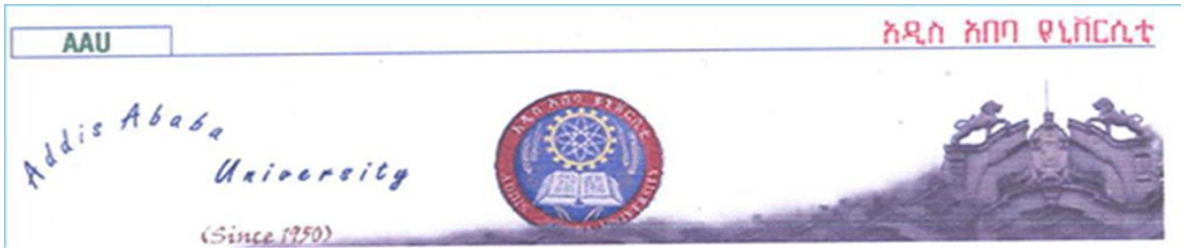

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BY

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SUPERVISORS

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JANUARY 2025

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A DISSERTATION SUBMITTED TO THE CENTER FOR POPULATION STUDIES, COLLEGE OF DEVELOPMENT STUDIES, ADDIS ABABA UNIVERSITY FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN POPULATION STUDIES

DECLARATION

I, the undersigned, declare that this dissertation entitled "*Examining change in nuptiality patterns and implications for fertility transition in Ethiopia*" is my original work and has not been presented for a degree in any other University or organization and that all sources of materials used for the dissertation have been duly acknowledged.

Declared by:

Name: Dame Kedir

Signature:_____

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Publications

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4. Chapter Five: Sources of Spatial Heterogeneity in Fertility Transition with Specific Emphasis on Oromia and Amhara Regional States of Ethiopia

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Abbreviation and acronyms

ASFR	Age specific Fertility Rate
CEB	Children Ever Born
CI	Confidence Interval
CIFs	Cumulative Incidence Functions
CMC	Century Month Codes
CSA [Ethiopia]	Central Statistical Agency [Ethiopia]
DHS	Demographic and Health Survey
EAs	Enumeration Areas
EDHS	Ethiopian Demographic and Health Survey
FDRE	Federal Democratic Republic of Ethiopia
LCT	Life Course Theory
LSM	Late Stable Marriage
LTF	Lifetime Fertility
LTFT	Lifetime Fertility Transition
PMS	Premarital Sex
SDG	Sustainable Development Goals
SNNP	Southern Nation and National People
TFR	Total Fertility Rate
TGE	Transitional Government of Ethiopia

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Abstract

This study comprehensively examines the shifts in nuptiality patterns in Ethiopia and their broader demographic implications, particularly focusing on the determinants of marriage timing, marital stability, and their contributions to lifetime fertility transitions. Using nationally representative data obtained from the Ethiopian Demographic and Health Surveys conducted in 2000 and 2016, the analysis reveals that marriage remains an early and nearly universal institution in Ethiopia. However, significant differences in the timing of first marriage and marital trajectories observed between the two birth cohorts and across the regions, reflecting the interplay of socioeconomic, cultural, and policy-driven influences. The national trends show a gradual shift towards delayed marriage and increased marital stability, with a notable 46% reduction in marital instability rates over the study period. These changes are driven by improvements in women's education and workforce participation, as well as regional disparities that underscore the importance of sub-national contexts. Addis Ababa and Gambela regions, for instance, demonstrated significant delays in marriage timing attributed to targeted policies, urbanization, and enhanced access to educational and economic opportunities. Conversely, the Harari and SNNP regions showed minimal changes in marriage timing, highlighting the prevalence of persistent cultural norms and the limited impact of policy in these areas.

The analysis further establishes a direct link between nuptiality patterns and the decline in lifetime fertility. Shifts in the timing of marriage, coupled with increased marital stability, reduced the overall fertility rate. Early marriage and instability, while still prevalent, were mitigated by improvements in socioeconomic conditions, reductions in child mortality, and the availability of modern family planning methods. These factors collectively contributed to a significant decline in fertility, underscoring the transformative role of nuptiality changes in shaping demographic transitions. The findings of this study highlight the critical need for region-specific interventions that address inequalities in education, wealth, and reproductive health services. Addressing these disparities can promote equitable marriage practices and better reproductive health outcomes. Furthermore, integrating nuptiality patterns into family planning and population policy frameworks offers an opportunity to optimize demographic transitions and improve the effectiveness of targeted programs.

Chapter 1. Introduction

1.1. Background

Nuptiality is an important component of the fertility transition, ensuring its sustainability. According to the theory of fertility transition, the sole fertility trend does not provide full information on the process of reproductive change. Nuptiality transition is the first step of fertility transition and preludes deliberate birth control (Bongaarts & Casterline, 2013b). Age at first marriage affects the length of the childbearing span by determining the time of entrance into marital life and the childbearing process. Therefore, to understand fertility as a component of population change, one needs to familiarize oneself with the concepts, definitions, and measurements of fertility and the nuptiality pattern itself (Hertrich, 2017).

Marriage, in its various forms, provides the primary social setting where the biological event of childbearing occurs. A woman's physiological capacity to have children is not dependent on the social phenomenon of marriage. Instead, a woman's fecundity varies with her age and health. Fecundity provides the biological potential for reproduction, marriage patterns and a variety of factors that determine women's actual reproductive performance, social norms, demographic patterns, and economic factors all play a part in shaping the character of marriage in a society (Peng, 2007).

The importance of nuptiality in the discipline of demography partly arises from its relationship with the age at which sexual relations begin and end and partly with the formation and dissolution of families and households. The frequency, characteristics and dissolution of marriage are important to measure fertility levels, as most births tend to occur within some kind of union. There are many forms of marriage such as formal, polygamous, consensual and marriage-type unions, for instance, cohabitation or visiting unions. The most commonly measured aspects of nuptiality are the rate and age at which this occurs, the characteristics of individuals involved and the rate of dissolution (Letamo, 2014).

According to Shapiro & Gebreselassie (2014), comparing the index of marriage from the Bongaarts model between the first and last demographic and health surveys (DHS) surveys (cross-sectional data) in 25 countries found mixed results: reduction in the proportion of married makes a significant contribution to national fertility decline (over 30% of the decline) in few countries only, but its impact is more common in urban places, especially in capital

cities. The study examined trends in age at marriage, and their influence on fertility by analyzing data from DHS and World Fertility Survey (WFS) reports across 33 sub-Saharan African countries. Age changes at marriage correlated with changes in fertility over the same period (Garenne, 2014).

According to the demographic transition theory, fertility transitions are driven by social and economic development. As modernization advances, societal socioeconomic changes such as industrialization, urbanization, new occupational structure, and increased education lead to low mortality and, subsequently, low fertility. A reduction in desired family size results from the rising costs of children and their declining economic value, which are the central forces driving the transition. The desire for smaller families, in turn, leads to a rise in the demand for and adoption of birth control (Bongaart, 2017).

In sub-Saharan African (SSA) countries, an initial fertility transition is confirmed as a shift from high to low fertility (Bongaarts & Casterline, 2013a). This observation motivated many demographic studies with the expectation that SSA countries progress through demographic transitions like other regions (Casterline & Agyei-Mensah, 2017). Ethiopia has been showing a decline in fertility. According to the 1990 National Family and Fertility Survey, the total fertility rate (TFR) was 6.6 children per woman. The rate declined to 5.5 in 2000, 5.4 in 2005, and further to 4.8 and 4.6 in 2011 and 2016, respectively (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b; CSA [Ethiopia] and ICF International, 2011; CSA [Ethiopia] and ORC Macro, 2005; Central Statistical Authority [Ethiopia] and ORC Macro, 2001).

The relationship between fertility decline and economic development is complex and often occurs simultaneously from 1950 - 2008 in SSA. Fertility decline is linked to socioeconomic factors such as women's educational attainment, income level, rising urbanization, lower marriage rates, and higher fertility outside of marriage. In cross-sectional studies, the level of education is universally negatively associated with fertility (Szente et al., 2007). Urban areas are associated with higher income levels, higher education levels, and better access to mass media. Educational attainment commonly works in combination with labor force participation to delay marriage. Educated women are found to be marrying at late ages or not getting married at all, and are using contraceptives more than uneducated women (Shapiro, 2012).

In Ethiopia, theoretically, age at first marriage for girls is determined by three sets of codified rules. One can also add customary law as a fourth set of rules. The three formal ones are the Feteha Negest, the Ethiopian Civil Code, and the Sharia Law (binding only on Muslims). The Gada system, the most prominent in customary laws, is the fourth. The Ethiopian Civil Code sets the minimum age for first marriage at 15, the Feteha Negest at 12, the Sharia Law at 9, and the Gada at 16 (Gelgelo et al., 2020). Moreover, the National Population Policy of Ethiopia 1993 stipulates that the minimum age at first marriage should be 18 years (Gazeta, 2000a; TGE, 1993). However, neither the old nor the new laws have any practical implications for demographic analysis because the age at marriage is not confirmed based on a birth certificate to prove the minimum age requirement of the law.

The study of nuptiality patterns provides essential information for understanding the mechanisms through which the demographic system reacts to social and economic changes. The nuptiality patterns encompass the magnitude and timing of marriage within this study and fertility transition informs a decline of TFR from high to low level and even to below replacement level. Henceforth, the Ethiopian government adopted a population policy that supports efforts in that direction and thereby balance the link between nuptiality patterns and fertility transition. The policy has several components, which deal with age at first marriage, family planning, and mother and child health. According to the National Population Policy of Ethiopia, the recommended minimum age at first marriage is 18 years (TGE, 1993).

Marriage has traditionally been early and universal in SSA (Ayiga & Rampagane, 2013). Due to the multi-ethnic and multi-cultural nature of Ethiopian society, the timing of entry into the marital union and level of marriage varies within/between societies (women) and across the regions. Moreover, the effects of socio-economic and demographic factors on early marriage and the prevalence of overall marriage may cause a variation at individual, community, and regional levels. However, no empirical evidence depicts the shift from early to delayed marriage and the decline in the proportion of women in marital unions and related regional variations (Gashaw, 2019).

1.2. Statement of the problem

The rising age of marriage is associated with several socioeconomic achievements, including a rise in education levels, labor skills, and career interests. These socioeconomic achievements

accelerate fertility transition by changing attitudes and behavior related to fertility (Muhoza, 2022). Changes in the economic sectors, notably in access to education, resulted in more girls joining and staying in schools, potentially reducing the number of eligible girls in the marriage market. Education is crucial in female empowerment, gender equality, and sustainable development (Shetty, 2015). The proximate determinants of fertility respond differentially to socioeconomic changes, and not all determinants shift in the same direction with fertility decline during the period of modernization (Rafael Caro-Barrera et al., 2022). However, the extent to which socioeconomic achievements influence marriage is unclear.

In Ethiopia, sex out of wedlock is not socially approved (Gurmu & Etana, 2014). Individuals are expected to have sex after entering into a marital union. That is, the age at first marriage exactly coincided with the age at first sexual intercourse. Marriage is a socially acceptable mode of procreation in Ethiopia and supposedly marks the start of family formation. The changes in marriage patterns like delayed marriage bring the issues of dating, premarital sex, unwanted pregnancy, abortion, polygamy, and marital instability. The idea that changes in nuptiality are part of a demographic transition was conceptualized in the 1960s (Erulkar, 2022). The nuptiality patterns of any country influence level of fertility significantly. Demographers have recognized marriage as one of the principal determinants of fertility (Orwa et al., 2023). However, the role of nuptiality changes in influencing fertility transition has not been adequately explored in Ethiopia.

A reduction in fertility has been strongly associated with a shift from early to late marriages. The proportion of married women at each age differs greatly between countries and over time and has significant effects on fertility. Raising the age of marriage is frequently suggested as an effective avenue for reducing fertility, especially in populations with relatively low levels of contraceptive use or induced abortion (Muhoza, 2022). The start of marriage is frequently linked to the start of childbearing. In countries where women marry at a young age, childbirth begins early, and the period of childbearing is longer. In communities where marriage occurs at a young age, fertility is higher than in societies where marriage occurs later in life (Bras et al., 2023).

Women's demographic and socioeconomic backgrounds are expected to have profound effects on behavior, values, and attitudes associated with the performance of their marriage. Populations with high age at marriage are likely more urbanized and use contraception

frequently. Thus, such populations may show low fertility because of their lost reproductive years due to late marriage and deliberate fertility limitation (Dribe et al., 2014).

The shift in prevalence levels of marriage and the timing of the first marriage is useful in explaining fertility transition. Ethiopia has been highlighted as a nation where the percentage of young women in unions is declining slowly (Shapiro & Gebreselassie, 2014). In unison, a decrease in the reproductive lifespan and a rise in age at first marriage contribute to reduced fertility. Although the proportion of married women is decreasing, little is known about how the shift in this trend affects the fertility transition of Ethiopians. An increase in age at first marriage, on the other hand, results in a rise in pre-marital fertility, which eventually offsets the falling effect of delayed marriage on the total fertility rate in countries with inadequate contraception (Alazbih et al., 2023). The extent to which this claim holds requires further research.

Marriage patterns have been changing over time. The prevalence and timing of marriage need closer attention because the total fertility rate is expressed as a function of the proportion of married, early marriage, and levels of marital and non-marital fertility (Jones, 2007). Previous research on fertility transition centered on measures of the proximate determinant model of fertility and identified marriage as the most important variable in Ethiopia (Laelago et al., 2019). The shift in marriage patterns marks the initial phase of the fertility transition and serves as a precursor to intentional birth control (Hertrich, 2017). However, in Ethiopia's context, the contribution of change in nuptiality pattern to fertility transition has not been adequately explored.

The current rise in age at first marriage played an important role in the ongoing fertility transition. According to the 2000 and 2005 EDHS reports, the fertility level showed a stall; from 2005 to 2011, EDHS showed a fertility decline; from 2011 to 2016, EDHS showed a slight stall. However, when we compare fertility levels observed in 2000 and 2016 EDHS, the path of fertility transition has been noted. From here, we set to examine how fertility has changed across the 2000 and 2016 DH surveys through changes in nuptiality patterns. It is noteworthy that by 2015, the Population Policy of Ethiopia set a target of 4.0 children per woman and a 44 percent contraception prevalence rate (TGE, 1993). The Ethiopian government has not yet met these targets.

Ethiopia has experienced impressive declines in child marriage over the past years. However, there are regional differences in early child marriage and median age at marriage in Ethiopia. The Amhara regional state experienced the biggest drop in the age of child marriage. In contrast, the Oromia regional state experienced an increase in the age of child marriage over the same period. Hence, progress has also been uneven, resulting in a geographical shift where child marriage is most prevalent (Erulkar, 2022). The median age at first marriage in the Oromia region slightly changed from 23.5 to 24. In contrast, the result for the Amhara region showed a significant change from 20.9 to 22.5 (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b; Central Statistical Authority [Ethiopia] and ORC Macro, 2001). Although few studies have been conducted to assess the role of nuptiality patterns in fertility transition, there is limited evidence about the reasons behind the geographical disparity in nuptiality and fertility transition in Ethiopia. Overall, the contribution of regional disparity in nuptiality patterns to fertility transition was not well investigated.

