Understanding fertility trends in India
A Dissertation for

Course code and Course Title: ECO- 651 &
Dissertation Credits: 16

Submitted in partial fulfilment of Master's Degree:

Masters of Arts (M.A) in Economics

By

Ancela Jane Rodrigues

Seat No: 22P010003

ABC ID:340004483140

PR.No:201907470

Under the Supervision of

Asst. Prof. Avina Kavthankar

&

Prof. B.P Sarath Chandran

Goa Business School/ Economics department

Economics

GOA UNIVERSITY / GOA BUSINESS SCHOOL

Date:

Examined by:

DECLARATION BY STUDENT

I hereby declare that the data presented in this Dissertation report entitled, **"Understanding fertility trends in India"** is based on the results of investigations carried out by me in the Economics at the Department of Economics, Goa University/Goa Business School under the Supervision of Asst. Prof. Avina Kavthankar and Prof. (Dr.) B.P Sarath Chandran and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University or its authorities /Goa Business School will be not be responsible for the correctness of observations / experimental or other findings given the dissertation.

I hereby authorize the University / Goa Business School authorities to upload this dissertation on the dissertation repository or anywhere else as the UGC regulations demand and make it available to any one as needed.

Date: 06-05-2024

Place: Goa University/Goa Business School

Rodrigues

Miss. Ancela Jane Rodrigues

Seat no: 22P010003

COMPLETION CERTIFICATE

This is to certify that the dissertation report **"Understanding Fertility Trends in India"** is a bonafide work carried out by Miss. Ancela Jane Rodrigues, under my supervision in partial fulfilment of the requirements for the award of the degree of **Masters in Arts** in the Discipline of Economics at the Department of Economics, Goa University/ Goa Business School.

Signature of Supervisor:Asst. Prof. Avina Kavthankar and Prof. (Dr) B.P Sarath Chandran

Date: 06-05-2024

Signature of Dean of the school/HOD of dept

Date: 11/5/2024

Place: Goa University/ Goa Business School

Goa Business School ★ Goa University ★

School Stamp

PREFACE

This study investigates the impact of social and economic factors on fertility rates in India. A study using multinomial logistic regression found that higher education, self-employment, and living in rural areas are connected to higher fertility rates, while factors such as age, urban residence, and higher wealth or job position are related to lower number of children. Interestingly, greater religious convictions were also linked to decreased fertility rates. Moreover, the study examined how GDP, female labour force participation, and fertility rates are interconnected. Although there wasn't a statistically significant direct correlation, cointegration tests showed a long-term relationship between these variables. Additional examination using the VECM method revealed a phenomenon of moving towards balance, indicating a mutual influence among these factors as time progresses. To summarize, this research illuminates the intricate relationship among socioeconomic aspects, economic development, women's participation in the workforce, and how they collectively impact the fertility patterns in India

[ANCELA JANE RODRIGUES]

[Date]

ACKNOWLEDGMENT

I would like to thank my respected teacher and guide, Asst. Prof. Avina Kavthankar and co guide(Dr.) B.P. Sarath Chandran, Department of Economics, Goa Business School, Goa University, whose worthy guidance and professional attitude are appreciated in completing this dissertation.

I thankfully acknowledge the support and inspiration that I received from my teachers and the Head of the Department of Economics Discipline Prof. Heena Gaude Goa Business School Goa University.

My special thanks to my friends and colleagues for their support and people who allowed me to take samples from their boreholes. I am deeply grateful to my parents for their support, appreciation, encouragement, and strong moral support throughout the research work.

SR. NO.	CONTENT	PAGE NO.
	Title	
	Declaration	
	Certificate	
	Preface	
	Acknowledgment	
	Content Table	
	List Of Tables	
	List Of Figures	

SR. NO.	CONTENT	PAGE NO.
	Title	
	Declaration	
	Certificate	
	Preface	
	Acknowledgment	
	Content Table	
	List Of Tables	
	List Of Figures	

LIST OF TABLES

LIST OF FIGURES

Chapter 1

1.1 Introduction

For the last 70 years, fertility rates have decreased worldwide, with a total 50% decline. The demographic landscape of India has been undergoing a profound transformation marked by a significant decline in fertility rates over the past few decades. This phenomenon, commonly referred to as the fertility transition, holds immense importance not only from a demographic perspective but also in terms of its far-reaching economic implications. Understanding the dynamics of fertility transition is vital. Fertility measures are crucial indicators for evaluating progress towards the United Nations Sustainable Development Goals (SDGs), particularly in improving maternal, newborn, and child health. Fertility decline can affect female labour force participation (Ahn and Mira, 2002; Jaumotte, 2003; Adsera, 2004; Bloom et al., 2009), and working women has low fertility rate as compared to non-working women (Del Boca, 2002; Engelhardt et al., 2004; Subramaniam et al., 2018). Moreover, many developed countries have experienced an enormous decline in fertility rate with an increase in female labour force participation, founded significant inverse relationship between these two factors (Engelhardt et al., 2004; Mishra & Smyth, 2010; Narayan, & Smyth; 2006).

India, with its vast and diverse population, stands at the forefront of demographic changes globally. The country's transition from high to low fertility rates has been a subject of considerable interest and debate. As birth-rates decrease, an array of challenges emerges, impacting healthcare systems, social welfare structures and affecting the labor market in the long run. The total fertility rate (TFR) has shown a

significant decline as seen in the NFHS reports NFHS 3 (2.7) to 2.0 in NFHS 5. As predicted by the UN and report by the NFHS the fertility rates in India are going to drop to 1.6 in the coming years below the replacement level. Historically characterized by high fertility levels, largely attributed to cultural, social, and economic factors, India has witnessed a remarkable decline in fertility rates since the late 20th century (Dyson & Moore, 1983). This decline has been particularly pronounced in urban areas and among educated women, reflecting shifts in societal norms, increased access to education, and economic opportunities for women. (Kamat, 1976) There is a modest positive impact of fertility decline on poverty and infant mortality reduction, and a rise in female work participation rate.

(*Fertility Decline in India: Contributions by Uneducated Women Using Contraception*, 2024)

The fertility transition in India holds profound economic implications that extend across various sectors and dimensions. At the macroeconomic level, a declining fertility rate can potentially lead to a demographic dividend, wherein the proportion of the working-age population increases relative to dependents, fostering economic growth and development (Bloom & Canning, 2008). Conversely, failure to leverage this demographic dividend could pose significant challenges, including strains on social welfare systems and economic stagnation (Lee, 2003).

Moreover, the fertility transition influences labor market dynamics, consumption patterns, savings, investments, and overall household welfare (Boserup, 1987). Changes in family size and structure impact household resource allocation, expenditure patterns, and intergenerational transfers (Mason, 1997). Furthermore, shifts in fertility patterns have implications for human capital development, healthcare

expenditures, and the provision of social services, necessitating adaptation and investment in relevant sectors (Cleland & Wilson, 1987).

India has achieved replacement-level fertility, where the total fertility rate (TFR) is around 2.1 children per woman. This means that a generation is replacing itself without population growth. The decline in TFR is due to factors like women empowerment, increased use of contraceptives, and government initiatives like Mission Parivar Vikas. which focus on providing family planning services in high-fertility districts, have also contributed significantly.

This transition to replacement-level fertility has both positive and negative implications. On the positive side, it can help alleviate pressure on resources and infrastructure. However, it can also lead to an aging population, which may strain social security systems and slow economic growth.

Understanding the underlying drivers and determinants of fertility transition in India is essential for formulating effective policy interventions aimed at harnessing its economic potential while addressing associated challenges. Factors such as access to healthcare, family planning services, women's empowerment, education, employment opportunities, and cultural norms play pivotal roles in shaping fertility behavior (Bhat, 2002).” Investments in education and healthcare, coupled with effective family planning measures, are fundamental for breaking the cycle of poverty and achieving sustainable economic development in India." - Shashi Tharoor

This dissertation seeks to delve into the multifaceted dimensions of fertility transition in India, examining its historical context, current trends, and future prospects. It

endeavors to unravel the complexities of fertility transition in India and elucidate its economic significance, offering valuable insights into the demographic and socioeconomic transformations shaping the country's future trajectory.

1.2 Objectives

I. To Examine the Relationship between Fertility rate and socioeconomic determinants of fertility.

II. Examine the Relationship Between Fertility and Economic Development in India.

1.3 Significance of the Study

The study aims to understand the transition of the India’s development in the growth process, from a developing country into becoming a developed nation. With respect to change in its fertility rates. The declining trends in the fertility rates will have a significant impact on the economy of the country in the long run as it with effect the demographic dividend of the country causes shortage in the labor force, increase dependency ratio and also puts pressure on the social security system of the country.

1.4 Scope Of the Study

The study show the transition process of the fertility rates in India. Using the data available in the NFHS 5 survey.

1.5 Research Questions

- What socio-economic factors play a significant role in influencing the decline in fertility rates across diverse demographic segments in India?
- Is there a relationship between the fertility rate and Economic Development, specifically GDP per capita, in India?
- How does the fertility rate relate to the labor force participation rate among women in India?

1.6 Hypothesis

(H0): There is no significant association between socio-economic factors and the decline in fertility rates in various demographic segments in India.

(H1): Socio-economic factors have a significant association with the decline in fertility rates across diverse demographic segments in India.

(H0): There is no significant relationship between the fertility rate and Economic Development (GDP per capita) and women labor force participation rates in India.

(H1): There exists a significant inverse relationship between the fertility rate and Economic Development (GDP per capita) in India.

(H0): There is no significant correlation between the fertility rate and the labor force participation rate among women in India.

(H1): There is a significant positive correlation between the decline in fertility rates and the increased labor force participation rate among women in India.

1.7 Methodology

- The Dependent variable in the first objective is Child ever-born this variable tells us how many children are born in that particular time period.
- The Independent variables are education, wealth index, age, marital status, religion, employment.
- The dependent variable for the second objective is Total Fertility rate (TFR) which represents the number of children that would be born to a woman if she were to live to the end of the childbearing years.
- The Independent variable for the second objective is Gross Domestic Product (GDP) of India this will be observed over the years.

1.8 Limitations:

1. Time Constraints: Because of limited time, I couldn't dig as deep into the data or explore specific groups as much as I'd like. Future studies with more time could go into more detail.
2. No proper relevance of the DHS data as it was collected from people and there are chances of biased or incorrect answers. E.g. the individual’s might underreport the number of children they have or if they have used contraceptive measures etc.

