Therefore, Household-level data analysis shows that the probability of young females' enrolment in technical courses at higher education level is lower in India which implies there is a significant gender gap during the time of enrolment in technical courses at higher education level. So, using the Fairlie Decomposition technique it is reported that larger family sizes exacerbate the gap while higher household income helps reduce it. On the other hand, gender gaps are smaller among Hindus compared to other religions. Here also, state-level policies play an important role in reducing the gender gap. It is known to us that technical higher education is costlier than general studies in higher education. If banks sanctioned a good amount of educational loan that will help to reduce the gender gap in technical higher education. Also, if states increase the budget allocation in technical courses at higher education by introducing new scholarship facilities, establishing a greater number of new technical institutions that also

leads to reduce the gender gap. Additionally, the mother's level of education and financial empowerment of mothers is critical in narrowing the gender gap in technical education

Finally, the thesis examines the link between higher education and employment for young women across 20 Indian states. The analysis reports that the state-wise comparison between the percentage of females complementing graduation and above and their unemployment rate reports that in most of the states, the unemployment rate is fluctuating within the concerned periods and the enhancement of females completing graduation and above is very poor over time. Using the Blundell and Bond Dynamic Panel Regression technique it is observed that factors like higher gross enrolment ratios in general courses and a higher percentage of women marrying between ages 18 and 20 contribute to higher unemployment rates among female graduates. However, expanding the service sector by creating more employment opportunities for females with technical and professional degrees and an effective marriage age of 21 years and above can help to reduce the unemployment problem among at least graduated women in India. This study provides valuable insights for policymakers aiming to address unemployment among educated women in India.

CHAPTER 9: POLICY PRESCRIPTIONS

Policy Prescriptions

India has adopted decentralized approach to educational management through central, state and grassroots level government. management system.

1. The central and state governments ought to augment their financial commitment to the higher education sector by introducing fresh scholarship opportunities and enhancing subsidies. This initiative aims to facilitate greater enrolment, particularly among economically disadvantaged youth and young girls, thereby mitigating the gender disparity prevalent in the Indian higher education landscape.
2. Increasing the number of higher education institutions across various regions, particularly prioritizing underdeveloped areas, is crucial for diminishing the distance between households and the nearest higher education institution. This strategic endeavour not only aims to narrow the gender disparity in higher education enrolment but also fosters improved educational accessibility for all young individuals.
3. In Indian society, parental preferences tend to lean towards assigning their young daughters to female teachers rather than male ones. This inclination is rooted in the belief that female teachers serve as more than just educators; they often become role models for young girls, extending their influence beyond academic realms. With their nurturing and caring demeanour akin to a mother figure, female teachers positively impact students' academic performance and accomplishments. Their presence challenges gender stereotypes and ignites aspirations in female students, encouraging them to pursue education fervently and aim for ambitious goals. This empowerment fosters heightened academic engagement and better scholastic outcomes among girls, paving the way for brighter futures. In essence, the maternal qualities embodied by female educators within Indian higher education institutions profoundly influence academic success and attainment. Consequently, the presence of female teachers not only facilitates increased enrolment and participation of girls in higher education but also enriches the overall academic excellence and educational quality for all students. To further bolster this dynamic, the government can prioritize recruiting more female teachers in higher education institutions, thereby promoting and nurturing the educational aspirations of young girls and enhancing the Gross Enrolment Ratio (GER) of females at targeted levels within India's higher education landscape.

4. It is imperative for the government to give precedence to augmenting the hiring of female teachers, particularly in districts predominantly rural, as a pivotal measure to narrow the gender disparity in higher education institution involvement. Through bolstering female representation among educators, young girls, particularly those in rural settings, can discover inspiring role models, thus cultivating heightened enthusiasm for learning and fostering gender parity in higher education enrolment. The ripple effects of educating a girl extend far beyond her own life; as a mother, she is more inclined to prioritize her child's education and advocate for their education, given that educated parents typically exhibit greater involvement in their child's educational journey.
5. By implementing a national family planning policy, such as a policy restricting to family size by imposing a maximum two-child policy, the government can incentivize households to allocate higher per-child expenditure on their young children's education.
6. Through the implementation of diverse income support and income-generating initiatives, the government can significantly bolster household incomes. This strategy holds promise in mitigating gender bias and fostering heightened gender parity in higher education enrolment across India.
7. To foster a more progressive and inclusive society, it is imperative for the government to prioritize the education of parents, especially mothers. By empowering mothers through education, the nation can break away from patriarchal structures, initiating a transformative shift in parental attitudes towards their daughters. This shift in mindset will be instrumental in ensuring holistic national development, fostering gender parity, and unlocking the full potential of every citizen. Educating mothers not only equips them with knowledge and skills but also empowers them to challenge traditional gender roles and expectations. As mothers gain education, they become better equipped to make informed decisions regarding their children's education, health, and overall well-being. Consequently, this will open up more opportunities for girls to access quality education and realize their potential, nurturing a generation of empowered and self-assured women. Moreover, an educated mother can serve as a role model for her children, inspiring them to pursue education and defy societal stereotypes. As such positive influences permeate through families and communities, the nation will

experience a beneficial ripple effect, propelling it toward meaningful development and progress.

8. By giving precedence to the education of mothers and advocating for gender equality, the government can construct a more encompassing and forward-looking society. This revolutionary strategy will not only yield advantages for the present generation but will also establish an enduring heritage for future ones, securing the nation's sustainable and comprehensive advancement in the years ahead. Education serves as a pivotal tool in diminishing the enduring gender disparity in educational accomplishments. Through granting women access to education, they acquire economic autonomy and enhanced decision-making capacities, instigating favourable changes in both their individual lives and society at large.
9. The government can initiate awareness campaigns that emphasize the importance of parental education. Parents with educational backgrounds grasp the importance of higher education and play an active role in supporting and mentoring their young children, resulting in improved educational standards. Through the promotion of such campaigns, the government can cultivate a favourable influence on young children's academic achievements and overall educational progress.
10. The government also arranges awareness drives regarding the adverse effects of early marriage practices, aiming to enlighten individuals and underscore the significance of female higher education.
11. Apart from education, the government needs to create an enabling environment that supports and encourages gender equality initiatives. This involves enacting policies and initiatives that advocate for equal opportunities for women across various domains, encompassing education, healthcare, and the workforce.
12. The government should also increase its investment in police protection for communities. Enhanced safety and security in an area can boost the likelihood of young females enrolling in higher education, thereby helping to reduce the gender gap.
13. It is crucial for policymakers to ensure that the Gender Parity Index (GPI) remains between 0.97 and 1.03 to achieve gender equality in enrolment rates.
14. Regularly examining the effective use of various government grants and evaluating teacher quality are essential measures to improve educational outcomes in Indian higher education institutions.

15. By ensuring efficient resource allocation and upholding teacher standards, the government can enhance learning outcomes and overall educational quality for students in rural India.
16. The government should also raise awareness about the importance of female employment. When a woman in a household earns an income, she is more likely to invest in family welfare, thereby enhancing the health and education of the next generation.
17. So, to improve the female employment situation government need to invest more on service sector and organize awareness campaign’s more on the importance of females’ technical education.
18. Ensuring that the advantages of various government policies extend to all segments of society is essential. India can fully leverage its demographic dividend only through substantial improvements in children's learning outcomes. By providing higher education institutions with adequate facilities and prioritizing the enhancement of educational achievements, young children will be better prepared to become skilled workers in adulthood, thereby contributing to the nation's progress and development.

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