The total fertility rate in the Amhara regional state is relatively low at 3.7 and highest in Oromia at 5.4 children per woman. The Amhara regional state has recorded a noticeable fertility decline, whereas, for Oromia, regardless of the gain in fertility decline, the current fertility level is above the national average (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b). Thus, we set out to find answers to the question, "What are the underlying elements for these regional disparities in fertility transition?"

As explicitly noted in the Population Policy of Ethiopia 1993, the minimum age at marriage is 18 (TGE, 1993). Further, significant steps have been taken to end early marriage, even by revising the family law in 2000, which set the legal age of marriage at 18 for both men and women (FDRE, 2000). Other rules and norms are associated with tradition and religion, such as Sharia law, which sets the minimum age at first marriage to 9, or the traditional Gada system, which sets it to 16 (Ezra, 2003).

Notwithstanding the above-noted efforts, many women get married at a young age. The proportion of women who married before age eighteen was 64% in 2000 to 58% in 2016. In other words, significant numbers of women still get married before the minimum age of 18, regardless of all the efforts made. Early marriage is widely recognized as a harmful customary practice that impinges on the full enjoyment of the economic and social rights of women. It affects sexual and reproductive health, denies the opportunity for education, autonomy, and

decision-making, and exposes them to gender-based domestic violence (Hailemariam, 2016). The median age at first marriage increased from 16 years in 2000 to 17.1 years among women aged 25- 49 in 2016, and postponement in marriage has been shown. Over the last two decades, the number of women aged 30 – 49 who were never married increased from 4.2 percent in 2000 to 10 percent in 2016. This decline in nuptiality level is observed for all age groups (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b; Central Statistical Agency (CSA) [Ethiopia] and ICF International, 2011).

Before the formulation of the Population Policy of Ethiopia, marriage was highly concentrated towards an early age, and almost all women got married hence, marriage was universal. However, after the policy, there was still early marriage, and age variability at first marriage increased, with a shrinking proportion of ever-married women over time for all age groups. A disparity in nuptiality patterns has been observed in nine regions and two city administrations. Likewise, women's marital culture is changing. Nonetheless, there is a shortage of information/evidence explaining how far the Population Policy of Ethiopia has contributed to the changes in nuptiality patterns over time. Thus, this study attempted to provide evidence of how nuptiality patterns have changed, the factors associated with those changes, and the contribution of observed changes in nuptiality patterns to fertility transition in Ethiopia.

1.3. Literature review

The inquiry paradigm is a philosophical-analytical structure that a researcher uses to study a problem or phenomenon in the world. There are many forms of paradigm inquiry, including Interpretivist, post-positivist, and positivist views. Interpretivist scholars believe that multiple, equally valid realities are discoverable through academic inquiry. Post-positivists believe that objective reality can never be fully achieved because human intellectual mechanisms are flawed (Haydam & Steenkamp, 2020). The positivist paradigm inquiry relies on quantitative methods of study. Ontologically, positivists hold that there exist verifiable facts, the reality is constant for every individual (for instance, a patient's weight is constant regardless of who measures it), and observation and measurement reveal what that reality is. Here, the study addressed the assessment of change in nuptiality patterns, determinants of changes, and their contributions to fertility transition, which are measurable. These measurements were made objectively. This study adopted a positivist viewpoint.

Various theories were used in literature to explain the dynamics of the nuptiality of populations and its implication for fertility transition. To mention a few, modernization theory, demographic transition theory, and life course theory were theories utilized most prominently in nuptiality and fertility research. Modernization theory argues that socio-economic development affects age at first marriage through spouses' self-selection and women's economic independence (Malhotra & Tsui, 1996).

According to the demographic transition theory (DTT), the shift to a low fertility rate will not happen until there has been a comprehensive modernization process, urbanization, education, women's empowerment, significant general socioeconomic development, and access to family planning services. DTT explains the overall historical trends of fertility and mortality transition unified, linking them to modernization (Zhang, 2021). The goal of life course theory is to comprehend and explain human behavior, looking at the social and economic backdrop of lives, as well as the social and individual meanings society places on the passage of biological time (McAdams & Olson, 2010).

1.3.1. Theoretical background of the study

The prevailing nuptiality patterns of a population has major implications for family/household formation for mortality. It is the major determinant of the timing of a sustained fertility decline in the demographic. In Europe and the Scandinavian nations, nuptiality began to drop in age at marriage in the first half of the 1960s. Later, this trend was adopted by some developing countries and other countries in Western Europe. Between 1950 and 1985, nuptiality trends impacted the demographic shift. Between 1950 and 1990, nuptiality changes contributed to Africa's population shift. Every adult female in the SSA is expected to marry at least once during her reproductive life, making marriage practically early and universal (Chojnacka, 1995).

Marriage is a socially acceptable mode of procreation and supposedly marks the start of family formation. Marriage timing refers to the age of a woman transitioning from never-married to ever-married status. In contrast, marriage prevalence refers to the age distribution of the ever-married and never-married women. Many academics studied nuptiality patterns with the perspective of determinants of age at first marriage and try to explain why people are less likely to get married. For instance, according to economic theory, in times of depression, marriage is put off until better times come. In contrast, in times of prosperity, where there is greater demand

for labor and higher expectations of money, younger weddings occur (Ayiga & Rampagane, 2013).

Developed countries' families and living arrangements have changed dramatically since the 1960s. The features change were the gradual decline of marriage and growth of cohabitation, the postponement of union formation and childbearing, the rise in union instability, and the disconnection between marriage, sex, and reproduction. The economic requirements and social restrictions were the driving forces behind the decline in nuptiality in many European countries (Schwanitz & Mulder, 2015). The need to delay marriage arises from resource limitation, which often results from excessive population growth. In turn, such a postponement could lead to a substantial reduction in fertility (Reniers & Watkins, 2010).

1.3.1.1. Modernization Theory

The evaluation of change in nuptiality patterns provides essential information to understand the mechanisms through which the demographic system reacts to social and economic changes, usually referred to as 'modernization'. Evolutionary theory states that women are ultimately attracted to a marital union for reproduction, whilst modernization theory argues that education and employment opportunities for women cause them to delay the timing of their first marriage (Gurmu & Etana, 2014). Modernization theory increases personal freedom, which is linked to alterations in demographic phenomena like cohabitation, divorce, and late marriage. The shortcoming of modernization theory was that it mainly examined macro-level variables that affect dichotomous transition experiences, specifically the disruption of conventional transition experiences (Berger, 2010).

The theory of demographic transition is one component of modernization theory and examines the relationship between economic progress and population expansion. Demographic Transition is the continual change of population indicators from an initially stationary population characterized by high mortality rates to lower fertility and mortality rates (Lesthaeghe, 2014). Thus, fertility transition is considered to be a subset of demographic transition. The shift in fertility levels from higher rates to replacement levels is considered a prerequisite to a population age structure shift resulting in a demographic dividend (Sewnet, 2022). In addition, the SDT connects fertility and nuptiality to structural changes such as increasing access to formal education, increasing levels of urbanization, and cultural changes

such as secularization, technological advancements, and the use of modern contraception. The theory allows for new lifestyles and consequent fertility behavior (Sobotka & Toulemon, 2008).

The mortality drops in the first demographic transition fueled the fertility transition, and the change in nuptiality pattern in the second demographic transition is the cause of the fertility transition. The SDT-related value changes are predicted to cause the mean age at marriage to increase, age at first marriage rates to decline, divorce rates to rise, cohabitation to become increasingly common and accepted, and the proportion of non-marital births to increase (Ortega, 2014). Many decisions regarding nuptiality changes and fertility transition are taken from the whole concept of modernization (Nobles et al., 2015).

The cause of transition has been sought in the reduction of the death rate by controlling the epidemic and contagious diseases. Children then become more expensive due to modernization. Cultural shifts diminish children's relevance. Smaller families result from women's increased ability to control reproductive choices. In light of this shift in attitudes, emphasis is now placed on the quality of children rather than their quantity. In summary, fertility transition is spreading worldwide, and any nation can be positioned on a continuum of transitional progress (van Bavel, 2010).

In Ethiopia, marriage was an early and universal social institution. By age 30, over 95 percent of all women are ever married (Central Statistical Agency (CSA) [Ethiopia] and ICF International, 2011) (CSA, 2007). There is great interest in nuptial studies in Ethiopia because most of Ethiopia's population is non-contraceptive, and marriage plays an important role in determining fertility levels and population growth (Ahmed Shallo, 2020). Very few studies have been conducted to understand Ethiopia's marriage patterns and regional fertility disparity.

Microeconomic theories employ human behavior to explain the establishment of marriages in studies of the timing of first marriages. As a result, the decision to marry or remain single is influenced by the perceived benefit of joining a married partnership vs. the perceived expense. The utility function includes factors such as the number of children, the prestige/social standing associated with marriage, and the benefits of the division of labor (Stevenson & Wolfers, 2007). Gary Becker's fertility theory holds that high-income people would purchase more children; the people behave as they would in purchasing consumer durables. However, higher-income groups frequently have fewer children. Higher-income families want high-quality children who

are more expensive. An increase in women's incomes and labor involvement reduces the benefits of marriage. There is mounting evidence that first weddings are being postponed in Sub-Saharan Africa, while the percentage of people who have never married is rising. Women's formal education, urbanization, and more economic options for women outside of marriage have all been cited as reasons for the shift in marital patterns (Becker et al., 1977).

Oppenheimer (1988) explores the dynamics behind the rising age at first marriage among women and links this trend to evolving societal gender roles. In the past, women could enter into marriage at a young age. However, according to Oppenheimer, the entry of women into paid employment changed the selection criteria, and the significance of women's income has grown. During the period of educational enrolment, the uncertainty of delay in family formation is considerable (Oppenheimer, 1988a).

The economic theory of marriage states that marriage is a function of economic benefits to individuals to maximize their well-being and production through marriage. Furthermore, uneducated and less educated women are easily trapped into marriage due to the perceived benefit from the potential husband’s earnings. However, educated women are less likely to marry since they can maximize their preferences elsewhere in the market because of their personal qualities (Torr, 2011).

1.3.1.2 Life Course Theory

A life-course perspective is the most effective way to examine individuals and groups' past lives and potential future trajectories. The idea bases its explanation on how demographic events change based on socioeconomic status and other contextual factors of individuals. The socioeconomic context of youths significantly influences the occurrence and timing of major family life course events. The event's timing, exposure, and interplay are crucial factors that can addressed quickly from a life-course perspective in the research of change in demographic events. Demographic and societal change has long been based on the time and order of significant life events connected to reproduction, such as the beginning of childbearing, the formation of partnership or marriage, and the first sexual encounter (Roy, 2014).

LCT allows us to look at the many different aspects of the life course while also considering the timing, length, and sequence of occurrences. Both men and women must go through the process of family formation in order to complete their lives. Families are often the

environments where most life course events occur, making family formation an important indicator of transitions between various life phases and social statuses. We concentrate on three events that serve as the cornerstone of almost all processes of family formation despite the fact that the process of family formation differs significantly across various cultural contexts. The second process is marriage or long-term relationships in which society encourages and anticipates having children. The third is the initiation of childbearing, which can consolidate the social status of marital relationships (Cheng et al., 2021). Families are formed through an extremely important process for individuals and societies. Most people base their social, emotional, and financial existence on their families, which collectively influence social groupings and countries' demographic, sociological, and economic development.

A life-course perspective is the most effective way to examine individuals and groups' past lives and potential future trajectories. According to LCT, the trajectory of people's and families' life experiences is influenced by the previous and present life phases. The interaction of socioeconomic, environmental, and behavioral factors is thought to be what determines how people develop over their lifetime. The timing and magnitude of marriage understood when it related to other status transitions typically follow or closely precede the entrance to matrimony. A shift in marriage age is a relatively unimportant finding unless this change is seen in the context of the timing of other events in the familial career, such as entrance to the labor force, education, place of residence, establishment of a household (Crosnoe & Riegle-Crumb, 2007).

1.3.1.3. Other relevant theories

Diffusion theory offers a valuable framework for analyzing how changes in marriage patterns affected the lifetime fertility transition in Ethiopia from 2000 to 2016. This theory explains how new ideas, innovations, technologies, or practices spread within or between societies over time. The transition from early marriage to later marriage and the growing acceptance of cohabitation and singlehood signifies a shift in social norms surrounding marriage (Pandey et al., 2018). New marriage patterns are adopted at different rates by different demographic groups. Early adopters, frequently better-educated women, set the standard for others by delaying marriage and having fewer children. These shifts in nuptiality patterns were made possible by the shifting cultural and economic context, which included better access to family planning options and educational possibilities for women (Zabak et al., 2023). Lifetime fertility rates have dropped significantly as a result of the substantial changes in reproductive behaviors brought about by the increasing prevalence of nuptiality patterns (Gatera, 2021). As societies

evolve, the diffusion of new norms surrounding marriage and family formation continues to reshape fertility landscapes.

According to the adaptations approach, differences in nuptiality patterns (e.g., age at marriage, rates of marriage, and family structures) among various societies and geographical areas are explained by differences in ecological factors, such as resource availability and economic opportunities. Nuptiality evolve when societies adapt to changing social, technological, and environmental circumstances (Sear & Coall, 2011; Hillard Kaplan, 1996). The diffusionist viewpoint holds that ideas, customs, and cultural characteristics that have permeated or dispersed over cultures and geographic locations are primarily responsible for regional heterogeneity in nuptiality patterns. However, cultural traits and practices passed down from one community to another, as well as local adaptations to ecological conditions, are not the only factors contributing to nuptiality patterns. Mass media, globalization, and technological advancements can hasten cultural dissemination and converge nuptiality patterns across different regions (Schneider & Goody, 1984; Lesthaeghe, 1983).

Marriage patterns vary greatly throughout cultures, historical periods, and geographic regions. According to Becker, the marriage market's supply and demand, the benefits and costs of marriage, and prospective partners' economic resources and earning capacity all influence marriage patterns (Becker, 1973). According to Becker, the supply and demand in the marriage market, the advantages and disadvantages of marriage, and the financial resources and earning potential of potential partners all have an impact on marriage patterns, which vary substantially across cultures, historical eras, and geographical areas (Oppenheimer, 1988b). Regional differences in labor markets, economic conditions, and resource distributions lead to different marriage patterns between regions. Marriage is a cultural event that involves gender, religious and spiritual belief systems, and larger households (Schneider & Goody, 1984).