Chapter Layout

Chapter 1: INTRODUCTION

This chapter contains introduction chapter, provides a broad over view of the entire study. This chapter also includes the objectives, hypotheses and methodology used in the study and also limitation of the study.

Chapter 2: Literature Review

This chapter contains introduction to the chapter and review of the existing literary work available.

Chapter 3: Data, Variables and Methodology

This chapter delves into the methodological aspects of the research. It's divided into two key sections. The first section, titled "Data Acquisition & Analysis," focuses on how we obtained the data and what kind of data we used (data sources & variables). It will also explain the specific methods we employed to analyse the data (methodology) and the statistical model we developed to test our research questions (model specification)

Chapter 4: Results and Discussion

This chapter dives into the heart of the research, presenting the results and their interpretation, analyse the findings in two sections, for both the objectives respectively.

Chapter 5: Fertility rates in Goa

This chapter explores fertility trends in Goa. The first section, "Goa's Fertility Landscape," examines the current state of birth rates and patterns within the state. The second section, "Goa vs. Uttar Pradesh: A Fertility Tale of Two States," compares Goa's fertility trends with Uttar Pradesh, a state known for significantly higher birth rates, to illuminate the contrasting scenarios across India.

Chapter 6: Findings and Conclusion

This is the final chapter of the study. It contains the "Findings" which gives an overview of the main points from the two objectives, emphasizing the impact of socioeconomic factors and economic trends on fertility rates in India. The "Conclusion" summarizes the research objectives, highlights the study's impact on Indian fertility understanding, and proposes avenues for future research.

Chapter 2

Literature Review

2.1) Introduction

This section provides a merger of the existing scholarly literature pertaining to the research topic. It aims to offer a whole understanding of the current state of knowledge and articulate research questions. Through a systematic review and analysis, this chapter one can illustrate key concepts, theories, and empirical findings relevant to the study. By critically examining previous research, we can aim to establish a solid theoretical foundation for the research and contribute to the ongoing scholarly field.

- (Ashraf et al., 2013) The study aimed to examine how fertility reduction influences economic growth in developing countries. Researchers sought to quantify the various pathways through which changes in fertility affect economic outcomes, utilizing a simulation model that incorporates factors such as education, demographics, and natural resources. To achieve this, the researchers developed a simulation model to isolate and analyse the impact of fertility changes on economic growth. By integrating microeconomic evidence, demographic data, and macroeconomic theory, they were able to investigate the causal relationships between fertility rates and economic development. The findings indicated that decreasing fertility rates in developing nations could result in a notable increase in income per capita over a 2-3 decade period. The study underscored the significance of policy interventions aimed at reducing

population growth rates and emphasized the potential benefits of lower fertility for economic prosperity in these countries.

- (Singh et al., 2021) The study aimed to explore the complex interplay between fertility rates, economic development, and female suicides in India. By analysing state-level data spanning from 2001 to 2011, the researchers sought to understand how these factors interacted and influenced each other within the Indian context. Utilizing longitudinal mixed effect regressions and controlling for various covariates, such as gross state domestic product per capita and total fertility rates, the study investigated the relationship between female suicide rates and indicators of female autonomy and economic development. The findings indicated that lower total fertility rates, which signify greater female autonomy, were associated with reduced rates of female suicides, particularly in states with higher levels of economic development. This suggests that the discrepancy between rapid economic growth and limited female autonomy may contribute to higher suicide rates among women in India. The study underscores the importance of addressing gender disparities and empowering women to mitigate the risk of suicide, emphasizing the need for targeted interventions and policy measures to promote women's well-being and mental health in the country

- (Doepke et al., n.d.)Comprehensive examination of fertility dynamics in high-income economies in the 21st century. Employing a narrative approach that combines empirical evidence, theoretical frameworks, and policy considerations, the authors analyse the evolution of economic models

explaining fertility behaviour and highlight significant shifts in both economic theorizing and observed fertility patterns over time. By incorporating factors such as public child care availability, paternal involvement in childcare, social norms supporting working mothers, and flexible labour markets, the paper introduces new-generation models that better capture contemporary fertility trends, challenging traditional economic theories.

Through a critical review of existing literature and the presentation of updated modelling approaches, the working paper illuminates the complexities of fertility decisions in advanced economies and the interplay between economic factors, social norms, and policy interventions. The findings underscore the importance of nuanced understandings of fertility behaviour and the necessity of incorporating multidimensional factors into economic models. By offering insights into demographic trends, family dynamics, and policy implications within changing economic and social landscapes, the research contributes significantly to ongoing discussions on the economics of fertility in high-income countries.

- (Schultz, n.d.) "The Fertility Transition: Economic Explanations" by T. Paul Schultz delves into the economic determinants behind the global fertility transition. It seeks to clarify how economic factors such as wealth, education, and technological advancements influence decisions regarding family size, and how evolving economic landscapes impact reproductive preferences. Employing economic models, the paper theorizes on how economic environments shape fertility choices, incorporating empirical data on price, income, and environmental constraints to illustrate variations in fertility outcomes. It advocates for an integrated approach that combines structural and reduced form models to capture the complexities of household decision-making. The paper's findings reveal a

consistent pattern: as wealth and economic development increase, fertility rates tend to decline, especially in high-income countries. It highlights the pivotal roles of education, healthcare technology, and access to birth control methods in shaping fertility decisions. Moreover, it discusses the heterogeneous nature of fertility declines across countries and emphasizes the influence of social support systems in reducing private demands for children. In essence, the document provides valuable insights into the intricate interplay between economic conditions and fertility choices, stressing the multifaceted nature of demographic transitions and the importance of considering diverse factors in comprehending these trends.

- **(**Boland ,2018) Mary Regina Boland conducted a study to figure out what affects the number of babies born in different countries. She used birth rate as a way to measure how fertile women are. The study looked at data from 182 countries to see which things might influence how many babies are born.

To do this, Boland and her team used a type of math called regression analysis. This method helps researchers see how different things might be connected. They looked at factors like temperature, how rich the country is (measured by GDP per person), how polluted the air is (using something called PM 2.5), and how many people are overweight (measured by BMI). They also looked at how these factors might interact with each other. The study found that how wealthy a country is, as shown by its GDP per person, was linked to how many babies are born. Air pollution (PM 2.5) and being overweight (high BMI) also had an impact, especially when combined with other factors. Temperature seemed to play a role too, but it was more complicated and depended on other factors. Overall, the research tells us that both environmental and economic factors can affect how many babies are born. Understanding these factors can help us better understand why some places have more babies than others. This

knowledge could be important for tackling fertility issues, not just in the United States but around the world. It could help us find ways to address declining fertility rates in women.

- (Ahmed et al., 2024)The study aimed to use a new method based on count regression models to estimate fertility rates in Pakistan. Its goals were to understand how socio-demographic and family planning factors affect birth rates and to calculate various fertility measures, like age-specific fertility rates and total fertility rate, for women who were ever married in the country. To do this, the researcher's analysed data from the Pakistan Demographic Health Survey conducted between 2017 and 2018. They used both classical and Bayesian regression methods and fitted different types of models to births that happened over 1-year, 3-year, and 5-year periods. They then used these models to predict fertility measures, paying special attention to handling missing or incomplete survey responses. The results showed that sometimes they were off in estimating how many babies women of certain ages were having—sometimes estimating too high and other times too low. However, the new model-based approach generally gave better estimates for fertility indicators, especially when survey data was incomplete. The study suggested using this approach for national and sub-national level demographic assessments. The study emphasized the importance of accurately estimating fertility rates for tracking progress towards United Nations Sustainable Development Goals related to maternal, new-born, and child health.

- (Singh et al., 2021)

The study "Reducing Fertility in India" investigates the relationship between socioeconomic development and fertility rates among the states of India. The research is based on the "Demographic Transition Theory," which suggests that as a country's level of development increases, fertility decreases, leading to population stability. The study utilizes data from the second National Family Health Survey (NFHS-2) to analyse 26 socioeconomic development variables and their correlation with fertility rates in India.

The findings of the study support the demographic transition theory, revealing a correlation between socioeconomic development variables and fertility rates in the predicted direction. The study indicates that higher levels of modernization, health care, education, and access to family planning information and services play a significant role in lowering fertility. Additionally, the study suggests that higher levels of female literacy and acceptance of contraceptives lead to fertility decline.

The study also discusses the impact of family planning programs, new contraceptive technologies, and the educational power of mass media in accelerating the diffusion of new ideas about family planning in both rural and urban environments, creating conditions for fertility decline. The research concludes that the overall level of modernization, health care, and education, accompanied by ready access to family planning information and services, are key factors in reducing fertility rates in India.

- (*Fertility Decline in India: Contributions by Uneducated Women Using Contraception*, 2024)

The study aims to analyse the impact of fertility decline, particularly among uneducated women, on various socio-economic and health indicators in India. It seeks to assess the contributions of fertility reductions by illiterate and literate women, as well as changes in the educational composition of women, on child health and nutrition indicators. The methodology involves decomposition analysis, panel data regression, and multivariate logistic regression to assess the macro and micro-level impact of fertility decline on key health and development indicators. The findings reveal that fertility decline among illiterate women, particularly through the adoption of contraception, has significantly contributed to the improvement of health and socio-economic conditions for women and children in India. The research demonstrates that the reverse causation of fertility reduction among uneducated women has led to positive outcomes, including improvements in women and child health, educational development, and economic conditions of families. Additionally, the study highlights the significant impact of fertility decline on poverty reduction, infant mortality, and female work participation rates. The findings also indicate that the states in the south, west, and east regions of India have experienced greater advantages in terms of higher literacy rates, lower infant mortality, and economic progress compared to the northern states.

In summary, the study provides evidence of the substantial contributions of fertility decline among uneducated women to the overall improvement of health and socio-economic conditions in India, highlighting the critical role of demographic changes in driving positive societal outcomes.

- (Ashraf et al., 2013)The study on the effects of a two-child policy in rural India employed sophisticated methodologies to investigate its impact on fertility behaviour, sex ratio preferences, and female infant mortality. Utilizing propensity score matching (PSM) models and ordinary least squares (OLS) models, researchers meticulously analysed data to understand the nuanced outcomes of the policy. Propensity scores, derived from logistic regression incorporating various socio-demographic factors, enabled the creation of comparable treatment and control groups. By ensuring balance between these groups, the study minimized biases and confounding variables, enhancing the reliability of the analysis. Matching techniques with common support and calliper width further strengthened the validity of the findings.