As a result, regional variations in social institutions, family structures, and cultural values might influence local marriage patterns. More recently, intersectional frameworks have been used to understand how political, cultural, ecological, and historical socioeconomic developments interact to influence regional differences in marriage patterns. These viewpoints emphasize how many social identities and structural injustices (such as those based on gender, race, and class) combine to produce regionally unique marriage patterns (Crenshaw, 2018; Davis, 2008). Religious beliefs, cultural norms, and practices may significantly influence a

region's marriage patterns. Regional differences in gender roles, family structures, and social attitudes toward marriage led to different marital practices (Thornton & Fricke, 1987).

1.3.2. Empirical reviews

1.3.2.1. Nuptiality Dynamics

The time of marriage is influenced by various circumstances like Urbanization levels, female employment prospects, educational chances, the availability of partners, and per capita income. Studies undertaken in the United States revealed that women with higher education, higher earnings, and better employment opportunities were likelier to marry than women with less education and lower earnings since they had access to and better communication with economically attractive men in workplaces. Urban women marry later than rural women, and better-educated women marry later than less-educated women (Ikamari, 2005).

According to the theory of marital instability, which emphasizes maximizing marriage utility while considering the mediating effects of socioeconomic and demographic factors, a loss of utility gain from marriage results in marriage instability, which weakens the mediating effect of marriage (i.e., birth). Conversely, Becker and Colleagues contend that the likelihood of birth and late marriage decreases the likelihood of divorce and vice versa (Becker et al., 1977). Huber & Spitze, 1980 discovered that wives' thoughts of divorce diminish with age at first marriage and marital duration, while those of husbands decrease with marital duration and age disparities in a study designed to test assumptions derived from Becker's theory of marital instability. It suggests that the degree of marital stability in a particular society influences the first birth interval. The timing is extended to the first birth for those who want to end the marriage and vice versa (Huber & Spitze, 1980).

The impact of schooling on marriage argued that late marriage was commonly observed among educated girls, strong inverse relationship existed between education and marriage. Accordingly, educated girls tended to delay the timing of their first marriage due to the employment opportunities they obtained. The delayed marriage in Addis Ababa did not indicate why the postponed marriage had been postponed, and the timing shifted to later ages. The marriage squeeze hypothesis states that the main reason for declining marriage rates is the shortage of marriageable men (Sibanda et al., 2003).

Shifts in age at marriage have been identified as a primary cause of Africa's demographic change (Chojnacka, 1995). Northern and Southern African countries had the most significant increases in age at first marriage, while Western and East African countries had the lowest age level at first marriage. In the breakdown of changes in TFR for nine countries in SSA, age at first marriage as a proximate driver emerged as a crucial factor for fertility change (Audrey Harwood-Lejeune, 2000). Changes in marital timing have been reported to have a significant impact on fertility transitions. The study conducted in Iran found that higher marital ages accounted for 15% of the drop in fertility between 1986 and 1996 and 35% between 1996 and 2006. A one-year rise in the age at first marriage could result in a 0.728-year delay in the age at first birth and a 0.196 reduction in the number of children ever born in Bangladesh (Taghizadeh et al., 2015).

In 2011, 41% of Ethiopian women aged 20-24 had been married before they reached 18. This percentage is even higher in the Amhara region, at 50% (Barton & Bruder, 2020). The EDHS (2011) indicates that the average age at marriage is 16.5 years, and over 41% of women aged 20-24 were married by the age of 18 (Central Statistical Agency (CSA) [Ethiopia] and ICF International, 2011). The high rate of early marriage means that Ethiopia has one of the highest adolescent fertility rates in sub-Saharan Africa, with 72.4 births for every 1,000 women aged 15-19 years (UNDP, 2011). Early marriage contributes to higher total fertility as women marrying earlier tend to have children earlier and bear more children over their lifetime than if they had married later (Batyra & Pesando, 2021).

According to Garenne, 2004, an analysis of the median age at first marriage of cohorts of women in more than 30 nations in sub-Saharan Africa finds that higher incomes are associated with later age at marriage. According to earlier studies, people from high-status households marry later than people from low-status families (Garenne, 2004). Although the intergenerational transmission of education is a key factor in explaining the pattern, earlier research suggests that the socioeconomic status (SES) of parents continues to have a significant influence on when people marry and controls the educational level of the individual. In most countries, higher parental SES results in later entry into marriage. The impact of parental SES on marriage timing weakens considerably after young adults enter a cohabiting union. Substantial cross-national variation is found in the strength of the link between parental SES and marriage timing. However, the cohabitation stage cannot explain this variation (Brons et al., 2021).

Regarding timing, socio-economic background differences in France and Sweden have remained relatively small, whereas, in Italy and Romania, higher parental education has become more strongly associated with postponement. In France and Sweden, family formation patterns have changed and continue to be stratified by socio-economic background. Socio-economic background differences in the timing of onset of family formation and family pathways chosen after the start of family formation, as well as how these socioeconomic background differences vary across cohorts and countries (Mooyaart et al., 2022).

In the context of developing countries, changes in the socioeconomic and cultural environment were observed to have influenced trends of nuptiality. Marriage patterns are an important determinant of fertility levels in a population. Ethiopia is one of the countries that stand out in terms of the rate of reduction in marriage, with a relatively slowly dropping percentage of young women in unions. In recent decades, Ethiopia has made great strides in expanding access to education and health services that enable the country to accelerate the demographic transition and use demographic opportunities. This implies that Ethiopian people are delaying their first marriage, which resulted in an increase in age at first marriage (Sewnet, 2022).

There is a shortage of “economically attractive” men to satisfy women's demand for marriage partners. The high unemployment rate and increased cost of living in the city delayed the timing of family formation in Addis Ababa. Engaging in marital life in this city was mainly a function of the economic situation of couples (Gurmu & Mace, 2021). Another research on the reproductive transition of females from the developing world showed a generally shifting pattern to late age; however, patterns of the shift were not investigated (Bongaarts et al., 2017a).

There is an increase in the proportion of women who are cohabiting and never-married. The proportions of marriages are low and late among African and rural women. Fertility levels are different for marital status, with married and widowed women having the highest mean number of children ever born and the lowest number of children ever born among the never-married women. Furthermore, the mean number of children ever born is among the highest in the older age group for all women. Recent studies on marriage patterns in South Africa have revealed a clear trend towards decreasing proportions of married women and an increase in age at first marriage. Despite marriage being one of the most important proximate determinants of fertility, the role of these nuptiality changes on the country’s decreasing fertility levels has not been adequately explored (Magagula, 2009).

A recent study in India showed that almost 65.9% of women got married before reaching the age of 18 years in the year 1992–93, which reduced to 23.2% among women aged 20–24 years in 2019–21. The region, respondent's level of education, caste, religion, wealth, and mass media exposure were significantly associated with the age at first marriage. The region, educational attainment, and age at first sexual experience were other major characteristics that may have impacted age at first marriage, depending on ethnicity (Singh et al., 2023a). Marriage in Malawi takes place early; nearly 70% of the respondents were married before the age of 18 years, and the mean age at first marriage is 17.4 years. Age at marriage varies by age, region, rural-urban residence, religion, ethnicity, and wealth. Early marriage and consequent early childbearing are related to high fertility, low status of women, and adverse health risks for both the mother and child (Palameleni E. Martin, 2011).

According to a recent study in Amhara national and regional states, some drivers of the recent fertility decline were increased age at first marriage, a decreased proportion of currently married women, a shift in women's birth to a later age, and a higher women's educational status. The percentage of women who married before 18 was still high, at 86% in 2014. The study conducted in the Amhara region shows that first marriage at an early age, lower level of education, older marriage cohort, and residence in the Amhara region significantly elongated the first birth interval (Alazbih et al., 2023).

Greater availability of education and women empowerment has been linked to postponement of marriage and reductions in fertility levels. In settings where cultural norms are evolving, women with increased empowerment tend to resist early marriage, contributing to shifts in marriage patterns. Additionally, in urban areas where the cost of living is higher, marriage tends to occur later than in rural areas. As a result, economic development can shape marriage behaviors by influencing how affordable individuals perceive marriage and raising children to be (Dadzie et al., 2024).

1.3.2.2. Fertility Transition

The move from a high to a low fertility is known as the fertility transition. A constant, ongoing, and irreversible drop in fertility characterizes fertility stalls (Hertrich, 2017). In Sub-Saharan

Africa (SSA), the fertility drop began in the mid-1960s in South Africa and extended to Botswana, Kenya, and Zimbabwe in the mid to late 1980s (Cho & Tien, 2014).

Bongaart, 2017 observed that the fertility transition in Africa was late-onset, earlier than projected, slower in pace, and more significant than the past transitions in other regions to illustrate Africa's exceptionalism in fertility decrease. In Africa, changes in proximate determinants have been linked to fertility transition. In Ethiopia, proximate determinants have been extensively used in many fertility studies. Among the four proximate determinants of fertility, the index of marriage was the most important inhibiting factor of fertility in 2011. Contraceptive use was the most important fertility inhibitor in 2016. The contribution of the index of contraceptives in inhibiting fertility increased from 28.5% in 2011 to 35.7% in 2016 (Laelago et al., 2019).

In recent decades, Ethiopia has made significant progress in improving access to education and health services, allowing the country to accelerate demographic change and take advantage of demographic dividends. The percentage of women aged 15 to 49 who used modern contraception increased from 4% in 1990 to 35% in 2016. Because of these developments, overall fertility has decreased from 5.5 children in 2000 to 4.6 children in 2016 (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b; Central Statistical Agency (CSA) [Ethiopia] and ICF International, 2011). The first criterion for determining whether a country is in the midst of a fertility transition is whether the published TFR (for the past three years) is at least 10% lower than the highest average number of children ever born among women aged 45–49 in any prior DHS survey and whether married women use contraception at a rate of at least 10%. Second, one must assess whether the fertility decrease has been stopped (Bongaarts & Casterline, 2013a).

The fertility transition may be characterized as a pre-transitional stage when total fertility (TFR) is 7 or more children per woman and shows very weak or no sign of decline; the early-transition (incipient) stage when fertility levels are between 5 and 6.9 children per woman; the mid-transition stage that encompasses fertility levels of 3.0 to 4.9 children per woman; the late-transition (advanced) stage corresponding to fertility lower than 3 children per woman but higher than the replacement level of 2.1 children per woman; and post-transition (below-replacement fertility) stage when fertility level is below 2.1 children per woman (Bongaarts, 2003).

Despite remarkable achievements in fertility reduction at the national level, this performance is not uniformly replicated at the subnational level and between urban and rural settings. Fertility is consistently higher among rural women, who give birth to nearly three more children during their reproductive years than urban women (5.5 versus 2.6 children per woman). Women in more remote and less developed regions give birth to more children than women in the more developed regional states: The total fertility rate ranges from 1.7 children per woman in Addis Ababa to 6.4 children per woman in Somalia, one of Ethiopia's designated "emerging regions. Fertility levels are higher than the national average in Somali, Benishangul-Gumuz, Afar, Tigray, Oromiya, and Southern Nations, Nationalities, and Peoples' Region (SNNPR), and fertility is rising in Somali, Benishangul-Gumuz, and Afar. The difference in fertility reduction between regions can be attributed to factors such as relatively delayed marriage for women in more advanced regions, household wealth levels, and education levels, with uneducated women having more children than women who have secondary or higher education.

Increased contraceptive use is observed at both the national and subnational levels, also with regional variations. Although urban women are more likely than their rural counterparts to use any method of contraception, use among currently married women in some rural areas has skyrocketed in recent years. For example, contraceptive use increased by more than six times in Amhara and SNNPR between 2000 and 2016. By contrast, in 2016, the contraceptive prevalence rate was only 2 percent in Somalia, where contraceptive use has declined, indicating that reproductive-age women who might not want more children or might want to space births are not using family planning. These trends have significant implications for fertility reduction and prospective gains from any demographic dividend.

Nationally and regionally, Ethiopia continues to face huge gaps in access to education, which plays a critical role in female empowerment, fertility reduction, and sustainable development. Despite these gaps, Ethiopia has made significant strides: Primary school net enrollment rates reached 84 percent in 2016, a huge increase from less than 20 percent in the 1990s, and secondary education enrollment has similarly improved.12 Government expenditures on education increased from 2.3 percent of Gross Domestic Product in the early 1990s to nearly 4.5 percent in 2016.

As with health indicators, education outcomes vary significantly among the regional states. Addis Ababa, Dire Dawa, and Harari have the highest literacy levels; Afar and Somali have the lowest literacy levels nationwide, followed by SNNPR and Amhara. A wide gender gap pervades the education system, especially at secondary and tertiary levels, with males considerably outnumbering females. The Ethiopian government has implemented policies to make schools more accessible and safer for female students, including constructing separate female bathroom facilities, hiring female teachers, and establishing counseling and guidance services. Gender parity in primary enrollment has substantially improved, but access to education continues to be skewed heavily toward males, with female enrollment and completion lagging at secondary and tertiary levels. In a related vein, in a recent examination of Ethiopia's return to education, education yielded an encouraging result, revealing that even first-cycle primary education yielded the highest rate of return in terms of earnings Education is a transformative experience that increases youths' awareness of alternative roles. As a result of increased earnings after schooling, youths are encouraged to postpone reproductive roles until later in life (Desalegn, 2018).

The Ethiopian Demographic and Health Surveys indicated that TFR continued to fall from 6.4 in 1990 to 4.6 children per woman in 2016. Moreover, the same source indicated regional disparities in fertility decline. TFR in Amhara Regional State has declined from 5.9 in 2000 to 3.7 children per woman in 2016 (Alazbih et al., 2023). The change from the traditional nuptiality pattern characterized by an early and universal marriage expresses the decline of the propensity for many girls to marry early as in the past; instead, there is a continuing later marriage as time passes. The generalization of the emergence of later marriage associated with fertility decline confirms the theoretical link between nuptiality change and fertility transition. In the past, marriage was universal, but as time passed by, this pattern has changed to the fact that not every woman gets married.

Finally, marriage is an important determinant of a woman’s reproductive behavior. In Ethiopia, early marriage is characterized by high fertility, when most births are likely to occur within the first two years of marriage. Ethiopia is found to reveal a unique case where late marriage among women occurs, with a number remaining unmarried throughout their reproductive life. Delayed age at marriage was found to be characterized by high levels of education and urbanization.

1.3.3. Research gap

The present study was conducted after identifying the following research gaps in Ethiopia. Previous studies in Ethiopia primarily focused on determinants of age at first marriage and period fertility. The patterns and dynamics of nuptiality and its contribution to the fertility transition of the nation have rarely been addressed. Recently, there has been growing evidence showing fertility stall at a high level in Ethiopia and exhibiting higher levels of variability in fertility transition among regional states. The sources of the fertility transition disparity among Ethiopia's different regional states have not been fully understood. Therefore, this study attempted to fill the following gaps:

- Marital experiences of Ethiopian women were characterized as early and universal; however, over time, the nuptiality patterns have shown a deviation from such patterns, with higher variability in age at first marriage and overall marriage prevalence. Therefore, this study attempted to evaluate the extent of the variability in marriage patterns and its determinants for Ethiopian women.
- Culturally, marriage is considered pivotal for procreation and crucially determines fertility levels in most Ethiopian societies. Thus, fertility transition is a natural corollary to the changes observed in both marriage patterns and its prevalence among Ethiopian women. The study, therefore, attempted to address the extent of the contribution of the change in patterns and prevalence of marriage to the fertility transition.
- Finally, the regional disparity in fertility transition in Ethiopia is a cause of concern among researchers and policymakers. The variability is not fully understood and there is a growing interest to evaluate the drivers of regional inequality in fertility transition. Thus, the study attempted to explore the underlying reasons for the differences in the performance of fertility transition among selected regions of Ethiopia.

1.3.4. Conceptual framework

At an individual level, the sources of influence for fertility transition are timing and patterns of marriage and change in contraception. Changes in marriage patterns and childbearing have substantially changed in recent decades. Nuptiality affects fertility dynamics in various ways: age at first marriage affects the length of the childbearing span by determining the time of entrance into marital life and so in the childbearing process (Ikamari, 2005). On the other hand, the proportion of women using contraception to space or limit births and the effectiveness of the contraception they use directly affect a society’s fertility level.

In addition, resources available to individuals, their educational achievements, birth cohort, and ascribed characteristics such as ethnicity and religion are considered drivers of the fertility transition. The combined effects of an increasing number of women reaching secondary education or higher and their low risks of marrying at a young age, with progress in contraceptive use among these educated women, lead to a continuing fertility transition (Muhoza, 2022). The region, level of education, religion, income, and mass media exposure were significantly associated with the age at first marriage, which resulted in a fertility decline (Singh et al., 2023a). The average level of education in a community influences the partners with which women interact, both within and beyond their immediate social environments, altering the reproductive norms to which women are (Colleran et al., 2014).

At the community levels, community affluence and literacy, contraceptive use behavior, and employment are assumed to influence fertility transition. Individual characteristics alone cannot capture fertility dynamics, and studies relying solely on them may systematically underestimate the importance of cultural transmission in fertility declines. Community literacy accelerates fertility decline in a way neither predicted by individual characteristics nor by the level of economic modernization in a population (Colleran et al., 2014). Further, for assessment of regional disparity in both nuptiality and fertility transition, the region of residence, which serves as a proxy variable for culture, is considered a contributing factor. The following figure captures the underlying drivers of the patterns of nuptiality and fertility dynamics. Lastly, this section focuses on the conceptual framework that enables us to understand how changes in nuptiality patterns contribute to fertility dynamics.

This conceptual framework is derived from three key theoretical perspectives: modernization theory, diffusion theory, and life course theory. Traditionally, marriage in Ethiopia has been early and nearly universal. However, with ongoing modernization, particularly among women, new ideas, technologies, and social innovations have gradually spread throughout the population. Modernization promotes women's education, economic empowerment, access to family planning, and improved living standards all of which contribute to delayed marriage. Diffusion theory explains how these modern values and practices disseminate across regions and communities, while life course theory highlights how changing social and economic contexts reshape individual life trajectories, including marriage timing. As a result, nuptiality patterns in Ethiopia have shifted significantly. These changes occur at multiple levels

individual, community, and national driven by broader socioeconomic development. Accordingly, this conceptual framework integrates these theories to explain the dynamic relationship between modernization and evolving nuptiality trends.

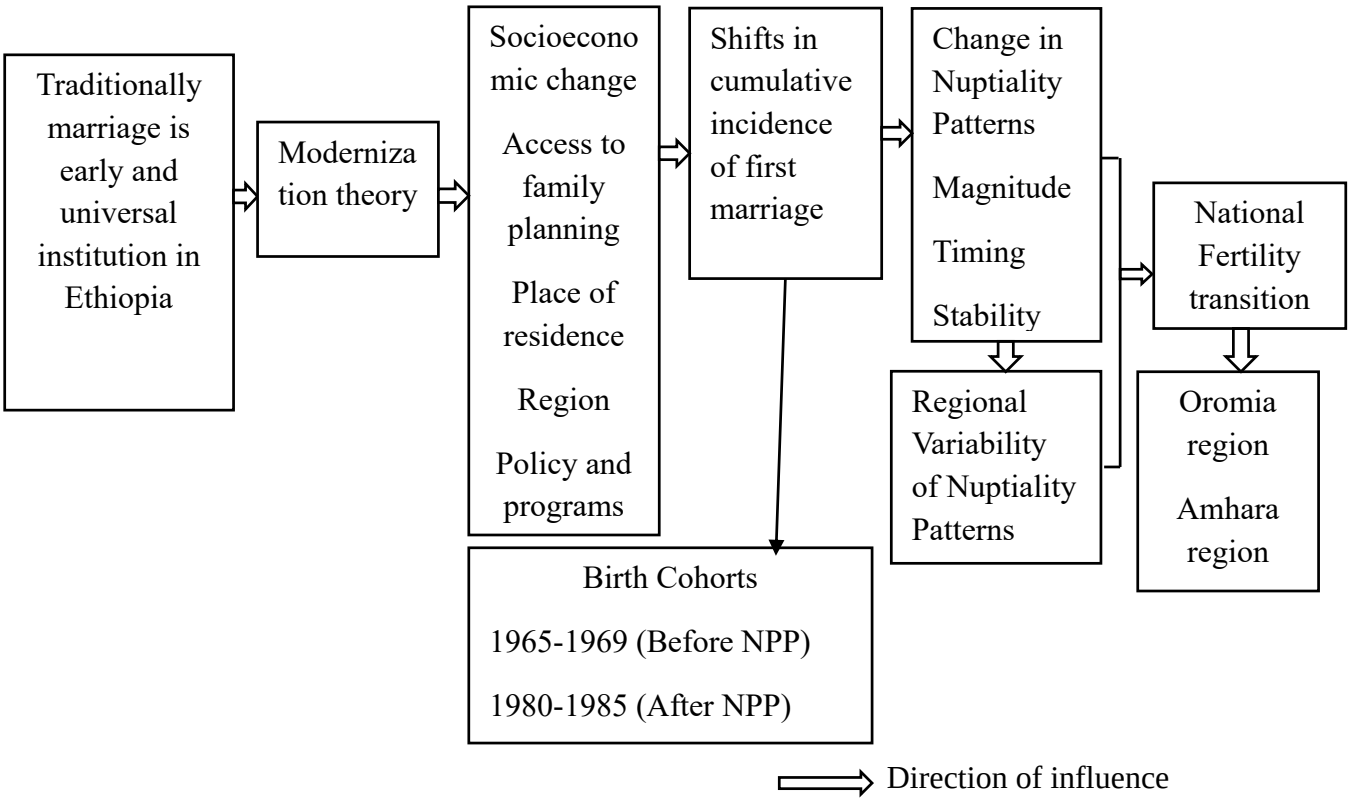

Figure 1.1: Conceptual Framework Showing Contributions of Nuptiality Changes to Fertility Transition
Source: Developed by the researcher based on a literature review

1.4. Research questions

The present research attempted to address the following questions:

i. What are the factors that explain changes in nuptiality patterns?
ii. What are the factors that explain regional differences in nuptiality patterns?
iii. How does nuptiality transition significantly contribute to fertility transition?
iv. What are the factors that explain regional inequalities in fertility transition?

1.5. Objectives of the study

1.5.1. General objective

The overall objective of the study is to examine the key drivers of changes in nuptiality patterns and its contribution to fertility transition in Ethiopia.

1.5.2. Specific objectives

Specifically, the study attempted to:

- Examine the level and determinants of changes in nuptiality patterns in Ethiopia
- Investigate the key predictors of regional inequalities in changes in nuptiality patterns,
- Examine the contribution of changes in nuptiality patterns to fertility transition and,
- Explain sources of spatial heterogeneity of fertility transition, specifically emphasizing Oromia and Amhara regional states.

1.6. Significance of the study

This study is significant for advancing knowledge and informing policy in family studies, population dynamics, and reproductive health. Examining the interplay between nuptiality patterns and fertility transition in Ethiopia contributes to bridging critical research gaps in understanding how marriage dynamics influence fertility decline. While marriage is recognized as a key proximate determinant of fertility, its role in shaping the country's demographic changes has not been adequately explored due to limited studies focusing on marriage and fertility interrelations. This research addresses this gap by leveraging data from the 2000 and 2016 Ethiopian Demographic and Health Surveys to analyze temporal and spatial variations in nuptiality and fertility transition.

Specifically, the study's findings are significant for several reasons:
Understanding Marriage Trends and Determinants: By assessing changes in nuptiality patterns and their determinants, the study provides insights into the social, economic, and cultural forces

shaping marriage trends over time. This knowledge is essential for designing interventions that address the challenges posed by early marriage, delayed marriage, or marital instability.

Addressing Regional Disparities: The decomposition of regional disparities in nuptiality patterns sheds light on the sociocultural and economic factors contributing to variations across Ethiopia's regions. This analysis is crucial for policymakers and practitioners seeking to design region-specific programs that address inequalities and enhance social cohesion.

Linking Nuptiality Patterns to Fertility Transition: By examining the contribution of nuptiality changes to fertility transition, the study provides valuable insights into the pathways through which delayed marriage or changing marital trends influence fertility levels. This understanding is crucial for policies that manage population growth while respecting cultural contexts.

Spatial Heterogeneity in Fertility Decline: The research highlights localized dynamics of fertility transition by focusing on spatial heterogeneity, especially in the Oromia and Amhara regional states. This nuanced understanding helps tailor interventions to regional contexts, enhancing their effectiveness and sustainability.

Policy and Program Implications: The study has practical implications for developing policies and programs promoting sustainable demographic and social outcomes. It can inform efforts to address early marriage, improve access to education, empower women, and enhance reproductive health services, all of which contribute to broader national development goals.

1.7. Scope of the study

The scope of this study is carefully confined to three fundamental dimensions of nuptiality, encompassing the timing of marriage, the volume or magnitude of marriage, and marital instability. The timing of marriage refers to the age at which individuals typically enter marital unions, providing insight into cultural, socioeconomic, and demographic factors influencing early or delayed marriages. The volume or magnitude of marriage examines the prevalence and frequency of marriages within the population, offering a quantitative understanding of marital practices and their trends over time. Marital instability investigates the dynamics and causes of

disruptions in marital unions, such as separations or divorces, shedding light on social, economic, and cultural stressors impacting marital cohesion.

The study incorporated current and lifetime fertility measures to assess the fertility transition. Current fertility reflects recent reproductive behavior, often measured through childbirth rates within a specified period. In contrast, lifetime fertility captures the total number of children born to a woman over her reproductive span. This dual approach enables a comprehensive understanding of fertility trends and their implications for population dynamics.

Geographically, the study is focused on Ethiopia, a nation characterized by diverse cultural, economic, and demographic profiles. By restricting the analysis to Ethiopia, the study aims to provide detailed insights relevant to the country's unique context, including regional variations, urban-rural disparities, and the influence of sociocultural norms on nuptiality and fertility. This geographical delimitation also ensures that findings are context-specific, addressing the complexities of marriage and fertility within Ethiopia’s socio-demographic landscape.

1.8. Limitations of the study

The event history method was employed to gather data from the Demographic and Health Survey. Consequently, the reliability of the information relies on the respondents' ability to accurately remember the sequence of events, which may be affected by memory lapses. Additionally, the event history data was collected only from individuals present during the survey, leading to the exclusion or underrepresentation of experiences from deceased or migrant women. Moreover, the analysis was based on a relatively narrow set of variables, focusing on women's characteristics alongside relevant household and community factors. Considering the study's practical limitations, available data, and specific research goals, these variables were selected. While this selection offered valuable insights, there may be other relevant variables, such as parental traits, that were not included but could have enriched the analysis.

Postpartum insusceptibility and abortion rate were excluded from the fertility transition analysis. Furthermore, the emphasis on women's experiences may overlook the role of men and broader family dynamics in shaping nuptiality and fertility patterns. Besides, due to the cross-sectional nature of the data, we are also unable to show the cause-and-effect relationship.

Despite these limitations, using a large, nationally representative dataset enhances the applicability of the findings to similar populations.

1.9. Structure of the dissertation

The dissertation was structured into six chapters. The dissertation begins with an introduction in Chapter 1, providing an overview of the study changes in nuptiality patterns and its contribution to fertility transition. It also highlights the research gap and purpose of the study. Chapter 2 presents how nuptiality patterns change and investigates the factors linked to these changes by comparing the experiences of two historical birth cohorts. The results demonstrate that the change in nuptiality pattern was explained through a reduction in cumulative incidence of marriage, the shift in the timing of entry to first marriage, and marital instability across the two birth cohorts.

Chapter 3 focuses on the factors that account for regional variations in nuptiality patterns in Ethiopia. Generally, the study found that there is spatial heterogeneity in nuptiality patterns among all regions. Chapter 4 investigates the decomposition of the lifetime fertility across survey periods. The lifetime fertility significantly declined between the survey periods. The changes in nuptiality patterns among older women significantly contributed to the lifetime fertility transition. However, the most significant reduction in lifetime time fertility was attributed to child mortality.

Chapter 5 addresses the sources of spatial heterogeneity of fertility transition with specific emphasis on the Oromia and Amhara regional states of Ethiopia. The chapter revealed that the difference in the fertility transition pace across Ethiopia's administrative regions is partly explained by place of residence, occupation, community education levels, community wealth, nuptiality patterns, and sexual unions. Finally, in Chapter 6, the dissertation synthesizes the findings, draws conclusions, and provides recommendations for policies and programs.

1.10. Operational definition

The total number of children ever born (CEB): Are children born to women during a specific age classification, and the average number of children born alive to a given reproductive age group. Until the time of data collection, the CEB is an indicator and measure of her lifetime fertility experience.

Nuptiality patterns: Magnitude of marriage (proportion of married women), timing of marriage (early and late marriage) and marital instability. In this study nuptiality patterns explained by cumulative incidence of first marriage.

Lifetime fertility: The total number of births during the lifetime was measured.

Lifetime fertility transition: The lifetime fertility transition typically involves a decline in the average number of children ever born to women, often influenced by factors such as increased educational level, economic opportunities, and access to family planning.

Chapter 2. Components of Change in Nuptiality Patterns among Ethiopian Women: A Decomposition Analysis of Demographic and Health Survey

Analysis of shifts in nuptiality patterns plays a vital role in understanding how demographic variables react to socioeconomic changes. However, there has been a lack of comprehensive research on the sources of changes in nuptiality patterns. Therefore, this study examines how nuptiality patterns change and investigates the factors linked to changes in the two birth cohorts. Data from the Ethiopian Demographic and Health Surveys conducted in 2000 and 2016 were used in this study. Marriage is considered as early and nearly universal in both birth cohorts. The large proportion of the difference in cumulative incidence of first marriage between the cohorts was observed at age 15 and shrunk after age 35. However, the entry rate for the first marriage was slightly pushed to a later age, with a 46% reduction in the rate of marital dissolution. The other results demonstrate that the covariate's compositional and structural impacts were responsible for initiating the cumulative incidence of transition to the first marriage. Furthermore, women's education, occupation, and regional variation were identified as the main contributors to reducing the cumulative incidence of first marriage. The results demonstrate that the change in nuptiality patterns was explained through a reduction in cumulative incidence of marriage, the shift in the timing of entry to first marriage, and marital instability between birth cohorts. Socio-economic factors, spatial drivers, and discriminatory effects between the two cohorts were the sources of changes in nuptiality patterns in Ethiopia.