The study revealed significant shifts in fertility behaviour in response to the two-child policy. Households in states with fertility limits experienced a notable reduction in family size compared to those without such restrictions. Moreover, there was a discernible decrease in the proportion of families with more than two children post-policy implementation. These findings underscored the effectiveness of the policy in influencing fertility decisions in rural areas. Furthermore, the study illuminated the impact of the policy on sex ratio preferences. Changes in the proportion of male children born after the policy indicated shifts in societal preferences regarding gender dynamics. Additionally, variations in female infant mortality rates following the policy implementation highlighted the importance of considering unintended consequences. Factors such as the presence of a male child before the policy and socio-economic characteristics were found to influence fertility outcomes, emphasizing the complexity of demographic dynamics in rural India. By providing comprehensive insights into the effects of the two-child policy, the study informs future policy decisions and interventions

aimed at addressing demographic challenges while promoting gender equality and sustainable development in rural communities.

- (Debnath, 2022)The study examined how women's involvement in work, childbirth rates, and economic growth are linked in India. It aimed to understand how these factors influence each other over time. To achieve these objectives, the study employed econometric models to analyse the relationships between female labour-force participation rate (FLFPR), fertility rate (FERT), and economic development (EDEV). The models formulated in the study allowed for a comprehensive examination of the functional relationships between these variables, providing a structured framework for analysis. Additionally, unit root tests, such as the DF-GLS estimator, were utilized to assess the stationary properties of the time series data, ensuring the robustness of the analysis. The findings showed that these factors affect each other in the long term. For example, when there are more job opportunities and economic growth, more women tend to work. However, high childbirth rates can make it harder for women to join the workforce. The study also found that as the economy grows, women's work rates can initially drop before increasing again, forming a U-shaped curve. This suggests that economic growth impacts women's work differently at different stages. Additionally, the study highlighted that high childbirth rates can slow down economic growth and reduce women's work rates. This indicates a complex relationship between childbirth, women's work, and economic progress.
- (Hondroyiannis & Papapetrou, 1999) The paper by George Hondroyiannis and Evangelia Papapetrou explores the empirical relationship between fertility choice, world capital markets, wages, and economic growth in the United States. The study aims to validate the idea that fertility rates are positively influenced by long-term real interest rates and

negatively affected by real wages in an economy connected to global capital markets. Using a vector autoregressive (VAR) model, the authors analyse data spanning from 1960 to 1995 to understand the dynamic interactions among fertility choice, capital markets, wages, and economic growth. Their methodological approach involves applying a VAR analysis within a neoclassical growth framework, where fertility rates are integrated into the utility function of the representative agent. By employing the VAR model, the authors estimate both short- and long-term responses of various endogenous variables to disturbances in fertility, output, labour markets, and capital markets as outlined in the theoretical model. The empirical analysis also includes variance decomposition and impulse response functions to explore the dynamic relationships among these variables over different time horizons. The findings suggest that there isn't a long-term relationship among fertility choice, real wages, long-term real interest rates, and output growth in the U.S. during the specified period. Nonetheless, the results confirm the endogenous nature of fertility choice and support the hypothesis that real wages, long-term real interest rates, and output growth are associated with changes in fertility rates. The study concludes that shifts in fertility rates play a role in influencing wage levels and output fluctuations, with significant implications for policy-making in economies experiencing declining fertility rates alongside technological advancements linked to low long-term real interest rates. In summary, the paper provides empirical evidence to underscore the interconnectedness of fertility choice with macroeconomic variables, shedding light on the nexus between fertility and economic growth.

- (Kamat, 1976) Anrudh K. Jain's study delved into how governmental policies, particularly those concerning population control and socioeconomic advancement, influenced fertility

patterns in India during the 1970s. Through a meticulous analysis of various indicators and factors, the study aimed to unravel the drivers behind the decline in fertility rates, both nationally and regionally. Using sophisticated statistical techniques like multiple regression analysis, Jain drew on state-level data from diverse sources including India's Sample Registration System, reports on the national family planning program, and census data. These rich datasets provided crucial insights into the evolving fertility landscape of India. The findings of the study illuminated several critical factors that shaped fertility outcomes in the country. Factors such as high levels of female literacy, low infant mortality rates, increased contraceptive usage, and delayed age of marriage for women were identified as conducive to reducing fertility rates. Additionally, Jain's research highlighted the pivotal role of India's family planning program in driving down fertility rates since the 1960s. Looking ahead, the study underscored the importance of continued efforts to reduce infant mortality, enhance female education, and bolster family planning initiatives for sustaining the decline in fertility rates. It emphasized the necessity of periodic evaluations of public policies to understand their effectiveness in influencing demographic trends.

- (Kamat, 1976) In A.R. Kamat's study on "Women's Education and Social Change in India," the focus is on understanding how women's education influences societal transformation within the Indian context. The study sets out to achieve several objectives: firstly, to assess the impact of education on the social standing of women; secondly, to identify the obstacles hindering women's access to education; and thirdly, to investigate how education serves to empower women in Indian society. To fulfil these aims, the author adopts a qualitative research approach, drawing upon a range of sources including historical documents, educational reports, and scholarly literature. Additionally, government reports and statistical data are analysed to provide a comprehensive understanding of the current

landscape of women's education in India. The study's findings depict a mixed picture: although progress has been made in women's education since India's independence, substantial challenges persist. These challenges include disparities in educational access for girls from marginalized backgrounds, high dropout rates among female students, and discrepancies in literacy rates across different regions and socioeconomic strata. Central to the study is the recognition of the urgent need to address these challenges. Policy interventions, community engagement initiatives, and advocacy efforts are identified as crucial strategies for promoting gender equality in education and improving the social status of women in Indian society. In summary, Kamat's study underscores the complex interplay between women's education and social change in India. By shedding light on existing disparities and advocating for targeted interventions, the study contributes valuable insights to the ongoing discourse on gender equality and education in India.

- (Fox et al., n.d.) Theoretical Considerations and Evidence from Europe" delves into the exploration of a potential positive correlation between fertility rates and economic development within European countries, particularly at the sub-national regional level. Utilizing a combination of theoretical frameworks and empirical analysis, the study aims to uncover shifts in this relationship over time. Examining data from 1990 to 2012 across 20 European countries, the research particularly focuses on the transformative period experienced by Central-Eastern and Eastern European nations during the 1990s. This period marked a transition from authoritarian regimes and command economies to more democratic governance and liberal economic systems. The study employs regional economic data at the NUTS 2 level to analyse the dynamics between income levels and fertility rates. The findings of the study indicate a notable weakening of the traditionally negative association between fertility rates and economic development across several countries. In some instances, a positive relationship between these factors emerges. The

research highlights that the link between income levels and fertility rates is diminishing, with considerable variation observed across countries regarding the thresholds at which these reversals occur. Furthermore, the document underscores the significance of considering the sub-national regional dimension to grasp the potential mechanisms through which economic development could positively impact fertility trends. In essence, the study aims to offer valuable insights into the intricate relationship between economic development and fertility trends within European countries, especially at the sub-national regional level. By shedding light on the evolving dynamics between these variables, the research contributes to a deeper understanding of demographic trends and socioeconomic transformations in the region.

- **(** Avner Ahituv, 2001) Avner Ahituv's study delves into the intricate dance between fertility rates and economic prosperity, aiming to decipher how demographic shifts influence a nation's financial health. Here are the key objectives: Firstly, it aims to scrutinize the accuracy of different estimation methods, comparing them against ordinary least squares (OLS) to understand which models provide the most reliable insights into fertility policies. Secondly, the study seeks to uncover hidden factors specific to each country that affect the relationship between fertility and economic growth, providing a more nuanced understanding of this complex connection. Thirdly, it endeavour’s to explore how changes in population growth impact a country's GDP per capita, shedding light on the broader economic implications of fertility trends. Lastly, the research aims to distil actionable policy recommendations from its findings, emphasizing the importance of initiatives like family planning and education in fostering sustainable economic growth. Methodologically, the study employs panel data analysis, utilizing various estimation techniques to account for country-specific nuances. By applying both linear and non-linear models, the research aims to capture the full extent of fertility's impact on economic

dynamics. The findings highlight that considering unobservable country-specific factors enhances the understanding of the link between fertility and GDP, pointing to potential biases in previous estimates. Moreover, the study underscores the multifaceted nature of this relationship, stressing the influence of factors like education and life expectancy on fertility rates.

- (Vollset et al., 2020)The study focused on mortality, fertility, migration, and population for 195 countries and territories in order to project future population trends from 2017 to 2100. Creating novel techniques for predicting demographic indicators and evaluating the possible geopolitical and economic effects of demographic changes were among the goals. In order to accomplish these objectives, the researchers investigated how changes in educational attainment and the need for contraception affected population dynamics using a causal model. In order to estimate mortality rates by cause as well as by all causes, they also included future health scenarios. Furthermore, national net migration rates were predicted using a time-series model with covariates that took into account variables such the population growth rates and the Socio-demographic Index. To estimate the uncertainty distributions for each country and territory, the components of fertility, mortality, and migration uncertainty were propagated. The results made clear how crucial it is to take demographic shifts into account when making plans for future resource requirements, economic environments, and social structures. The study highlighted the importance of proactive governmental steps to handle changing demographic trends and offered insightful information about possible future situation.

- (Bongaarts & Hodgson, 2022) The book "Socio-Economic Determinants of Fertility" delves into the intricate connection between socio-economic factors and fertility rates within developing nations. Its primary objectives encompass identifying pivotal drivers behind fertility decline, examining how socio-economic shifts influence fertility trends, and evaluating the efficacy of voluntary family planning initiatives in curbing fertility rates. Through a meticulous blend of controlled experiments, natural experiments, and regression analyses, the researchers scrutinized the impact of diverse socio-economic variables on fertility outcomes. Employing data gleaned from surveys, censuses, and vital statistics systems, the study endeavour's to furnish empirical evidence elucidating the forces propelling fertility transitions in developing regions. The study's revelations illuminate several critical facets of fertility behaviour within these contexts. It underscores the significance of education, income levels, and access to family planning services as key determinants of fertility reduction. Additionally, it underscores the instrumental role of voluntary family planning programs in empowering individuals to make informed decisions regarding family size and spacing. Furthermore, the research tackles pertinent debates surrounding fertility decline, including the trade-offs involved and the efficacy of family planning interventions. By anchoring their findings in empirical evidence and historical context, the researchers aspire to deepen comprehension of the intricate interplay between socio-economic dynamics and fertility outcomes in developing settings.