2.1. Introduction

Fertility transition cannot be fully understood by looking at the fertility trend alone, and the components of the transition need to be examined to gain a more nuanced and comprehensive understanding of the transition (Muhoza, 2022). In the 1960s, the concept of nuptiality change was developed as a component of demographic change. In the experiences of developed nations, the strain on natural resources caused by continuous population growth was mitigated through various strategies. Apart from out-migration, although it is not a deliberate effort to reduce fertility, one such response among rural dwellers was the postponement of marriage (Hertrich, 2017; Kingsley Davis, 1963). In the discourse of Coale, nuptiality change was viewed as an initial step in the fertility transition across a large part of the world. The change in nuptiality acts as a regulator of general fertility and fixes the onset of fertility change (Coale, 1967, 1974).

Marriage is a social institution deeply embedded within cultural norms, economic realities, and gender roles. For instance, during periods of economic prosperity, marriage rates might surge as individuals feel more secure establishing families (Parsons et al., 2015). Similarly, cultural shifts regarding gender roles can influence marriage patterns. As women gain greater educational and economic independence, they may choose to prioritize careers or delay marriage for personal fulfillment (Alteneiji, 2023). Evidence shows that women are getting married late in life, and the percentage of women across all age groups who never get married is growing (Hamedanchi et al., 2020). Women's rising educational levels, greater engagement in paid work outside of the house, and the creation of roles that women can play outside of marriage and motherhood are all widely cited as causes of shifts in union formation (Lindstrom & Woubalem, 2003).

Women used to marry at a relatively young age and almost universally a few decades ago. The percentage of married couples and the rate at which new couples are entering marriages vary widely throughout nations. In many sub-Saharan African nations, marriage is still often seen as "early and near-universal," although for many women, this is no longer the reality. Nonetheless, there is a tendency in several of the region's countries toward delaying the start of marriage, with early marriage becoming less common (Ayiga & Rampagane, 2013; Shapiro & Gebreselassie, 2014). Ethiopia is one of the countries that stand out in terms of the rate of reduction in marriage, with a relatively slowly dropping percentage of young women in unions. Ethiopia achieved significant progress in the last few decades in increasing the number of people who have access to health and education services, which has allowed the nation to take advantage of demographic possibilities of excess gross national production and hastened demographic transition (Sewnet, 2022).

Ethiopia has a longstanding cultural tradition of early marriage, driven by a complex web of societal norms, religious factors, economic considerations, and gender dynamics. Among sub-Saharan Africa, Ethiopia has one of the highest rates of early marriage, regardless of the improvements witnessed. According to research conducted by the National Committee on Harmful Traditional Practices of Ethiopia, 57% of people get married before turning 15. According to the same report, girls are married as young as eight or nine years old in northern Ethiopia, where the practice is most prevalent. While it is common throughout the nation, the rates of early marriage in the Amhara and Tigray regions are significantly higher than the

national average (82 percent in Amhara, 79 percent in Tigray, 64 percent in Benshangul, 64 percent in Gambella, and 46 percent in Afar) (Alazbih et al., 2023).

This study centers on examining marriage patterns among women in Ethiopia, referred to as nuptiality. Nuptiality patterns were assessed regarding the timing, magnitude of marriage, and marital instability of the women. The timing of marriage is measured by age at first marriage, and the magnitude of marriage is measured by cumulative incidence function (CIF). Several previous studies focused on determinants of age at first marriage. There is a lack of longitudinal studies that track individuals over time to understand how nuptiality patterns evolve across different life stages and historical contexts (Imron et al., 2020; Khalajabadi Farahani & Rahimi, 2019; Makheti, 2008; Singh *et al*., 2023b). Gaining insights into the factors that influenced the shift in nuptiality patterns is crucial for policymakers and researchers as it aids in assessing social, economic, and demographic trends within a country.

The Ethiopian government issued a revised family law proclamation, stating that the minimum legal age for marriage for both sexes is 18 years old to lower the high number of early marriages (The Revised Family Code of FDRE, 2000). In 2000, Ethiopia had one of the highest rates of early marriage in all of Sub-Saharan Africa. Marital experiences of Ethiopian women were characterized as early and nearly universal; however, over time, the nuptiality patterns has shown a deviation from such pattern, having a higher variability in age at first marriage and overall marriage prevalence across different regions (Shapiro & Gebreselassie, 2014). In Ethiopia, previous research has primarily focused on assessing the magnitude of marriage, examining the timing of marriage, and analyzing trends and regulators of age at first (Dureti et al., 2022; Gurmu & Etana, 2014). The elements of the change in nuptiality patterns over time have not yet been fully understood. Consequently, this study assessed how the nuptiality patterns has changed and identified the elements that explain the change in age at first marriage using 1965 – 1969 and 1980 – 1984 synthetic birth cohorts of women.

2.1.1. Theoretical perspective of the study

The life-course theory offers a helpful framework for comprehending how age at first marriage and marriage patterns change over time. According to this theoretical viewpoint, the historical and social context in which a person lives profoundly shapes their life. The timing of important life events is influenced by socioeconomic, cultural, and policy factors (Elder, 2018). From the perspective of life-course theory, marriage patterns do not exist in isolation but rather reflect

the broader social, economic, and institutional structures of a given time and place. For instance, changes in female labor force participation, educational attainment, contraceptive access, and gender norms can all impact the age and prevalence of first marriage in a population (Bongaarts et al., 2017a; Geist, 2017; Liefbroer & Corijn, 1999). The life course theory thus underscores how individual lives are embedded within and shaped by the larger historical and institutional context. By adopting this theoretical lens, researchers can gain a more nuanced and contextual understanding of how and why marriage patterns evolve rather than viewing them as isolated or ahistorical phenomena.

Ethiopia had a formal population policy acknowledged the relationship between development, environment, resources, and population in 1993 (Hailemariam et al., 2011). After the national population policy formulated, several national and international policies and strategies were introduced, including the Ethiopian revised family law proclamation (Dejene & Gurmu, 2022; The Revised Family Code of FDRE, 2000). These reforms were part of a broader effort align population dynamics with sustainable development goals, acknowledging the critical role of legal and policy frameworks in shaping demographic trends and social outcomes. The study borrowed the construct of the life-course theory to examine how the transition to first marriage differs between the two cohorts that experienced distinctly different historical, policy, and socioeconomic conditions. The first group of women in the study, birth year 1965 – 1969, lived their youth age during a period absent of the policy and socioeconomic developments that the second cohort of birth year 1980 – 1984 experienced.

Analyzing age at first marriage across different cohorts is a powerful lens to examine how marriage patterns have transformed over time. By examining how age at first marriage varies across cohorts, researchers can identify these correlations and understand their historical contexts (Elder Jr & George, 2016). Thus, transcending the limitations of cross-sectional studies and single cohort studies, the present work proposes a comparative cohort analysis to illuminate the dynamic interplay between historical contexts and their impact on nuptiality trends. A comparative type of analysis allows researchers to not only document the changing landscape of marriage but also connect it to the historical forces that shaped it.

To conduct a thorough analysis of the factors contributing to changes in nuptiality over time, this study used data from the Demographic and Health Survey (DHS) and employs a decomposition analysis methodology. This methodology enables researchers to isolate the

effects of policy changes, and socioeconomic developments on nuptiality trends, offering a robust framework for understanding the multifaceted nature of nuptiality patterns over time (Rahimi & Hashemi Nazari, 2021). Through this comprehensive approach, the study aims to uncover the underlying drivers of change in marriage patterns.

2.2. Data and methods

2.2.1. Data source

Ethiopia Demographic and Health Surveys (EDHS) carried out in 2000 and 2016 were used in the study. Significant demographic and health variables were estimated for the entire nation, including urban and rural areas, each of the nine regions, and the two city administrations. The survey used a two-stage cluster sampling technique stratified by residence to collect the data from 645 enumeration areas for the 2016 survey and 539 enumeration areas for the 2000 survey. Demographic and health surveys are acknowledged as a key source for tracking population indicators and critical data in middle- and low-income nations due to their very comparable design across settings and time (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016a).

Data on selected variables for the 1965-1969 birth cohorts of women and the 1985-1989 birth cohorts of women were obtained from the 2000 and 2016 EDHS, respectively. The selection of these cohorts was guided by the relevance to comparability of cohort experiences. Comparing cohorts at similar ages allows the researchers to isolate the effects of being born and coming of age in different eras, rather than conflating age and cohort effects (Aldy & Viscusi, 2008). The experiences of these groups of women are particularly relevant to quickly identifying patterns in the timing and shifts in the volume of marriage over time as well as the sources of the changes in timing and magnitude of marriage in the periods before and after the promulgation of the national population policy and revised family code of Ethiopia. The information used in our study is freely accessible to the public at the following website address: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm (USAID Demographic and Health Surveys Program, 2023).

2.2.2. Variables and measurements

The response variable is the cumulative incidence of the first marriage. The cumulative incidence function (CIF) provides the percentage of women who ever experienced an event at any particular age, capturing both the timing and the magnitude of an event (Pintilie, 2006). In

the present analysis, marriage and union are used interchangeably. The age at first marriage is measured as when a woman starts living in a consensual union or legally recognized marriage (ICF, 2018b). The DHS puts significant effort into ensuring that important dates, such as those related to marriage, accurately recorded. This involves conducting various data checks, implementing procedures to resolve inconsistencies in reports, and using methods to impute missing data (MacQuarrie & Juan, 2019).

The DHS standard recode manual contains descriptions of numerous variables (ICF, 2018b), and the specific descriptions of the variables and their measurements utilized for this study are shown in the table below (Table *2.1*). The variables used in this study are widely acknowledged in the relevant literature as key determinants influencing the complex relationship between individual characteristics, community variables, and the timing of first marriage. The selection of these specific variables was guided by and grounded in the existing research and literature on this topic (Dejene & Gurmu, 2022; Hertrich, 2017; Imron et al., 2020).

2.2.3. Data processing and analysis

STATA 16.0 was used for data management and analysis. Initially, the CIF for age at first marriage was computed using survival analysis. Before decomposing the change in age at first marriage, the difference in CIF for age at first marriage between the two birth cohorts was tested (Sayers et al., 2018). Accordingly, statistically significant differences between the two cohorts were observed between ages 15 and 25 (Figure 2.1). As such, the shift in the magnitude and timing of marriage between the two cohorts was evaluated at ages 15, 20, and 25. Adopting Oaxaca decomposition, the degree and timing of marriage were broken down into components that may be attributed to variations in individual attributes and behavioral responses using multivariate decomposition analysis. While changes in the behavioral response are referred to as changing behaviors as a result of changing characteristics, changes in the proportion of the population with particular social, economic, and demographic qualities are referred to as changing characteristics (Rahimi & Hashemi Nazari, 2021).

Table 2.1: An explanation of the variables and how they were measured for the analysis

Type	Name and label	Description and measurement	Source
Outcome (numeric)	Age at first marriage (v511)	Age at the start of the first marriage or union is calculated from the date of the start of the first marriage or union and the respondent's birthdate.	Individual interview data
Grouping Variable (categorical)	Birth cohort	Two groups of birth cohorts, that is, those born in the years 1965-1969 and 1980-1984 were used to identify changes in nuptiality patterns among groups of women. It was calculated using the respondents' birth dates (v011).	Computed
Independent (categorical)	Place of residence (v102)	The interviewee indicated whether they lived in an urban or rural area. (1=Urban, 2=Rural)	Individual interview data
Independent (categorical)	Region (V024)	The Region in which the respondent was interviewed	Individual interview data
Independent (categorical)	Educational level (v106)	The highest degree of education attained. The following categories represent the level of education represented by this variable: 0 = No education, 1 = Primary, 2 = Secondary, and 3 = Higher.	Individual interview data
Independent (categorical)	Occupation (v717)	Respondents' occupation group classified as 0=Not working (student and pensioner), 1=Agricultural employee, 2=Industry employee	Computed from individual interview data
Independent (categorical)	Religion (v130)	The religious affiliation of respondents which will be recoded to 1=Christians (Orthodox, Protestant, and Catholic), 2=Muslim, 3=Others)	Computed from individual interview data
Independent (categorical)	Household wealth (hv271)	A combined indicator of the overall standard of living in a home. Selected assets owned by the household are used to compute it. It is produced using principle components analysis, a statistical technique. It divides all interviewed homes into five wealth quintiles (1=Lowest, 2=Lower, 3=Middle, 4=Richer, 5=Richest) and sets each household on a continuous scale of relative wealth.	Household interview data
Independent (numeric)	Community affluence	Percentage of population living in a well-off household in a community (enumeration area)	Computed from Household data
Independent (numeric)	Community literacy	percentage of an enumerated community's (age-appropriate) population with at least a secondary education	Calculated from Household data

For an Oaxaca decomposition, assuming that the second cohort is the reference group, the model specification for the decomposition analysis and interpretation is described here under (Rahimi & Hashemi Nazari, 2021):

$$\Delta\bar{Y} = (\beta_o^1 - \beta_o^2) + \sum_{j=1}^{k} \beta_j^1 (\bar{x}_j^1 - \bar{x}_j^2) + \sum_{j=1}^{k} \bar{x}_j^1 (\beta_j^1 - \beta_j^2)$$

In the model specification shown above,

$\Delta\bar{Y} = \bar{Y}^1 - \bar{Y}^2$ refers to the magnitude of change in the cumulative incidence of marriage at specific ages, that is, at ages 15, 20, and 25.

The first component of the right-hand side (RHS) $\left(\beta_o^1 - \beta_o^2\right)$ shows basic differences that measure the effects of unobservable variables that are not included in the model or accounted for. The β_o^1 and β_o^2 are constant terms for the model of the first and second cohorts.

The second component of the RHS, $\sum_{j=1}^{k} \beta_j^1 (\bar{x}_j^1 - \bar{x}_j^2)$, captures the change in the average predicted cumulative incidence of marriage for the first cohort when the covariates of the first cohort are set to match the covariate levels of the recent cohort. In other words, it is the part of the overall difference that can be accounted for by group differences in the measured covariates. It is referred to as the endowment effect. Of note, β_j^1 is the coefficient for the regulator $\bar{x}_j$ for the first cohort model and in the present analysis the overall effects were produced for categorical covariates.