-

- (Kuloğlu et al., 2022) The study aims to investigate the impact of social and economic factors on fertility characteristics through a cross-country analysis. The method employed in the study involves creating a model based on the research carried out by Wang and Sun (2016), with the addition of reducing several variables to a single variable using principal

component analysis. The study examines the effect of social and economic variables on fertility characteristics in 49 countries within the time-span of 1990-2018, focusing on high-income, upper-middle-income, and low-middle-income countries. The findings of the study reveal that fertility characteristics are affected more by economic variables than social variables in all country groups, indicating that a positive increase in economic variables improves the quality of human capital in high-income countries, while a positive increase in economic variables in low-income countries increases the number of human capital.

- (Madalozzo, 2012) The goal of the study "Transitions in Fertility for Brazilian Women" was to investigate the connections between female labour involvement, fertility patterns, and other contributing factors among Brazilian women. The researchers focused on women 45 years of age and older, analysing fertility characteristics across many cohorts using data from the PNAD micro data, which covered the years 1992 to 2009. Regression analysis was used in the study's methodology, specifically an ordinary least squares regression model with robust standard errors. In order to evaluate their influence on the number of children that women had, the model incorporated factors including marital status, race, education level, region of residence, labour force participation, location in an urban area, and per capita family income.The study's conclusions provided some important new information. First of all, the number of children women had was influenced by factors such as marital status, race, and education, region of residence, labour force participation, urban area residency, and family income. Family income was particularly noteworthy, with higher income levels associated with a lower probability of having additional children. Additionally, the study highlighted a decline in fertility rates over the years, with women born in later cohorts having fewer children on average. The analysis also indicated that while female labour force participation had a modest impact on fertility variations,

education and income profiles played a more substantial role in shaping fertility decisions, especially among younger cohorts. To sum up, the study shed light on the complex interplay of various factors influencing fertility transitions among Brazilian women, emphasizing the evolving dynamics between fertility choices, female labour participation, and socio-economic variables in the Brazilian context.

- (Roger Jeffery and Patricia Jeffery, 2024) Jeffrey and Jeffery sought to challenge essentialist beliefs about the influence of religion on fertility behavior, examine the impact of regional factors on fertility differentials, and evaluate the work of Moulasha and Rama Rao in their analysis of religion, fertility, and family planning in India. They used a critical review methodology, examining the body of research as well as demographic information to evaluate the veracity of the findings of earlier studies. Their findings demonstrated how crucial it is to take into account socioeconomic factors, the standard of education, and the geographic distribution of Muslims and Hindus when analysing fertility differences. They emphasized the necessity to contextualize demographic trends within larger social, political, and economic settings, challenging essentialist ideas that link greater reproduction rates to particular religious groups. The writers also criticized oversimplified policy suggestions that focus solely on changing attitudes towards fertility and family planning among specific religious communities.
- (James Brander and Steve 1993) The aim of this study is to use aggregate cross-national data to examine the relationship between population increase, fertility, and economic growth. In order to take advantage of the time-varying behaviour of nations, the method entails building a panel data collection based on five-year intervals and performing empirical analysis using an econometric model. The goal of the article is

to investigate how demographic shifts and economic growth are related to the "investment effect" and "savings effect." The results imply that variations in fertility, especially in the degree of birth rate decline, could play a major role in the increase of per capita income in different nations. Additionally, the data shows that decreases in the birth rate occur before improvements in income growth, which raises the possibility of a self-reinforcing demographic shift with feedback consequences. The study highlights the significance of taking demographic shifts into account when analysing economic growth and offers empirical data to back up this claim. The study also recognizes the drawbacks of applying straightforward cross-sectional regress and emphasizes the need of using panel data for a more thorough investigation.

- **(Kundu et al., 2023**) The study's goals were to identify the socio-demographic, behavioural, and medical conditions that may affect a woman's ability to conceive as well as to examine the patterns of primary and secondary infertility in India between 1992–1993 and 2015–2016. Secondary data from all four waves of the National Family Health Survey (NFHS) were used in the cross-sectional study design. The methodology comprised a multivariate logistic regression model on primary and secondary infertility outcomes, bivariate analysis with cross-tabulation and chi-square test of association, and a t-test to determine the proportional change in infertility rates from 1992 to 2016. The study also employed a number of possible economic, socio-demographic, and, health-related behaviour covariates to comprehend the factors that contribute to infertility. The results of the research showed that infertility rates are rising in India, with differences in the frequency of primary and secondary infertility across many socioeconomic characteristics, including age, religion, and lifestyle factors. The necessity for a more precise definition based on ongoing exposure to the

risk of conception and the difficulty of assessing infertility due to definitional variances were also brought to light by the study. The report also underlined the necessity of making infertility treatment a top health priority and the requirement for reproductive and child health programmes in order to effectively address infertility problems in India.

- (Golub et al., 2023)The purpose of the study was to examine the socio-demographic factors that influence fertility in Bosnia and Herzegovina, with a focus on the Semberija region. The study concentrated on how intended family real birth rates were affected by variables like housing conditions, economic crises, and employment status. Using a survey approach, a sample of one thousand women in their reproductive years were asked questions about economic variables, population policy measures, and demographic traits. To investigate the connection between these variables and fertility rates, statistical analysis was employed, including Pearson's correlation and logistic regression. Future birth trends are heavily impacted by factors such as housing conditions, employment position, and state financial support. The gap between the desired and actual number of children was also underlined by the survey, with financial support and stable employment standing out as important elements influencing the intentions of fertility. The study came to the conclusion that addressing these socio-demographic factors is crucial for creating strategies that effectively promote reproduction and mitigate the region's unfavourable demographic trends

- (Kazemzadeh et al., 2023)The main goal of the research is to examine how economic complexity, fertility rate, and information and communication technology (ICT) influence the ecological footprint in 19 developing countries. The data from 2000 to 2016 is analyzed in the study using the STIRPAT model and quantile panel

regression. The study seeks to address the gap in the existing literature by investigating how these factors affect environmental degradation, utilizing the ecological footprint as a holistic measure.

The technique utilizes panel quantile regression to analyze how explanatory variables impact the ecological footprint at various quantile levels. The findings indicate that economic complexity has an adverse and statistically substantial impact on the ecological footprint, especially in the 75th and 90th percentiles. The fertility rate has a noteworthy influence on the ecological footprint, particularly in the middle quantile where the impact is more pronounced. ICT has a quantifiable, negative impact on the ecological footprint at all levels of measurement, but its influence is not as strong as that of other factors. Results from the fixed effect model panel suggest that ICT does not have a significant impact on the ecological footprint, but both economic complexity and fertility rate do have significant positive and negative effects respectively.

Ultimately, the research offers valuable understanding regarding how economic complexity, fertility rate, and ICT influence the ecological footprint in developing countries, presenting crucial policy recommendations for reducing environmental harm.

- (Golub et al., 2023)The study titled "Determinants of Desire for Children: A Multinomial Logistic Regression Approach" aimed to identify potential factors influencing the desire for more children in Bangladesh to accelerate fertility decline and achieve replacement level. The study utilized a multinomial logit approach to determine key covariates such as child's sex preference, professional status, wealth index, and residential places significantly associated with high fertility desires. The findings highlighted the importance of female literacy in addressing high fertility rates

and suggested that policy interventions should focus on enhancing female education and workforce involvement to improve women's status and reduce societal attitudes towards sex preferences, ultimately leading to a decline in fertility rates. By analyzing data from the Bangladesh Demographic and Health Survey, the study identified determinants influencing the desire for more children and recommended strategies to revise national family planning programs to achieve replacement level fertility within the shortest time period.

- (Bhalla & Kaur, n.d.)The paper investigates fertility and employment trends in urban Indian women using data from NSS, NFHS, and CSO surveys. It employs a human capital wage model and Tobit estimates to explore factors influencing fertility. Results suggest declining fertility rates, nearing replacement levels. Urban women exhibit consistently low labour participation at 25% over 25 years. Factors affecting fertility include income, education, and socio-economic status. The study challenges the gender pay gap, finding a residual gap of 10-20% when accounting for human capital factors. India is expected to achieve replacement fertility in 5-10 years

- (Balhasan Ali1 and Preeti Dhillon2) The study aimed to investigate the cointegration and causality between fertility and female labour force participation in India. The objectives were to analyze the long-term relationship between total fertility rate (TFR) and female labour force participation rate (FLPR), determine the direction of causality between these variables, and assess the impact of economic factors like GDP growth on TFR and FLPR.To achieve these objectives, the study utilized annual time series data from 1983 to 2018 and employed unit root tests such as the Augmented Dickey-

Fuller (ADF) Test and Phillip-Perron (PP) Test to check for stationarity in the data. The analytical approach included a model with long-term and short-term parameters to test for cointegration between TFR and FLPR.The findings revealed a significant long-term relationship between TFR and FLPR in India, indicating that changes in fertility rates have a lasting impact on female labour force participation. Additionally, the study identified a bidirectional causality between TFR and FLPR, suggesting a complex interplay between these two variables. Economic factors, particularly GDP growth, were found to influence both TFR and FLPR, highlighting the interconnectedness of demographic and economic dynamics in shaping female labour force participation patterns in India

Chapter 3

Data, Variables and Methodology

3.1) Introduction

This chapter describes the methodology employed to analyses the data and test research hypotheses. It provides an overview of the sources of data collection, hypotheses, variables and method utilized for data analysis techniques utilized. Furthermore it discusses the validity and reliability if the variables and the model used for analyses.

3.2) Data and Variables

Data has been collected for NFHS Round 5. The NFHS-5 (National Family Health Survey) in India is like a big health check-up for the whole country. It helps us understand things like how healthy people are, how many children they have, and what kind of healthcare they can access. It surveys households all over India to gather this information. This data is really important for the government and other organizations to make decisions about health policies and programs. The variables included in this study are Child ever born, Age, level of education, Occupation, Residence, Religion, Marital status, Wealth index.

3.1.1 Child ever born – this variable represent the number of children a women has given birth to. In this study this variable is used as a proxy to the fertility rate.

3.1.2 Level of education- this variable shows the level of education attained by a person at different levels such as primary, secondary, higher secondary education. Higher level of education is usually linked to lower levels of fertility

3.1.3 Occupation- this variables tells us about a person's employment status whether if a person is employed, unemployed, self-employed or others. This can have an impact on the fertility rate as if a person is employed there are high chances of the fertility level dropping down.