The final component of the RHS, $\sum_{j=1}^{k} \bar{x}_j^1 \left(\beta_j^1 - \beta_j^2\right)$, is referred to as coefficient effect measuring the part of the gross difference in the outcome caused by the differential effect of the observable variables on the outcome across the two comparison groups.

The *oaxaca_rif* command was utilized for its flexibility in handling the decomposition of some distributional statistics (Rios-Avila, 2020).

2.2.4. Ethical consideration

Secondary data from the Demographic and Health Surveys Program served as the foundation for the investigation. The regular Demographic and Health Survey methodologies and questionnaires have been reviewed and approved by the ICF/ORC Institutional Review Board.

Furthermore, the study methodologies received ethical approval from the Ethiopian Ministry of Science and Technology's Institutional Review Board offices and the Ethiopian Health and Nutrition Research Institute. Interviews were conducted after getting the respondents' verbal consent. The names of respondents and other personal identifiers were removed from the final data to protect respondent anonymity.

2.3. Results

Table 2.2 shows the distribution of women by selected socio-economic variables of first marriage in Ethiopia. The weighted sample constitutes a total sample of 3873 women, whereas 1804 respondents were from the first birth cohort (1965–1969) and 2069 respondents from the second birth cohort (1980–1984). Across all birth cohorts, a sizable portion of the samples consisted of rural respondents. Between the two birth cohorts, the percentage of women who live in rural areas dropped to 78.66% from the most recent birth cohort and 85.12% from the previous one. Compared to the earlier birth cohort, a higher percentage of women in metropolitan areas belong to the late birth cohort. Compared to prior birth cohorts of women, the more recent cohort of women had higher levels of education, greater media exposure, and lived in wealthier households (Table *2.2*).

Regarding educational attainment, there was a slight increase in the proportion of literacy. The proportion of women with no education has decreased from 79.93% for the earlier birth cohort to 71.79% for the latter cohort. The proportion of women with primary education increased significantly from 13.68% to 19.57%, while the proportion of women with secondary and above education slightly increased from 6.39% to 8.64%. The results also indicate that the proportion of women not working increased by 8.94%, from 34.67% to 43.61%. Similarly, a 7.32% increase in the distribution of industry employment was also observed, from 25.17% to 32.49%. Three regions, Amhara, Oromiya, and SNNP, contributed to more than four in five of the samples in both cohorts. Distribution by religion shows that the two cohorts had a similar distribution, with two-thirds of the sample affiliated with Christianity (Table 2.2).

In terms of community affluence, the percentage of women in the low and medium categories decreased slightly, while the percentage of women in the highest categories increased significantly. Between the two birth cohorts, there was a rise in community literacy for both the medium and high categories. For the first and second birth cohorts, the medium literacy

rates were 31.83% and 46.39%; for the high-level categories of community literacy, the rates were 14.97% and 31.45% (Table 2.2).

Table 2.2: The percentages of women by selected socioeconomic characteristics

Variables and Categories	**Birth cohort**	
	1965-1969 [n=1804]	**1980-1984 [n=2069]**
Educational level		
No education	79.93	71.79
Primary	13.68	19.57
Secondary+	6.39	8.64
Place of residence		
Urban	14.88	21.34
Rural	85.12	78.66
Region		
Tigray	6.48	6.85
Affar	1.35	0.69
Amhara	24.51	23.16
Oromiya	38.49	38.33
Somali	1.51	2.36
Benishangul- Gumuz	1.10	1.10
SNNP	21.98	20.47
Gambela	0.31	0.25
Harari	0.22	0.24
Addis Ababa	3.50	5.98
Dire Dawa	0.54	0.57
Occupation		
Not working	34.67	43.61
Agricultural Employee	40.17	23.89
Industry Employee	25.17	32.49
Religious affiliation		
Christians	66.68	68.09
Muslim	30.49	30.89
Others	2.83	1.02
Community Affluence		
Low	28.41	26.78
Medium	50.92	47.85
High	20.67	25.36
Community Education		
Low	53.20	22.16
Medium	31.83	46.39
High	14.97	31.45

The overall estimates of cumulative incidence function showed that the hazard of getting married for both birth cohorts is almost similar before age 15. The results showed that the incidence of first marriage is highly concentrated towards early ages. The incidence of entering into marital union was comparable across the two cohorts before age 5. However, the cumulative incidence showed a difference after age 15 for the two birth cohorts. The cumulative incidence of the first marriage of both birth cohorts showed a progressively growing inter-cohort gap starting at age 15. For nearly four in five girls of the second birth cohort (78%),

and nine in ten girls of the first birth cohort (88%), the cumulative incidence of first marriage happened at age 20. The cumulative incidence of entry to the first marriage gap narrows after age 30, but there is still a tiny difference between the two birth cohorts (Figure 2.1).

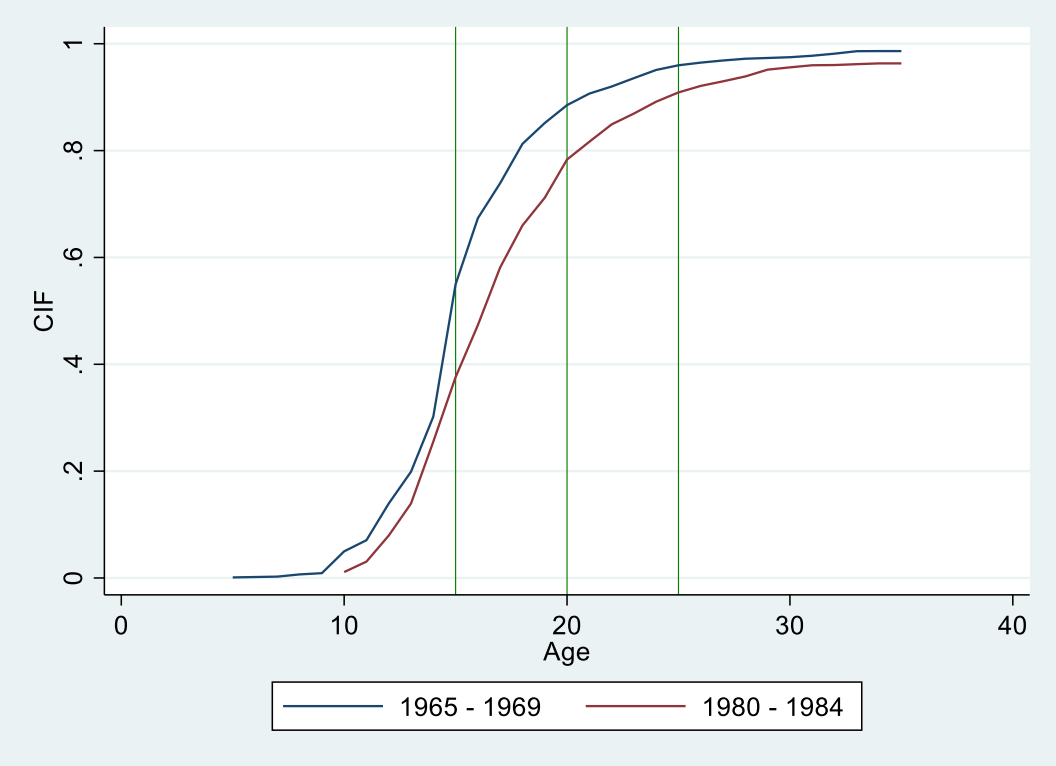

Figure 2.1: Cumulative incidence of first marriage for the two birth cohorts by age

Regarding marital instability, Figure 2.2 shows that there has been a significant decrease in women who have been married more than once between the two birth cohorts. About 61.28% of women in the former cohort got married once, and 78.96% in the latter cohort. We found that the likelihood of remarriage was much lower for women in later birth cohorts compared to those in earlier cohorts. In the former birth cohort, 38.72% of women were reported to have remarried, whereas in the latter, the proportion decreased to 21.04%. The remarriage rate among the earlier birth cohort was approximately two in five women and one in five for the latest birth cohort (Figure 2.2).

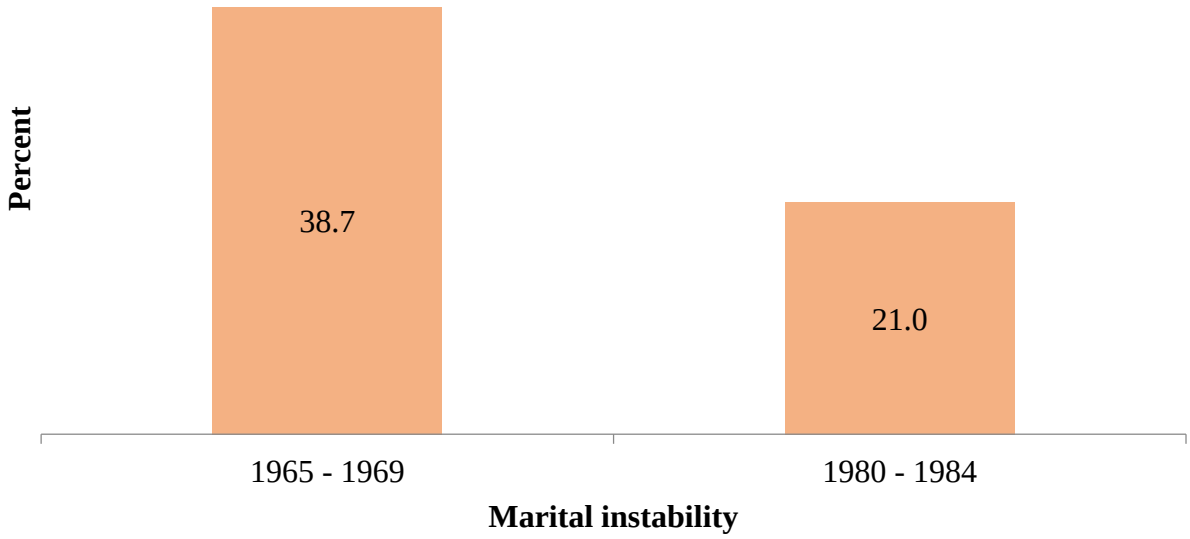

Figure 2.2: Marital instability rate by birth cohort

For both cohorts, the distribution of first marriage entry at ages 15, 20, and 25 was compared and decomposed into its parts. The overall cumulative incidence of first marriage was 55%, 88.5%, and 96% at 15, 20, and 25 for the first birth cohorts of women, respectively. The corresponding figures were 37.6%, 78.3%, and 90.9% at 15, 20, and 25 for the second birth cohorts of women, respectively **(**Table 2.3 **-**Table 2.5**)**. The decomposition analysis of the incidence of first marriage revealed a 17.4% reduction in the cumulative incidence of marriage at 15. Nearly one-third of the reduction (-0.054/-0.174 = 31.0%) was attributed to differences in characteristics between the two birth cohorts of women. The remainder of the reduction, however, results from discrimination in the effects of variables or coefficients. The detailed decomposition of the reduction in the cumulative incidence of entry to first marriage at age 15 showed that educational achievement, occupation of women, and region significantly contributed to the reduction. The difference between cohorts in the level of educational achievement of women contributed a 6% reduction in the overall gap. The difference in the occupation of women between the two cohorts resulted in a far greater decrease in the occurrence of early marriage (12.6%) than in education. The increase in the relative share of mainly urban regions has also significantly the reduction in the cumulative incidence of first marriage, however small the magnitude (2.9%) **(**Table 2.3**)**.

Regarding the contributions of the coefficient effects, occupation, wealth, and community education played a significant role in the marriage dynamics in Ethiopia. These factors contributed to widening the gap in the incidence of marriage between the two birth cohorts rather than reducing it. The positive coefficient value of community education in the detailed decomposition analysis (0.017) results from its significant role in reducing the incidence of marriage in the former cohort and the loss of its significance in the latter. Similarly, the positive coefficient for the occupation of women (0.008) shows the decline in the significance of occupation of women, particularly employment in the agricultural sector, in promoting early marriage. Contrarily, for household wealth, the positive contribution (0.015) results from an increase in its potency in contributing to an increase in the incidence of marriage. This shows wealthier households marry their daughter earlier for the recent cohort than earlier cohorts. The higher significant coefficient value of the constant, however, suggests that the factors that could reduce the gap were not included in the model at age 15 **(**Table 2.3**)**.

Table 2.3: Decomposition Analyses of cumulative incidence of first marriage at age 15

Components of Decomposition	Coefficient	p-value	95% CI			
Overall						
1980 – 1984	0.376	0.000	[0.355, 0.397]			
1965 – 1969	0.550	0.000	[0.527, 0.573]			
Difference	-0.174	0.000	[-0.205, -0.143]			
Explained	-0.054	0.000	[-0.077, -0.032]			
Unexplained	-0.120	0.000	[-0.157, -0.083]			
Characteristics	Endowment Effect			Coefficient Effect		
	Coefficient	p-value	95% CI	Coefficient	p-value	95% CI
Rural	0.003	0.497	[-0.007, 0.013]	0.034	0.650	[-0.112, 0.190]
Education	-0.010	0.006	[-0.017, 0.003]	0.005	0.819	[-0.036, 0.180]
Regions	-0.005	0.021	[-0.010, -0.001]	0.009	0.771	[-0.054, 0.045]
Occupation	-0.022	0.000	[-0.031, -0.012]	0.008	0.042	[0.000, 0.073]
Religion	-0.001	0.377	[-0.003, 0.001]	0.012	0.065	[-0.001, 0.016]
Wealth	-0.002	0.520	[-0.008, 0.004]	0.015	0.002	[0.006, 0.025]
Community Education	-0.020	0.145	[-0.048, 0.007]	0.017	0.001	[0.008, 0.027]
Community Affluence	0.002	0.383	[-0.003, 0.008]	0.000	0.964	[-0.014, 0.014]
Constant				-0.221	0.004	[-0.370,-0.07]

The decomposition analysis of the cumulative incidence of first marriage at 20 revealed a 10.2% reduction. Nearly one-fourth of the reduction (-0.027/-0.102 = 26.0%) was attributed to differences in characteristics between the two birth cohorts of women. The remainder of the reduction (74%), however, results from discrimination of the effects of variables or coefficient effects. The detailed decomposition of the reduction in the cumulative incidence of first marriage at age 20 showed that women's educational achievement, community affluence, and occupation significantly contributed to the reduction. The positive coefficient for residence shows that the disparity between urban and rural areas in cumulative incidence of marriage was significantly higher in the former birth cohort of women than the recent when other factors were controlled. The inter-cohort gap in women's educational achievement level contributed to a 12.7% reduction in the overall gap. The difference in the occupation of women between the two cohorts also resulted in more reduction in the incidence of first marriage (10.7%) than community affluence (3.9%). On the other hand, the increase in the relative share of mainly urban regions (urbanization) has significantly contributed to the reduction in the cumulative incidence of first marriage, however small the magnitude (3.9%) **(**Table 2.4**)**.