3.1.4 Residence- this variable describes the persons place of residence, whether the person lives in an urban or rural area. Urbanization is another factor that is linked to decline in the fertility rates

3.1.5 Marital Status- This variable tell us whether a person is married, unmarried or in other marital status.Marital status also has a strong effect on the fertility rates, with unmarried individuals being more likely to have no children ever born compared to married individuals.

3.1.6 Religion – This variable tells us about a person's religious association, such as Christian or Non- Christian. Specific religious teachings regarding family planning and contraception can influence the fertility rates.

3.1.7 Wealth index- This variable describes the level of wealth a person possesses. This is at three levels i.e. lower, middle and high level of wealth. The relationship between wealth index and fertility rate typically shows an inverse correlation, with higher wealth associated with lower fertility rates, as increased affluence often correlates with better access to education, healthcare, and contraception, influencing family planning decisions.

3.1.8 Age- this refers to a person's age. Fertility generally peaks in the late teens to early twenties, declines gradually thereafter, and decreases significantly after the age of 35 due to factors such as decreased egg quality and quantity.

3.3) Data Sources

Data has been collected from the official IR individual record file was downloaded from the DHS website, from National Family Health Survey (NFHS 5) (2019-21).

- Data for the level of GDP has been taken from the Reserve Bank of India RBI website.

3.4) Methodology

a) The method that will be used to get the results for the first objective is the Logististic regression. Multinomial Logistic Regression is a statistical technique used to model the probability of a binary outcome (such as yes/no) based on one or more predictor variables. Unlike linear regression, which predicts continuous outcomes, logistic regression predicts the probability of the outcome falling into one of two categories using a logistic function, which constrains the output to values between 0 and 1.

The multinomial Logistic regression will be used to interpret the data as the model will constitute of more than one independent variables.

b) The method that will be used for the second objective to test the level of stationary in the data using time- series analysis. Johansen's cointegration test was used to test for cointegration and also VECM Test was done to check the movement between the variables.

3.5) Hypothesis for the variables

a. Level of Education

   i. HO: There is no significant association between level of education and the number of children ever born.
   ii. H1: There is a significant association between level of education and the number of children ever born, with higher education levels associated with lower fertility rates.

b. Occupation

   i. HO: There is no significant association between occupation and the number of children ever born.
   ii. H1: There is a significant association between occupation and the number of children ever born, with certain occupations (e.g., manual labour) associated with higher fertility rates.

c. Residence (Urban vs. Rural)

i. HO: There is no significant association between residence (urban or rural) and the number of children ever born.
ii. H1: There is a significant association between residence and the number of children ever born, with rural residence associated with higher fertility rates.

d. Marital Status

i. HO: There is no significant association between marital status and the number of children ever born.
ii. H1: There is a significant association between marital status and the number of children ever born, with married individuals having higher fertility rates compared to unmarried individuals.

e. Religion

i. HO: There is no significant association between religion and the number of children ever born.
ii. H1: There is a significant association between religion and the number of children ever born, with certain religious groups (e.g., those with pro-natal beliefs) having higher fertility rates

f. Wealth Index

i. HO: There is no significant association between wealth index and the number of children ever born.

ii. H1: There is a significant association between wealth index and the number of children ever born, with higher wealth associated with lower fertility rates.

j. Age

i. HO: There is no significant association between age and the number of children ever born.

ii. H1: There is a significant association between age and the number of children ever born, with younger individuals having higher fertility rates compared to older individuals.

k) Gross Domestic Product (GDP)

i. HO: There is no significant association between GDP and TFR.

ii. H1: There is a significant association between GDP and the TFR, with higher GDP associated with lower fertility rates.

3.6) <u>Model</u>

- For objective 1 - Child ever-born ~ level of education + Occupation + Residence + Marital Status+ Religion + Wealth index + Age
- For objective 2 – TFR ~ GDP + Women labor-force participation rate

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

a) The connection between the birth rate and how well the economy is doing has caught the attention of many researchers and policymakers around the world. In India, where there are lots of different kinds of people and the economy is growing fast, this link is really important. Because India is so big and has so many people, what happens with babies being born and how the economy is doing are closely tied together. This means it's really important to study and understand this connection so that decisions about policies and plans can be made wisely to keep development going in a good direction.

b) Over the years, India's population has changed a lot. The birthrates was very high especially in rural areas where farming is common. But now, as urbanization has picked the number of birth rates has declined. These changes in population, along with how the economy is changing, have big effects on things like jobs and how money is spent on social programs. Figuring out how all these things are connected helps us understand why India's population is changing and how the economy is doing.

4.2) Descriptive Statistics

Table 1

Variables	Mean	Std. Dev.
TFR	2.943	0
Child ever-born	.9529303	.3010229
Education	2.422145	.8614209
Occupation	.08414	.379589
Residence	1.17562	.380497
Working Women	.4860206	.0007755
Religion	.9991239	.168376
Wealth index	2.725215	.6552135
Age	31.30195	9.90736

Descriptive statistics based on the different aspects of an individual's demographic and socioeconomic characteristics are seen here. The total fertility rate (TFR) averages at 2.943, reflecting the average number of children born to women within a specific population. In particular, it is noted that the standard deviation for TFR has been reported to be zero which indicates minimal variation in this measure among the sampled population. The variable "Child ever-born" indicates that, on average, individuals have had approximately 0.95 children, with a moderate level of variability denoted by a standard deviation of 0.30. The level of education, which is measured shows an average of 2.42, with a mean deviation of 0.86, indicates some degree of diversity in educational attainment among the population. Occupation, with an average score of 0.084, shows a relatively low mean indicating that the sampled population might be predominantly unemployed or working in lower skilled occupations. Residence status, measured on a scale with an average of 1.18 indicating the tendency to live in urban or

rural environments and having moderate variability by standard deviation of 0.38, is shown. Working women scores an average of .486, with a standard deviation of 0.0077. The predominant religious affiliation in the sample group is reflected in the average score of around 1, while the wealth index is at 2.73 indicating a moderate level of wealth in the population. In addition, the mean age of individuals in the sample is 31.30 years with a normal deviation of 9.91 and indicates that there are some differences between population groups within the data set.

4.3 Table 2

		No children		
child_everborn		Coef.	p-value	Sig
women's age group	odd values			
15-19	0	1	.	
20-24	1.010050167	0.01	0	***
25-29	1	0	0	***
30-39	1	0	0	***
40-49	1	0	0	***
women's Education ~		1	.	
primary	13.83221096	2.627	0	***
secondary	51.16214996	3.935	0	***
higher	9.52516E+36	85.147	0	***
type of residence ~n				
urban	2.718281828	1	.	
rural	8.182518596	2.102	0	***
religion_d :				
hindu		1	.	
muslim	86.40106482	4.459	0	***
christian	2.734640547	1.006	0.994	
others	119.8211243	4.786	0	***
caste :				
base SC		1	.	
ST	8.440149317	2.133	0	***
OBC	40.48777189	3.701	0	***
None of them	215.9398723	5.375	0	***
wealth_dv				
poorest		1	.	
poorer	2.440004784	0.892	0.529	
middle	2.834881111	1.042	0.814	
richer	2.52439139	0.926	0.658	
richest	1.319166371	0.277	0	***
working status of women				
not working		1	.	
working	9.393331287	2.24	0	***
occupation				
base~ non agricultural	0	1	.	
agricultaral	5.841572358	1.765	0	***
others	145.9114601	4.983	0.056	*
Constant	200.7378845	5.302	0	***

	6- 10 chilren				
	Odds ratio		coef.	p- value	sig
womens age group					
15~19			1	0.999	
20-24	5466854		5466854.9	0.999	
25-29	12160278		12160278	0.999	
30-39	68887955		68887955	0.998	
40-49	267400000		2.67E+08	0.998	
womens education				.	
no education			1	0.017	
primary	1.904081995		0.644	0	**
secondary	1.42903587		0.357	0.998	***
higher	1		0	.	
type of residence				0.239	
urban			1	.	
rural	3.560852562		1.27	0.027	
religion				1	
base ~hindu			1	0.005	
muslim	4.091861496		1.409	.	**
christian	1		0	0.233	
others	1.53879555		0.431	0.102	***
caste				0.112	
base SC			1	.	
ST	2.085481993		0.735	0.04	
OBC	3.695071852		1.307	0.002	
None of them	2.121238253		0.752	0	
wealth_dv				0	
: base poorest			1	.	
poorer	1.950332752		0.668	0.37	**
middle	1.707448242		0.535	.	***
richer	1.359340968		0.307	.	***
richest	1.003004505		0.003	.	***
working status of women				.	
not working			1	.	
working	2.398875294		0.875	.	
occupation :				.	
base non agricultural			1	.	
agri	3.994825905		1.385	.	
others	1		0	.	
Constant	1		0	.	

	More than 10 children			More than
			Coef.	p-value	sig.
womens age	**odds values**				
15-19			1	.	
20-24	1.054429645		0.053	1	
25-29	1.049170655		0.048	1	
30-39	1.022243784		0.022	1	
40-49			1114558.6	0.999	
womens education					
no education			1	.	
primary	1		0	0.998	
secondary	1		0	0.994	
higher	1		0	0.997	
residence					
urban	base		1	.	
rural			1751527.7	0.995	
religion_d					
hindu	base		1	.	
muslim	2.565106505		0.942	0.96	
christian	2.159766254		0.77	1	
others	1		0	0.997	
caste					
base SC	base		1	.	
ST	7.614086359		2.03	0.621	
OBC	29.66595227		3.39	0.308	
None of them	1		0	0.996	
wealth_dv					
base poorest	base		1	.	
poorer	2.909554568		1.068	0.955	
middle	1.339103018		0.292	0.395	
richer	1		0	0.997	
richest	1		0	0.994	
working status of women					
not working	base		1	.	
working	6.110447432		1.81	0.53	
occupation:					
base non agricultural	base		1	.	
agri	1		0	0.999	
others	1900.742731		7.55	1	
Constant	1		0	0.997	

4.4 Interpretation of the table:-

The multivariate logistic regression model confirms the impact of socio and demographic predictors on the number of children ever-born (fertility rate).

(**Zero Children ever-born)**

Age group- for category 5(40-49) the odds of have zero children is 75%. And for category 4(30-39) the odds of having zero children 17%. For category 3(25-29) the odds of having zero children is 13%. And for category 1(20-24) the odds of having zero children 19%.This

shows that individuals with higher age group individuals have lower chances of having no children.

Education- compared to women with primary education, women with no education (if it's coded as 0) have odds about 13.83 times higher of whatever outcome you're measuring. As a person moves to secondary education the odds of having zero children ever born increase by 51.16% times higher of the outcome, holding other variables constant. Compared to women with primary education, women with higher education have much higher odds about 9.525% times higher of the outcome, holding other variables constant. This suggest an unexpected result where higher education was associated with a higher likelihood of having zero children ever born.

Residence- compared to urban residents, rural residents have odds about 8.184times higher of having zero children ever born, holding other variables constant. This could imply that rural residence is associated with a higher likelihood of having zero children born.

With reference to the above table it is noted that Compared to individuals who are Hindu, Muslims have odds about 86.375 times higher of having no children born, holding other variables constant. While Christians the odds of having no children born was 2.735%. While those belonging to the category of religion not specified the odds of having no children born is 119.79%.

Caste - Scheduled Tribe members have odds about 8.43% times higher of having zero children being born compared to Scheduled Caste (SC) members, holding other variables constant. Other Backward Classes members have odds about 40.47 % times higher of having zero children being born compared to SC members, holding other variables constant. Individuals who do not belong to any specified caste category have odds about 215.83 times higher of the outcome compared to SC members, holding other variables constant.

Wealth index –compared to the base category poorest, individuals in the "poorer" category have odds about 2.44 times the odds of having no children born. For the "middle" category, individuals have odds about 2.835 times the odds of having zero child born. Individuals in the "richer" category have odds of 2.52 of not having children or zero children being born to them. Individuals in the "richest" category have significantly lower odds 1.31% of the outcome compared to the base category. This revels that richer people tend to have fewer children, compared to the poor and poorest section of the society. But in the case of the richest section of the society it is observed that they have lower odds of having no kids being born. This could be because they have better access to healthcare or prefer having a larger family.

Working status- This suggests that individuals who are working have odds about 9.39 times higher of having zero children being born to those who are not working. This could be because working people might delay having children or have fewer children due to their job commitments or other factors.

Individuals in agricultural occupations have odds about 5.84 times higher of having zero children born compared to those in the base category (non-agricultural). The category labelled others has odds about 200.79 times higher of having no children born compared to those in the base category. This suggest that people belonging to “others” category are less likely to have being children being born.

1- 5 children ever born is taken as a base category.

6-10 children ever born.

It has been noted from the analysis that there is a massive increase in the odds of having 6-10 children ever born compared to women aged 19. This indicates that women in the 20-24 age range have much higher odds of having larger families.

Similarly for the age group 25-29 the odds of having 6-10 children born is 12160278. Which is higher than the age group 20-24. Women in the 30-39 age range have significantly higher odds of having 6-10 children ever born, suggesting that fertility remains high during this period.

Education- the odds of having 6-10 children for women who have primary education is1.94 Therefore, Women with primary education are less likely to have 6-10 children than those with no education. The odds of having 6-10 children for women who have secondary education is 1.42 which suggests that women with secondary education are even less likely to have 6-10 children than those with primary education. For higher education, a coefficient of 0 indicates that there is no difference in the odds of having 6-10 children between women with higher education and those with primary education. As education level rises, women are less likely to have 6-10 children, especially with secondary education, while higher education doesn't change this much compared to having primary education.

Residence- the odds of having 6-10 children ever born for those living is rural is 3.56 higher compared to the reference category. So, women living in rural areas are more likely to have 6-10 children compared to those living in urban areas.

Religion- the odds of having 6-10 children for Muslim is 4.91 which is higer compared to thr reference category. Muslim women are more likely to have 6-10 children compared to the Hindus. Compared to Hindu's (the reference category), being Christian has no significant impact on the likelihood of having 6-10 children ever born. A coefficient of 0 indicates that

there is no difference in the odds of having 6-10 children between women who identify as Christian and Hindus.

The odds of having 6-10 children for the “others” category is 1.53 so, women with other religious affiliations are more likely to have 6-10 children compared to the Hindu category.

Caste- the odds of having 6-10 children to those women belonging to the ST category is 2.85 higher than the reference category. The women belonging to Scheduled Tribes are less likely to have 6-10 children compared to those belonging to Scheduled Castes. The women belonging to Other Backward Classes are more likely to have 6-10 children compared to those belonging to Scheduled Castes. Lastly, women who do not belong to any specified caste category are less likely to have 6-10 children compared to those belonging to Scheduled Castes. Women belonging to Other Backward Classes (OBC) tend to have higher odds of having 6-10 children compared to those belonging to the Scheduled Caste (SC) category, while women belonging to Scheduled Tribes (ST) or not belonging to any specified caste category are less likely to have 6-10 children.

Wealth index- the odds of having 6-10 children to those belonging to the poorer category is 1.95 which is higher as compared to the reference category. So, women in the poorer wealth category are less likely to have 6-10 children compared to those in the reference category.

Being in the middle wealth category the odds of having 6-10 children ever born are 1.70 , women in the middle wealth category are even less likely to have 6-10 children compared to those in the poorest wealth category (reference).

Being in the richest wealth category on the odds of having 6-10 children ever born is 1.3

A very small coefficient suggests that being in the richest wealth category significantly decreases the likelihood of having 6-10 children compared to being in the reference category. So, women in the richest wealth category are the least likely to have 6-10 children compared to those in the other wealth categories.

The odds of having 6-10 children born for a working women is 2.39. So, women who are working are less likely to have 6-10 children compared to those who are not working.

Occupation- being in an agricultural occupation on the odds of having 6-10 children ever born are 3.99. So, women in agricultural occupations are more likely to have 6-10 children compared to those in non-agricultural occupations.

10 and more children ever born

Age – women belonging to 39-49 years group have higher odds of having 10 and more kids compared to the other age categories. Suggesting that as a women age increases there are more chances of her having more children.

Education- the odds of having 10 and more children born for all the educational categories is 0 suggesting that, there is no significant difference in the likelihood of having 10 or more children compared to women with no education.

Residence- Women living in rural areas have substantially higher odds of having 10 or more children compared to those in urban areas.

Religion- the odds of a Muslim women and a Christian women having 10 and more children is 2.56 and 2.15 respectively. While those belonging to the others category have higher odds of having 10 and plus children born.

Caste - Women belonging to Scheduled Tribes (ST) and Other Backward Classes (OBC) have higher odds of having 10 or more children compared to those belonging to Scheduled Castes (SC). Women not belonging to any specified caste category (None of them) show no significant difference. The OBC category shows highest level of odds of having 10 and more children compared to the other castes group.

Wealth - Women in the "poorer" wealth category have slightly higher odds of having 10 or more children compared to the reference category. However, women in the "middle," "richer," and "richest" wealth categories whose coefficients are 0 show no significant difference.

Working status - Women who are working have higher odds of having 10 or more children compared to those who are not working. Being employed is associated with an increased likelihood of having a larger number of children.

Occupation- Women in agricultural occupations and those in the category not specified show no significant difference in the likelihood of having 10 or more children compared to the reference category.

4.5) OBJECTIVE 2 ANALYSES

Model 1: OLS, using observations 2009-2022 (T = 14)
Dependent variable: d_TFR
HAC standard errors, bandwidth 1, Bartlett kernel

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
d_GDP	−0.00654990	0.00346453	−1.891	0.0831	*
d_womenLaborforcepartRate	1.04951	1.22340	0.8579	0.4078	

Mean dependent var	−2.219429	S.D. dependent var	3.435261
Sum squared resid	197.2798	S.E. of regression	4.054625
R-squared	0.112852	Adjusted R-squared	0.038923
F(2, 12)	2.131250	P-value(F)	0.161422
Log-likelihood	−38.38410	Akaike criterion	80.76820
Schwarz criterion	82.04631	Hannan-Quinn	80.64988
Rho	−0.046689	Durbin-Watson	1.917277

The Coefficients are interpreted as –

Augmented Dickey Fuller test was conducted to check if the data was stationary. Data was found to be to be stationary after taking the 1st difference model the unit root problem was over and now data was made stationary.

The coefficient for d_GDP is -0.00654990. This indicates that a one-unit increase in the growth rate of GDP (d_GDP) is associated with a decrease of approximately 0.00655 units in the dependent variable, d_TFR (total fertility rate), holding other variables constant. The

coefficient is negative, suggesting an inverse relationship between GDP growth and the total fertility rate.

The coefficient for d_womenLaborforcepartRate is 1.04951. This suggests that a one-unit increase in the growth rate of women's labour force participation rate is associated with an increase of approximately 1.0495 units in the total fertility rate, holding other variables constant. However, the coefficients lack statistical significance in this model since the p values are greater than 0.05 Since the variables in the model were non stationary and have now become stationary therefore it is necessary to perform the cointegration test to establish a long run relationship. To check whether the variables are cointegrated or not, the Johanson Cointegration test (JCT)was conducted. The hypothesis for the same is

Null Hypothesis: H0- There is no cointegration equation.

Alternate Hypothesis:H1- H0 is not true

Cointegration tests, ignoring exogenous variables

Rank	Eigenvalue	Trace test	p-value	Lmax test	p-value
0	0.74185	24.027	[0.0016]	17.605	[0.0125]
1	0.38983	6.4223	[0.0113]	6.4223	[0.0113]

The ‘Rank’ column indicates the number of cointegrating relationship present. The Eigenvalues shows the strength of cointegration. ‘Trace test’ and ‘Lmax Test’ assess the significance of cointegration.

The test states a low p-value, which is below 0.05, indicates statistical significance. When considering Rank 0, which implies no cointegrating relationships, the obtained p-value of

0.0094 leads to rejection of the null hypothesis, suggesting the presence of at least one cointegrating relationship. The results further indicate Rank 1, which suggests the existence of one cointegrating relationship. With a p-value of 0.0310 for Rank 1, there is statistically significant evidence supporting the presence of this cointegrating relationship. In conclusion, the cointegration tests provide strong evidence of at least one cointegrating relationship among the variables, with statistical significance.

Eigenvalues

- Eigenvalue 1 (0.74185): Since this eigenvalue is less than 1, it suggests that the first cointegrating relationship might not be very strong. However, it's still close to 1, indicating some level of cointegration.
- Eigenvalue 2 (0.38983): Similarly, this eigenvalue is also less than 1, indicating a potentially weaker cointegrating relationship compared to the first one.

The eigenvalues from the cointegration tests give us clues about how strongly the variables are connected in the long run. Even though neither eigenvalue goes above 1, which would indicate a strong connection, they both suggest there's some level of long-term relationship among the variables. The first eigenvalue is close to 1, showing a moderate connection, while the second one is weaker. So, even though these connections aren't super strong, they still suggest that the variables tend to move together over time, just maybe not as tightly as we'd expect with higher eigenvalues. Overall, it tells us that there's likely some stable relationship among the variables, even if it's not the strongest one.