The differential effects of variables were furthermore evaluated, and the results portray that religion and community affluence had a significant contribution. With regards to contributions of the coefficient effect, religion played a significant role in the marriage dynamics at age 20 in Ethiopia. These factors contributed to the widening of the gap in the incidence of marriage between the two birth cohorts rather than reducing it. In the comprehensive decomposition study, women's religious affiliation had a positive coefficient value of 0.017 due to its considerable contribution to the higher incidence of marriage in the previous cohort and its decline in significance in the subsequent cohort. The difference effects of community affluence (0.016) significantly contributed to reducing the cumulative incidence of first marriage between the two cohorts. Moreover, wealthier communities tend to refrain from marrying their daughter earlier for the recent cohort than the wealthiest community in the earlier cohort. The higher significant coefficient value of the constant, however, suggests that the factors that could reduce the gap were not included in the model at age 20. The overall impact of unidentified variables that contributed to a reduction in cumulative incidence of marriage at 20 was higher than that of age 15 **(**Table 2.4**)**.

Table 2.4: Decomposition Analyses of cumulative incidence of marriage at age 20

Components of Decomposition	Coefficient	p-value	95% CI			
Overall						
1980 – 1984	0.783	0.000	[0.766, 0.801]			
1965 – 1969	0.885	0.000	[0.870, 0.900]			
Difference	-0.102	0.000	[-0.12, -0.079]			
Explained	-0.027	0.001	[-0.042, -0.011]			
Unexplained	-0.075	0.000	[-0.100, -0.050]			
Characteristics	Endowment Effect			Coefficient Effect		
	Coefficient	p-value	95% CI	Coefficient	p-value	95% CI
Rural	0.008	0.020	[0.001, 0.015]	0.091	0.075	[-0.009, 0.190]
Education	-0.013	0.000	[-0.021, -0.006]	-0.002	0.897	[-0.030, 0.027]
Regions	-0.004	0.007	[-0.008, 0.001]	0.030	0.187	[-0.015, 0.075]
Occupation	-0.011	0.000	[-0.016, 0.006]	0.004	0.202	[-0.002, 0.009]
Religion	-0.001	0.362	[-0.003, 0.001]	0.017	0.000	[0.008, 0.026]
Wealth	0.002	0.304	[-0.002, 0.006]	0.004	0.222	[-0.002,0.010]
Community Education	-0.003	0.750	[-0.019, 0.014]	0.004	0.233	[-0.003, 0.011]
Community Affluence	-0.004	0.031	[-0.008, 0.000]	-0.016	0.001	[-0.025, 0.007]
Constant				-0.207	0.000	[-0.310, 0.104]

The decomposition analysis of the cumulative incidence of first marriage shows a 5.1% reduction between the two cohorts. Nearly one-fourth of the reduction (-0.014/-0.051 = 27.5%) was attributed to differences in characteristics between the two cohorts. The remainder of the reduction (72.5%), however, is a result of discrimination effects of variables or coefficients effects. The detailed decomposition of the reduction in the aggregate incidence of first marriage at age 25 indicated that the level of educational achievement, region, and occupation of the women significantly contributed to the reduction. The inter-cohort gap in women's educational achievement level contributed about 13.7% to the reduction in cumulative incidence of the first marriage to the overall gap. Between the two cohorts, there was an equivalent reduction in the cumulative incidence of first marriage (13.7%) because of the shift in women's occupations and regions. Furthermore, the number and concentration of first marriages for each of the two birth cohorts differ by regional state, as shown by the variation in the endowment of cumulative incidence of first marriage at the regional level **(**Table 2.5**)**.

Regarding the differential effects of variables contributing to the reduction, region, community education, and rural residence contributed significantly. This implies that the urban-rural gap (incidence of marriage) was greater in the recent cohort than in the former. The differential effects of rural women (-0.088) significantly contributed to a reduction in the cumulative incidence of marriage between the two cohorts. For the regional states, the positive coefficient effect shows that regional variability in the incidence of marriage in the recent cohort was higher than in the former cohort. Whereas, community education was responsible for limiting the incidence of marriage in the former cohort than the recent one **(**Table 2.5**)**.

Table 2.5: Decomposition Analyses of cumulative incidence of first marriage at age 25

Components of Decomposition	Coefficient	p-value	95% CI			
Overall						
1980 – 1984	0.909	0.000	[0.896, 0.921]			
1965 – 1969	0.960	0.000	[0.951, 0.969]			
Difference	-0.051	0.000	[-0.066, -0.035]			
Explained	-0.014	0.004	[-0.024, -0.005]			
Unexplained	-0.037	0.000	[-0.053, -0.020			
Characteristics	Endowment Effect			Coefficient Effect		
	Coefficient	p-value	95% CI	Coefficient	p-value	95% CI
Rural	-0.002	0.296	[-0.006, 0.002]	-0.088	0.008	[-0.152,-0.023]
Education	-0.007	0.003	[-0.012, -0.002]	0.007	0.485	[-0.012, 0.025]
Regions	-0.004	0.003	[-0.006, -0.001]	0.035	0.018	[0.006, 0.065]
Occupation	-0.004	0.011	[-0.007, -0.001]	0.001	0.438	[-0.002, 0.005]
Religion	0.000	0.382	[-0.001, 0.000]	0.006	0.053	[0.000, 0.012]
Wealth	0.002	0.083	[0.000, 0.005]	-0.002	0.349	[-0.006, 0.002]
Community Education	0.001	0.776	[-0.009, 0.012]	0.006	0.021	[0.001, 0.011]
Community Affluence	-0.001	0.514	[-0.003, 0.001]	-0.005	0.101	[-0.011, 0.001]
Constant				0.003	0.937	[-0.064,0.069]

2.4. Discussion

The study aimed to compare the nuptiality patterns of selected cohorts of Ethiopian women. In addition, the identification of components and sources of the changes in nuptiality patterns among Ethiopian women was made using the 2000 and 2016 Ethiopia Demographic and Health

Survey. A decomposition analysis framework was employed in the study to evaluate the cumulative incidence of transition to first marriage and its components. The results of the study generally revealed that marriage is considered nearly universal in both cohorts of women. However, the entry rate for first marriage was slightly pushed to a later age (>20 years), and a 46% reduction in the degree of marital dissolution was also noted. A large proportion of the difference in cumulative incidence of first marriage between the cohorts was observed at age 15 and below, but it shrunk after age 35. Generally, the study identified the sources of changes that contribute to changes in the nuptiality patterns of Ethiopian women between the two cohorts.

From a life-course perspective, researchers delve into intricate dynamics of how demographic events change over time, seeking to unravel the underlying factors that drive these changes. They explore how historical events, socioeconomic transformations, and individual agency intertwine to shape the trajectory of individuals' lives (Roy, 2014). The findings of our study provide empirical evidence supports the life-course perspective. Specifically, we demonstrate how the ever-evolving social and economic landscapes exert a profound influence on individuals' choices regarding marriage patterns across different birth cohorts. Our research highlights the intricate interplay between broader societal changes and individual decision-making, shedding light on how individuals navigate their lives in response to the opportunities and constraints presented by their historical and socioeconomic contexts.

2.4.1. Socio-economic factors

Despite the slight difference in percentages, it is crucial to note that both cohorts exhibit a high marriage prevalence. The fact that over 90% of individuals in both groups married before age 25 suggests that marriage remains a prevalent and customary practice among these cohorts. In sub-Saharan Africa, marriage has traditionally been early and commonplace, with the expectation that every adult female will marry at least once in her reproductive career (Ayiga & Rampagane, 2013). Marriage has been an early and universal social institution in Ethiopia. By age 30, over 95 percent of all women are ever married (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b).

The earliest of early marriage that is first marriage before age 15, reduced by about 17%, whereas the reduction in early marriage, that is, first marriage before the age of 20, amounted to 10%. These shifts at all points of decomposition sects were the results of several socio-

economic factors including the rise in educational achievement and type of occupations of women across the birth cohorts. The type of occupation distribution directly attached to high educational achievements makes a significant contribution to lowering the risk of entering the first marriage (Amoo,2017). In agreement with our findings, studies have shown that modernization, characterized by mass education and shifts in means of livelihood, contributed to the reduction in early marriage (Paul, 2019). Education empowers girls to make informed decisions about their lives, including when and whom to marry. It equips them with the skills necessary to participate in economic activities and become financially independent, which further reduces their reliance on early marriage as a means of economic security.

In addition, studies have shown that the effects of modernization cannot be avoided and cause a shift in the values and marriage expectations of younger individuals, resulting in the postponement of marriage or the decision to remain unmarried (Himawan et al., 2019). Contrarily, the findings show that girls who do not attend school or complete their primary education are more likely to marry young (Paul, 2019). In the earlier cohort, it was observed that communities characterized by higher wealth and social status exhibited a notable decline in the incidence of marriages. This decline in marriage rates was consistent with the recent cohort, where communities with medium affluence similarly experienced a decrease in the number of marriages taking place.

Approximately 55% of the earlier cohort's married women married before turning 15, or 17.4% of the total, decided to postpone their first marriage and married later in the recent cohort. Additionally, among five women, one woman delayed her first marriage from the earliest possible age to slightly later. The 1993 National Population Policy and the 2000 Revised Family Code of Ethiopia secure the lowest age for first marriage as 18 years (The Revised Family Code of FDRE, 2000; TGE, 1993). By age 15, many women were influenced by the policy and chose to postpone their first marriage from a very young age to a slightly older age. The occurrence of the earliest early marriages was significantly pushed to later early marriage as a result of policies and programs actions.

The shift has occurred as a result of improvements in girl’s education at all levels. In primary school, the percentage of girls enrolled rose from 20% in 1993 to 90.5% in 2007/2008; in secondary school, the percentage rose from 7.1% in 1993 to 22% in 2007/2008 (TGE, 1993). However, the policy was primarily formulated to push a large proportion of incidence marriage

after age 18, but not yet. This study revealed that the cumulative incidence of entry to first marriage was reduced by 10% at age 20. Thus, among ten women, one woman postponed her first marriage to a later age. Policies and programmatic actions were ineffective in pushing the incidence of first marriage after the age of 20.

The experience of women who enter to first marriage in the era before the policy and after the policy has been reduced as a result of changes in socioeconomic factors. According to LCT changes in demographic events are explained based on socioeconomic status and other contextual factors of individuals. The timing and occurrence of important life course events are greatly influenced by the socioeconomic background. Hence, socioeconomic differences in the birth cohorts before and after the policy intervention can be guided by life course theory.

2.4.2. Spatial drivers

The largest proportion of marriage prevalence was contributed by Oromia, Amhara, and SNNP in both cohorts. The regional administrations have significantly contributed to the reduction/shift in characteristics difference of cumulative incidence of marriage at all points of decomposition divisions. According to Islam et al., 2016, in Bangladesh, significant geographical differences in child marriage were found. Another study revealed that regional difference was a community-level factor associated with child marriage (Zegeye et al., 2021). By age 15, 20, and 25 the difference in characteristics was mainly attributed to urban areas (Harari region, Addis Ababa city administration, and Dire Dawa city administration) that contributed to a reduction in cumulative incidence of marriage between the two cohorts. In addition, urban areas have discriminatory effects of inspiring marriage at age 25. The structural effect of place of residence and regional variation hardly contributed to reducing the occurrence of marriage at all levels of decomposition except at age 25. After controlling for other factors at age 25, each regional state responded separately to the marriage encouragement between the two cohorts. The coefficient effects observed at age 25 were the response of women residing in rural areas within the recent cohort, and no coefficient effects were noted in the earlier cohorts. According to Erulkar, (2022), Addis Ababa, Amhara, and Tigray regions had the biggest declines in child marriage. Estimates for the Somali and Oromia regions during the same period point to a rise in child marriage. In the regions of Afar, Beneshangul-Gumuz, Somalia, and Oromia, the majority of girls get married before turning eighteen.

2.4.3. Coefficient effects

The results confirm the hypothesis that the cumulative incidence of entry into marriage resulted from the discriminatory effects of socioeconomic determinants in addition to socioeconomic inequalities. A similar finding has been reported from a study done in Ethiopia showing that the potency of socioeconomic factors largely determined the reproductive transition of youths (Dejene & Gurmu, 2023). The discriminatory effects of community education, household wealth, and occupation significantly contributed to the reduction in cumulative incidence of marriage at age 15 across birth cohorts. These characteristics discriminately affected the recent cohort more than the former in determining the entry rate to first marriage in the absence of socioeconomic inequality across cohorts. That is, the gap in the rate of first marriage at age 15 would have widened as a result of differences in the potency of these factors. The potency of Christian believers chose not to marry before reaching the age of 20, whereas other religious groups actively encouraged their daughters to enter into marriage during their earlier years. Muslim women are far more likely than those of other religions to get married as children (Islam et al., 2016). Similarly, in Bangladesh religion has a significant effect on early marriage, compared with women in other religious groups, whereas Muslim religious followers were more likely to marry early than others (Sarkar, 2009). The influence of wealthy households contributes to a decrease in the occurrence of marriage within the earlier cohort compared to the later cohort.

The influence of community education on marriage rates becomes apparent when examining the discriminatory effects at both the ages of 15 and 25, alongside other predictor variables. This finding emphasizes the crucial role that community literacy plays in shaping and reducing the incidence of marriages, surpassing the impact of other factors. In contrast, communities with lower levels of education may experience higher rates of early marriages. Limited access to education in these communities can result in fewer opportunities for personal and professional development, leading individuals to prioritize marriage at a younger age due to cultural, economic, or social pressures.

The results suggest that communities with higher educational attainment display a lower incidence of early marriages. This may be attributed to individuals within these communities having access to better educational opportunities, which in turn encourages personal growth, career development, and the pursuit of individual aspirations before entering into marriage. The significant role of community literacy in influencing marriage patterns emphasizes the

importance of promoting accessible and quality education for all. By investing in education, communities can empower individuals to make wise decisions regarding their lives, including decisions related to marriage, and break free from societal pressures that perpetuate early marriage practices.

These findings highlight the need for targeted interventions, such as educational initiatives, awareness campaigns, and policy reforms, to address the disparities in community education and promote educational opportunities that enable individuals to make autonomous decisions about their marital futures. The general effect of unidentified factors that contributed to a reduction in cumulative incidence of marriage was significantly large at both ages 15 and 20. Therefore, while the specific unknown factors responsible for the gap in cumulative incidence of marriage at ages 15 and 20 between the birth cohorts remain elusive, their impact cannot be ignored.