Beta values- The long-term linkages between d_GDP (change in Gross Domestic Product) and d_womenLaborforce (change in women labor force) in the model are represented by the cointegrating vectors that are provided. These vectors provide insights into the ways in which these variables interact over time. The effect of a unit change in each variable on the others is

represented by a coefficient within the vector. An rise in GDP causes a drop of 0.0061036 units in the first variable and 0.0058459 units in the second, according to the coefficients for d_GDP, which are 0.0061036 for the first variable and -0.0058459 for the second. On the other hand, the coefficients related to d_womenLaborforce, which are 0.78397 and 1.0649, suggest that an increase of one unit in the number of women working leads to a corresponding rise of 0.78397 and 1.0649 units in the variables. These coefficients show that d_GDP and both variables have a negative association, indicating that drops in both are correlated with GDP growth. On the other hand, the positive coefficients for d_womenLaborforce suggest that both variables climb in response to an increase in women's labor force participation. All in all, these explanations illuminate the long-term dynamics and relationships between the variables in the model's long-term equilibrium.

The long-run matrix-The long-run matrix provides insights into the long-term equilibrium relationships between the variables d_GDP (change in Gross Domestic Product) and d_womenLaborforce (change in women labor force).

.. Analyzing the values in the matrix provides distinct meanings for every variable. For d_GDP, the matrix shows that for every unit rise in the long-term change in GDP, there will be a drop of around 1.1096 units in GDP itself and a decrease of about 0.00050257 units in the change in the labor force participation rate among women. Comparably, for d_womenLaborforce, a one-unit rise in the change in the labor force of women leads to a long-term decline in GDP of around 85.017 units and a change in the labor force of women of about 1.0882 units. Long-term inverse relationships between the variables are highlighted by these negative values, which indicate corrections made to keep things in balance. In conclusion, the long-run matrix provides insight into the complex interactions and adjustments between d_GDP and d_womenLaborforce. Specifically, increases in GDP lead to

decreases in both GDP itself and the change in women labor force, while increases in women labor force lead to decreases in both GDP and the change in women labor force.

VECM - Since the analysis of JCT has confirmed cointegration between the variables (such as d_GDP and d_womenLaborforce), then employing a VECM would be appropriate. The presence of cointegration suggests that the variables are linked in the long run and that short-term deviations from the equilibrium relationship are corrected. VECM explicitly represents the process of returning to equilibrium after a short-term deviation. This is particularly relevant when examining the short-term dynamics of the relationship between variables.

MODEL - D_TFR~ d_GDP + d_women labour force participation rate

Ensure that the variables are integrated of order 1 (I(1)), indicating that they are stationary after differencing once.

- Comparing the AIC (Akaike criterion) and HQC (Hannan-Quinn) of the VECM model with the previous model after doing the first differencing for the variables.(refer to model 1)

4.6) TABLE 2

Model 1	**VECM Model**
AIC **80.76820**	AIC 16.1027
HQC **80.64988**	HQC 16.0312

Source- authors own composition

Lower values of AIC and HQC indicate better model fit.

Final model after VECM test

```
Equation 1: d_d_GDP
             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       89.3152      40.2859       2.217    0.0509  *
  d_TFR       13.3131      10.2651       1.297    0.2238
  EC1         -0.924448     0.198297    -4.662    0.0009  ***
Mean dependent var   3.643185   S.D. dependent var   193.5701
Sum squared resid    137217.9   S.E. of regression   117.1401
R-squared            0.694822   Adjusted R-squared   0.633787
rho                  0.288340   Durbin-Watson        1.232305
Equation 2: d_d_womenLaborforcepartRate
             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       0.288607     0.382199      0.7551   0.4676
  d_TFR      -0.0109113    0.0973870    -0.1120   0.9130
  EC1        -0.00379826   0.00188128   -2.019    0.0711  *
Mean dependent var   0.059048   S.D. dependent var   1.205986
Sum squared resid    12.35049   S.E. of regression   1.111327
```

Equation 1 shows the relationship for the variable d_d_GDP (change in Gross Domestic Product) in this revised Vector Error Correction Model (VECM), and Equation 2 depicts the dynamics of d_d_women.LaborforcepartRate (variation in the rate of female labor force participation).

First Equation: d_d_GDP- With a standard error of 40.2859, the coefficient for the constant term (const) is 89.3152. This coefficient represents the anticipated shift in d_d_GDP assuming that all other variables remain unchanged.

The change in the total fertility rate, or d_TFR, has a coefficient of 13.3131 and a standard error of 10.2651. Nevertheless, this coefficient is not statistically significant, with a p-value of 0.2238. The error correction term (EC1) has a coefficient of -0.924448 and a standard error

of 0.198297. This coefficient is statistically significant (p-value < 0.001), suggesting a significant adjustment process towards equilibrium in the relationship between d_d_GDP and other variables.

Equation 2 shows that d_d_womenlaborforce participationrate- With a standard error of 0.3821, the coefficient for the constant term (const) is 0.2886. This coefficient represents the anticipated shift in women laborforce participation rate, assuming that all other variables remain unchanged.

The change in the total fertility rate, or d_TFR, has a coefficient of 13.3131 and a standard error of 10.2651. Nevertheless, this coefficient is not statistically significant, with a p-value of 0.2238. The error correction term (EC1) has a coefficient of -0.924448 and a standard error of 0.198297. This coefficient is statistically significant (p-value < 0.001), suggesting a significant adjustment process towards equilibrium in the relationship between d_d_GDP and other variables.

CHAPTER 5

Fertility trend in Goa

5.1) The total fertility rate (TFR) in Goa registers at 1.3 children per woman, notably falling below the replacement level of fertility. This reflects a decrease in fertility by 0.4 children between the National Family Health Survey (NFHS)-4 and NFHS-5. Both urban and rural areas exhibit markedly low fertility rates, with urban areas at 1.3 children per woman and rural areas at 1.4 children per woman, both significantly below replacement levels. GoaHigher levels of education and income are associated with lower fertility rates worldwide, indicating a positive correlation between improved social conditions and reduced family size. Despite lower fertility rates observed in other states, Goa stands out as the sole state with both low fertility and the lowest birth rate in the country. However, declining fertility rates and an aging population pose challenges, increasing the burden on the workforce and finances. Census 2011 data reveals that Goa ranks second, after Kerala, in the proportion of elderly individuals, with over 11% of its population aged 60 and above. Which in the long run will pose a challenge to the social security system of the state.("Goa's Birth Rate Is Steadily Falling, but Even More Rapidly in Recent Years," 2023) Examination of births within the three years preceding the survey reveals a decline in higher-order births, with only 2 percent being of birth order four or higher, down from 4 percent in NFHS-4. Fertility rates vary significantly by religion and caste/tribe. For instance, Muslim women are projected to have an average of 0.3 children less than Hindu women, resulting in a TFR of 1.2

compared to 1.5. Conversely, Muslim women are anticipated to have 0.2 children more than Christian women, yielding a TFR of 1.0. These statistics underscore the multifaceted nature of factors influencing fertility patterns and emphasize the necessity for targeted policies and interventions to address demographic shifts effectively. (NFHS 5 Report Goa)

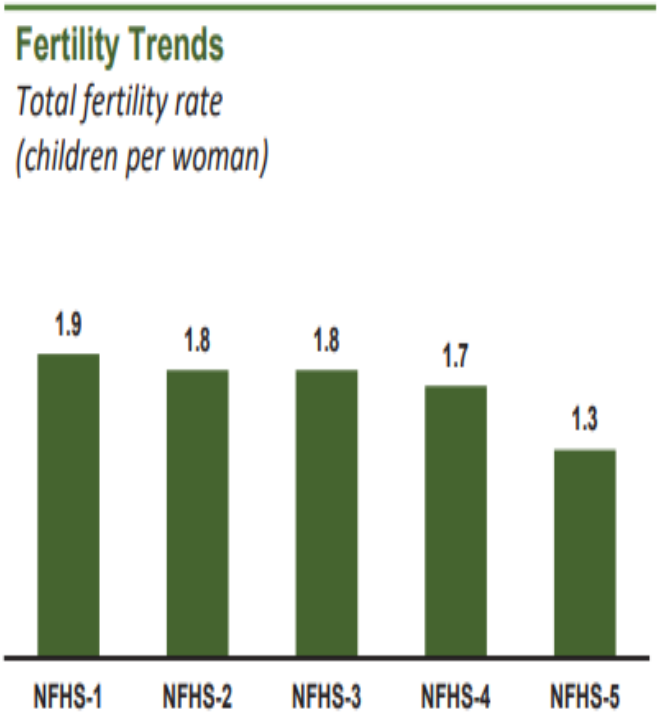
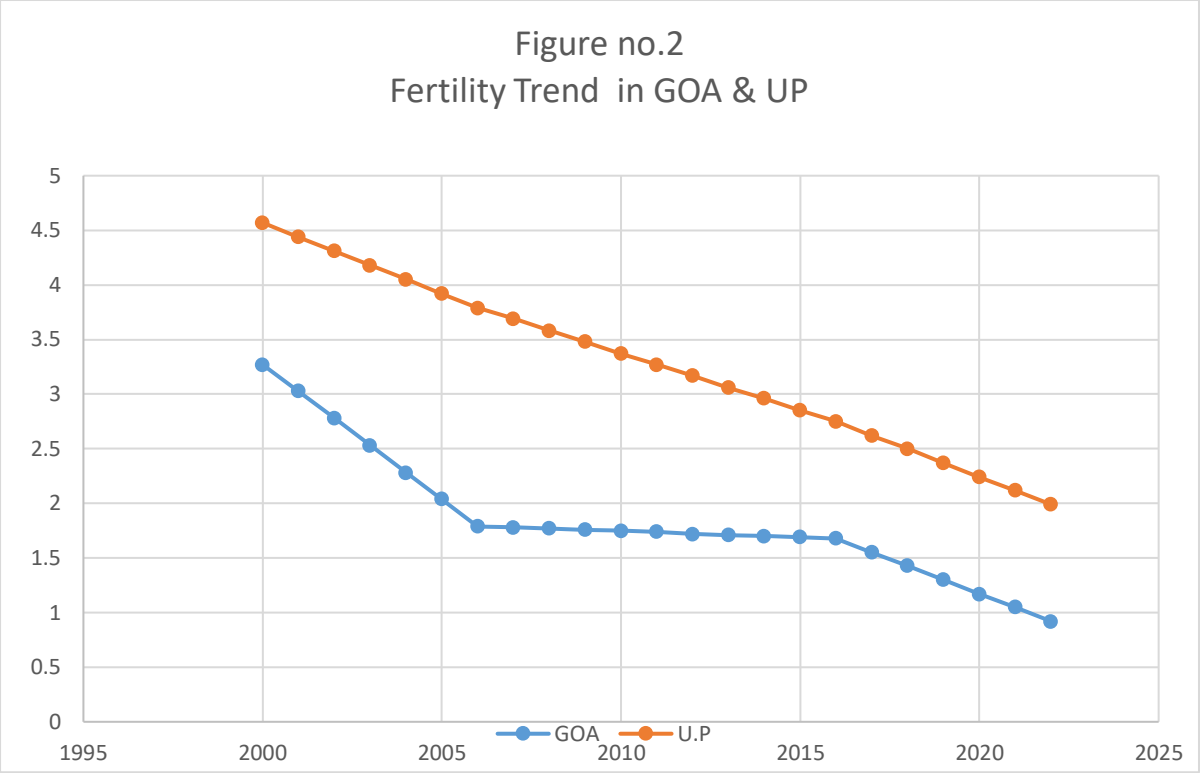


Figure No.1

Source NFHS 5 report Goa

5.2 Comparing Goa's Fertility rate to that of Uttar Pradesh

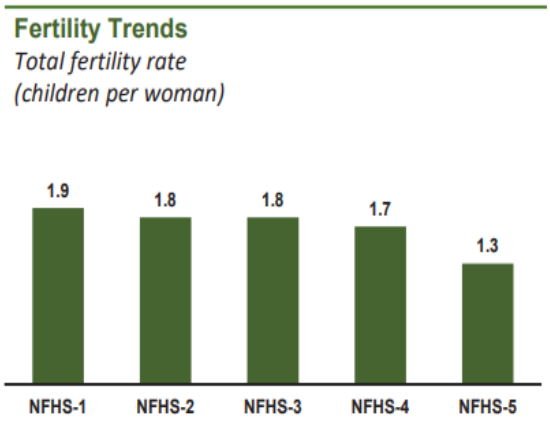


Source – Authors own composition

5.3) Interpretation from the graph

Over the span of two decades, from 2000 to 2022, both Goa and Uttar Pradesh experienced a remarkable decline in fertility rates, reflecting shifting demographic trends and socio-economic changes. In Goa, the fertility rate steadily decreased from 3.27 in 2000 to 0.92 in 2022, indicating a substantial reduction in the average number of children born to women over their lifetime. Similarly, Uttar Pradesh witnessed a significant decline, with the fertility rate dropping from 4.57 in 2000 to 1.99 in 2022. This downward trajectory in fertility rates aligns with global patterns observed in regions undergoing rapid development and increasing access to education and healthcare. The data underscores a fundamental transformation in

family planning practices and underscores the importance of addressing demographic shifts in policy-making and planning for the future.



CHAPTER 6

FINDINGS AND CONCLUSION

6.1) FINDINGS

6.1, a) For Objective 1

1. Age-Women aged 39-49 have higher odds of having 10 or more children, indicating a correlation between older age and larger families.

2. Education Influence- Higher education correlates with lower fertility rates, particularly secondary education, suggesting a trend towards smaller family sizes with increased education levels.

3. Residence Factor- Rural areas exhibit higher fertility rates, with rural residents having increased odds of both zero children and larger families (6-10 children).

4. Religious Variation- Muslims tend to have higher fertility rates compared to Hindus, while Christians show no significant difference. Other religious groups may have higher odds of having larger families.

5. Caste - Other Backward Classes (OBC) having higher odds of larger families compared to the other casts in India.

6. Wealth Influence-Wealthier individuals generally have fewer children, but the richest category shows lower odds of larger families.

7. Working Status and Occupation- Working individuals are likely to have larger families compared to those not working. Those engaged in agricultural occupations are associated with higher odds of larger families.

6.1,b) For objective 2

The study conducted OLS regression analysis, revealing a relationship between GDP growth, women's labour force participation, and total fertility rate. Although coefficients lacked statistical significance, indicating a subtle connection. Cointegration tests confirmed at least one long-term relationship among the variables, suggesting they move together over time, albeit moderately. VECM analysis, prompted by cointegration, showed improved model fit with lower AIC and HQC values compared to the previous model. Equations within the VECM highlighted the expected shifts in GDP growth and labour force participation rate. Notably, the error correction term in the VECM was statistically significant, implying a significant adjustment process towards equilibrium. Overall, the study underscores the intricate interplay between economic growth, female labour force participation, and fertility rates, emphasizing both long-term stability and short-term dynamic

6.2 CONCLUSION

- This Concludes that the socio- economic factors play a great role in shaping the fertility choices among women and also it has been noted that the zero children category showed more significant values compared to the other categories.
- The research underscores the complex relationship between economic growth, women's participation in the workforce, and fertility rates, indicating the necessity for comprehensive strategies to comprehend and manage demographic shifts amidst evolving socioeconomic landscapes.

6.3 SUGGESTION FOR FUTURE STUDIES

This research opens doors for further exploration. Future studies could delve deeper into specific aspects of the identified factors, like educational fields or religious denominations. Engaging in qualitative research, like interviews, could provide richer context on decision-making behind family planning. Analysing these factors and their relationships across different Indian states would reveal regional variations. Lastly, exploring how public policies can influence fertility choices in a desired direction offers valuable future research avenues.

BIBLIOGRAPHY

Bhalla, S. S., & Kaur, R. (n.d.). *Labour Force Participation of Women in India: Some facts, some queries*.

Boland, M. R. (2018). A model investigating environmental factors that play a role in female fecundity or birth rate. *PLOS ONE*, *13*(11), e0207932. https://doi.org/10.1371/journal.pone.0207932

Bongaarts, J., & Hodgson, D. (2022). *Fertility Transition in the Developing World*. Springer International Publishing. https://doi.org/10.1007/978-3-031-11840-1

CNA (Director). (2023, September 6). *India's fertility rate faces a sharp decline amid rising concern over lifestyle factors, infertility*. https://www.youtube.com/watch?v=511xl_yt30o

Dyson, T., & Moore, M. (1983a). On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Population and Development Review*, *9*(1), 35. https://doi.org/10.2307/1972894

Dyson, T., & Moore, M. (1983b). On Kinship Structure, Female Autonomy, and Demographic Behavior in India. *Population and Development Review*, *9*(1), 35–60. https://doi.org/10.2307/1972894

Goa's birth rate is steadily falling, but even more rapidly in recent years. (2023a, April 2). *The Times of India*. https://timesofindia.indiatimes.com/city/goa/goas-birth-rate-is-steadily-falling-but-even-more-rapidly-in-recent-years/articleshow/99183968.cms

Goa's birth rate is steadily falling, but even more rapidly in recent years. (2023b, April 2). *The Times of India*. https://timesofindia.indiatimes.com/city/goa/goas-birth-rate-is-steadily-falling-but-even-more-rapidly-in-recent-years/articleshow/99183968.cms

Golub, R., Ivkov-Dzigurski, A., & Simeunović, V. (2023). Determinants of Fertility Intentions of the Women in Bosnia and Herzegovina—An Example from the Semberija Region. *Behavioral Sciences*, *13*(5), 417. https://doi.org/10.3390/bs13050417

Kazemzadeh, E., Fuinhas, J. A., Salehnia, N., & Osmani, F. (2023). The effect of economic complexity, fertility rate, and information and communication technology on ecological footprint in the emerging economies: A two-step stirpat model and panel quantile regression. *Quality & Quantity*, *57*(1), 737–763. https://doi.org/10.1007/s11135-022-01373-1

Kundu, S., Ali, B., & Dhillon, P. (2023). Surging trends of infertility and its behavioural determinants in India. *PLOS ONE*, *18*(7), e0289096. https://doi.org/10.1371/journal.pone.0289096

Madalozzo, R. (2012a). Transitions in Fertility for Brazilian Women: An Analysis of Impact Factors. *PLoS ONE*, *7*(7), e40756. https://doi.org/10.1371/journal.pone.0040756

Madalozzo, R. (2012b). Transitions in Fertility for Brazilian Women: An Analysis of Impact Factors. *PLoS ONE*, *7*(7), e40756. https://doi.org/10.1371/journal.pone.0040756

[Personal communication]. (n.d.). [Personal communication].

Ranjan, A. (n.d.). *Selected Papers of Bhopal Seminar 201*.

Religion and Fertility in India. (2024).

Sarkar, S., & Gupta, P. (2016). *Socio-Demographic Correlates of Women's Infertility and Treatment Seeking Behavior in India*. *17*(2).

Schoumaker, B. (2013). A Stata module for computing fertility rates and TFRs from birth histories: tfr2. *Demographic Research*, *28*, 1093–1144. https://doi.org/10.4054/DemRes.2013.28.38

Singh, P., Das, A., William, J., & Bruckner, T. (2021). Fertility, economic development, and suicides among women in India. *Social Psychiatry and Psychiatric Epidemiology*, *56*(10), 1751–1759. https://doi.org/10.1007/s00127-021-02054-4

Traeger, B. (n.d.). *Poverty and Fertility in India: Some Factors Contributing to a Positive Correlation*.

Vollset, S. E., Goren, E., Yuan, C.-W., Cao, J., Smith, A. E., Hsiao, T., Bisignano, C., Azhar, G. S., Castro, E., Chalek, J., Dolgert, A. J., Frank, T., Fukutaki, K., Hay, S. I., Lozano, R., Mokdad, A. H., Nandakumar, V., Pierce, M., Pletcher, M., … Murray, C. J. L. (2020). Fertility, mortality, migration, and population scenarios for 195 countries and territories from 2017 to 2100: A forecasting analysis for the Global Burden of Disease Study. *The Lancet*, *396*(10258), 1285–1306. https://doi.org/10.1016/S0140-6736(20)30677-2

What does the global decline of the fertility rate look like? (2022, June 17). World Economic Forum. https://www.weforum.org/agenda/2022/06/global-decline-of-fertility-rates-visualised/

World Bank Open Data. (n.d.). World Bank Open Data. Retrieved February 16, 2024, from https://data.worldbank.org

(Balhasan Ali* 1and Preeti Dhillon2) Cointegration and Causality between Fertility and Female Labour Force Participation in India (2022)