2.4.4. Marital instability

Early marriage has a significant effect on divorce and remarriage. According to a survey done in Thailand, the number of divorced and widowed women who have ever remarried has been on the rise, with an overall increase from 60.5% in 2001 to 71.3% in 2016. The findings consistently demonstrated that the percentage of married women who have never gotten married again rose dramatically from 8.8% in 2001 to 21.6% in 2016 (Pothisiri et al., 2023). In Nigeria, the crude rate of marital breakup per 1000 people was 11. The crude rate of marriage dissolution among those who had ever been married was 29.5 per 1000. The South-east region had the lowest rate of marital divorce while North-east and South-South regions had the highest rates (Ntoimo & Akokuwebe, 2014). Ethiopia exhibits a high rate of marital breakdown. In Ethiopia, 45 percent of first marriages result in divorce. It was estimated that 25% of married women had divorced during their first marriage. Additionally, this result is greater than the 2019 Ethiopian Demographic and Health Survey mini-report, which indicated that 6% of Ethiopian women aged 15 to 49 were divorced or separated (Asfaw & Alene, 2023). The rate of divorce reduced from 8.7% to 6.3% according to the 2000 and 2016 Ethiopia Demographic and Health Survey.

2.4.5. Strength and limitations

Lastly, it is important to discuss the strengths and limitations of the current analysis. Changes in nuptiality patterns have been compared between the birth cohorts in the context of

socioeconomic shifts and policy backdrop. While this study examined the diversity in nuptiality patterns between the two birth cohorts, previous studies simply examined the average age at first marriage at a certain point in time. In addition, large cross-sectional nationally representative datasets were utilized in the investigation with the applicability of the findings to a larger population having a similar context. Contrarily, the fact that this study uses a cross-sectional study design has the problem of ignoring the experiences of deceased and migrant women. Furthermore, the analysis only took into account socioeconomic and demographic characteristics as explanatory variables. In particular, among older and less educated respondents, retrospective reporting of months and years of age at first marriage may cause a recall bias, which in turn results in age misreporting and digit preference.

2.4.6. Implications for research and policy

The study's findings showed that the nuptiality patterns exhibited geographic variability. Future studies ought to concentrate on elucidating the regional variability and investigating the fundamental causes of spatial diversity in nuptiality patterns that occurred within a similar national policy environment. Our study provides evidence that socio-economic shifts significantly explain the changes observed in nuptiality patterns in Ethiopia. Moreover, it is worth noting that these changes in nuptiality patterns have a direct impact on fertility transitions, particularly in sub-Saharan countries. These findings highlight the potential for designing effective socio-economic policies that lead to a demographic transformation, ultimately resulting in a demographic dividend. By recognizing the interconnections between socioeconomic factors, nuptiality patterns, and fertility transitions, policymakers can develop targeted strategies to harness demographic dividends and foster sustainable development in the region.

2.5. Conclusions

The results demonstrated that the change in nuptiality pattern was explained through a reduction in cumulative incidence of marriage (magnitude), the shift in the timing of entry to first marriage (timing), and marital dissolution (a 46% reduction in the amount of nuptial dissolution) across the two birth cohorts. The study has identified the sources of changes in nuptiality patterns: namely, socio-economic factors, spatial drivers, and coefficient effects between the two cohorts. Marriage has been an early and universal social institution in Ethiopia. However, this study found that there was a shift from extremely early marriage to

early and almost universal marriage meaning women delay getting into marriage. Additionally, the findings indicated that two socioeconomic factors, namely occupation and educational attainment, as well as spatial drivers (region), accounted for the reduction in the cumulative incidence of marriage across all levels of analysis. Further research is advised to reveal unknown factors that may play a role in the decline of marriage rates.

Chapter 3. Spatial Heterogeneity of Nuptiality Patterns in Ethiopia: A Decomposition Analysis

Different geographic contexts have been observed to impact the change in nuptiality patterns differently depending on factors like socioeconomic level, educational achievement, religious affiliation, and cultural traditions. Few studies have considered the spatial aspect of nuptiality among women in Ethiopia. However, these studies have not focused on changes in nuptiality patterns across regional levels. Therefore, this study investigates the components that account for regional variations in change in nuptiality patterns. Data from the Ethiopian Demographic and Health Surveys conducted in 2000 and 2016 were used. The likelihood of individuals entering their first marriage differed significantly depending on their location. Culturally, marriage is early and almost universal, but this study found that it is not universal in Addis Ababa. No temporal change has been observed in all regions except in Addis Ababa. In the Southern, Nations, Nationalities, and People and Harari regions, there was no change in the timing of the first marriage between the birth cohorts. In Dire Dawa, the shift was reversed, and women residing in the Gambela region showed the highest postponement. The national policy was well-implemented and enforced in the Gambela region, leading to the tangible outcomes of delaying marriage. The regional heterogeneity in policy outcomes underscores the importance of considering sub-national factors when designing and evaluating demographic policies. The educational attainment of the women, wealth index, and migration were merely coefficient effects that explain the overall difference. Addressing inequalities in education achievements and wealth distribution promotes more equitable marriage practices across all regions.

3.1. Introduction

In developing nations, geospatial variations in cultural practices and beliefs strongly influence the acceptance and practices of early marriage (Johnson et al., 2019). In the Kenyan context, regional variation in the prevalence of early marriage explained in women's education, socioeconomic development, ecological, and cultural variations (Ikamari, 2023). Ethiopia stands out for having one of the elevated rates of early marriage within the sub-Saharan African region. Similarly, variations in sociocultural norms, values, and traditions encourage early marriage in Ethiopia, particularly in the Amhara regional state, compared to the other areas (Setognal Birara et al., 2021). Overall, there has been a decline in child marriage and a rise in

the age at which women marry for the first time in Ethiopia; however, not all regions and population groupings have seen these improvements (Irenso et al., 2022).

Different geographic contexts are observed to impact the nuptiality patterns differently depending on factors like socioeconomic level, educational achievement, religious affiliation, and cultural traditions (Ambel et al., 2017). The diversity of ethnicities, norms, and cultures contributes to variations in the timing and prevalence of marriage within and between societies. These variations are influenced by features such as socio-economic and demographic conditions, which affect early marriage rates and overall marriage prevalence at the individual, community, and regional levels (Tezera G, 2019). The age at early marriage is widely practiced in many parts of the country, rates in Amhara and Tigray regions are much higher than the national average (82 percent in Amhara, 79 percent in Tigray, 64 percent in Benshangul, 64 percent in Gambella and 46 percent in Afar (Alazbih et al., 2023). Particularly in Amhara, young women who had married young typically lived in rural regions. This emphasizes the necessity of focusing on early marriage campaigns geographically (Erulkar, 2013).

Previous studies in Ethiopia primarily focused on examining the determinants of age at first marriage at a specific point of time but regional disparity concerning change in the nuptiality patterns at different times was not examined (GetnetMasrie et al., 2019). Few studies have considered the spatial aspect of nuptiality among women in Ethiopia (Agegenehu et al., 2021; Arega et al., 2023; Setognal Birara et al., 2021). However, these studies have not focused on the trends of nuptiality across regional levels over time, as they were based on a single survey year. Additionally, studies concentrate solely on a specific region within the country, lacking national representation. This study utilizes partial spatiotemporal analysis because it has an additional advantage over separately analyzing spatial or temporal trends. The analysis of identifying potential areas of cumulative incidence of marriage investigates any unusual patterns and clustering over time and ultimately helps to direct tailored programs and interventions to address regional disparities in nuptiality patterns. This article addresses gaps in the existing literature by utilizing nationally representative data and performing spatiotemporal analysis of evolving trends in nuptiality patterns. The regional variation of change in nuptiality pattern across the regional state and two city administrations has rarely been investigated. Furthermore, it attempts to provide answers to the research questions related to spatiotemporal variations in change in nuptiality patterns in Ethiopia with a specific focus on; what patterns they change over time and what the sources of the changes are. Therefore,

this study investigates the components that account for regional variations in change in nuptiality patterns.

Ethiopia has been undergoing political and demographic transformation as well as policy changes since the early periods of 1990. Regarding nuptiality, there are several studies conducted in Ethiopia and sub-Saharan Africa to show how age at first marriage is regulated and its association with fertility. A number of these studies either focus on the regional variations, showing trends, or assessment of determinants using snap-shots of data. Our study, however, departed from these perspectives taking comparable two distinct birth cohorts, and the shift in age at first marriage and marital stability were contrasted among the regional states. What is more, the childhood and, much of the youth years of the first cohort were lived in an era where Ethiopia had no population policy and girls' education was limited. Whereas, the second cohort lived through a policy period -population policy, and the times were characterized by a regime change and a rise in girls' enrollment and improved access to reproductive health services. This study attempts to address this gap, and we believe that this insight will open an avenue for future research that is rooted in inter-cohort comparison or comparison of experiences across different historical times and regional variations.

3.1.1. Theoretical backgrounds of the study

Marriage patterns vary greatly throughout cultures, historical periods, and geographic regions. According to Becker, the marriage market's supply and demand, the benefits and costs of marriage, and prospective partners' economic resources and earning capacity all influence marriage patterns (Becker, 1973). Likewise, the economic theory of marriage suggests that economic factors, including employment possibilities, income levels, and the costs of marriage, impact marriage patterns. Compared to economically low areas, marriage rates are greater in regions with stronger economies and more employment opportunities (Oppenheimer, 1988b). Divergent marriage patterns between areas result from geographic disparities in labor markets, economic situations, and resource distributions. Marriage is a deeply cultural occurrence intertwined with larger household, gender, and religious/spiritual belief systems (Schneider & Goody, 1984).

Local marriage patterns can consequently vary depending on the geographic differences in social institutions, family structures, and cultural values. Intersectional frameworks have been utilized more recently to comprehend how the various socioeconomic developments, including

political, cultural, ecological, and historical, interact to shape regional variations in marriage patterns. These perspectives highlight how different social identities and systemic inequalities (such as those based on class, race, and gender) interact to create marriage patterns that are specific to a given area (Crenshaw, 2018; Davis, 2008). Regions' marriage patterns could be greatly influenced by cultural norms, customs, and religious beliefs. Different marriage practices resulted from regional variations in factors including gender roles, family structures, and social attitudes about marriage (Thornton & Fricke, 1987). Demographic characteristics, including population size, age distribution, and sex ratios, affect marriage patterns, claims the demographic theory of marriage. Higher proportions of people who can get married may lead to higher marriage rates, but a skewed sex ratio could show distinct marriage patterns (Rao, 2016; Witty, 1982). Marriage trends can be influenced by the social, political, and legal institutions of a given area. In various geographic locations, factors such as social assistance programs, tax regulations, and marital laws can encourage or prohibit particular marriage habits (Cherlin, 2004).

The adaptations approach holds that variations in ecological factors, such as resource availability, disease environments, and economic opportunities, can account for variations in nuptiality patterns (e.g., age at marriage, rates of marriage, and family structures) across different societies and regions. As cultures adjust to shifting environmental, technological, and social conditions, nuptiality patterns change (Hillard Kaplan, 1996; Sear & Coall, 2011). According to the diffusionist approach regional variability in nuptiality patterns is mostly caused by the ideas, practices, and cultural traits that have spread or diffused over various societies and geographical areas. On the other hand, nuptiality patterns are not solely the product of local adaptations to ecological circumstances; cultural features, and practices transmission between communities. Globalization, mass media, and technological improvements can accelerate the spread of culture and cause converging nuptiality patterns in various locations (Lesthaeghe, 1983; Schneider & Goody, 1984).

The theoretical framework is explained and clarified by the conceptual framework, making it more actual and actionable. Policies, laws, and broader societal changes can influence nuptiality patterns at the national level. Community-level factors that affect marriage patterns include social norms, local economic circumstances, and education. Individual characteristics influencing marriage decisions and timing include age, education, work, financial stability, and personal preferences. Figure 3.1 shows the conceptual framework for understanding how the

change in demographic characteristics, socioeconomic factors, and Institutional factors contribute to the change in the regional nuptiality patterns particularly in age at first marriage. Policymakers and researchers must examine the interplay between national, community, and individual factors to fully understand the drivers of regional nuptiality patterns and design appropriately targeted interventions.

In reality, the nuptiality patterns seen frequently are the outcome of intricate interactions between institutional, structural, cultural, socioeconomic change, and demographic elements which vary considerably across different regions and societies. These theoretical frameworks provide several perspectives to easily comprehend the regional variability of change in nuptiality patterns.

3.2. Data and methods

The study employed a cross-sectional research design and used pooled data which were drawn from the 2000 and 2016 Ethiopian Demography and Health Surveys (DHS). The study utilized two women birth cohorts one born between 1965 and 1969 from the 2000 (DHS), the other born between 1980 -1984 from 2016 (DHS). The spatiotemporal analyses of the nuptiality pattern of women residing in the nine regions and two city administrations were done. The extended Oaxaca decomposition analyses used to examine the changes in nuptiality patterns across all the regions. The DHS data is freely accessible from DHS Program 2023 (USAID Demographic and Health Surveys Program, 2023). The collective encounters of women play an essential role in quickly identifying the trends of marriage incidence and understanding factors that contribute to the variations among different regions in Ethiopia, both before and following the introduction of the national population policy and revised family code.

3.2.1. Variables and measurements

The outcome variable is the cumulative incidence of age at first marriage measured by the timing, magnitude, and marital stability among regional states and two city administrations. In this study, the term nuptiality patterns encompasses the timing and magnitude of cumulative incidence of marriage and the marital instability of women. The timing of marriage was assessed using the age of the women and the magnitude of marriage measured by the cumulative incidence of the women's marital union history. The cumulative incidence function (CIF) gives the proportion of women who have ever experienced an event at any given time.

This property of CIF makes it desirable to analyze the first marriage over the instantaneous measure. Assessing spatial heterogeneity of change in nuptiality patterns employs the Oaxaca-Blinder decomposition analysis at individual and group-level characteristics. The descriptions of many variables are available in the standard recode manual of 'DHS (ICF, 2018a), and the specific descriptions of the variables and their measurements utilized for this study are shown in the table below. The DHS invests significant effort to ensure that the dates of the key events, including marriages accurately reported through multiple data checks and procedures for reconciling discrepant reports and imputing missing information (MacQuarrie & Juan, 2019). Like most dates, the date of marriage is recorded in DHS recode datasets in century month codes (CMC), the number of months since January 2000. Age at first marriage is calculated as the difference between the CMC of marriage and the CMC of birth date.

3.2.2. Data processing and analysis

Data processing and analysis were done using STATA 16.0 and R software. The analysis began with describing the characteristics of each regional state and two city administrations by cohorts using the cumulative incidence curves. The change in magnitude was assessed using the cumulative incidence function of marriage among regional administrations. Since our interest is determining the factors that can explain spatial heterogeneity of change in nuptiality patterns among nine regional states, used multivariate decomposition analysis. The decomposition of regional disparity of change in nuptiality patterns refers to the process of examining and understanding the differences in the marriage patterns across the nine regional states and two city administrations, and how these patterns changed over time.

Spatiotemporal survival analysis combines elements of both spatial analysis and survival analysis to investigate how the timing and occurrence of marriage events vary across different regions that change with time. In survival analysis, censoring refers to situations where the complete information about an event of interest is not available. It occurs when the event has not yet occurred for some individuals in the study, or when the event is known to have occurred but the exact time of occurrence is unknown. The multivariate decomposition analysis was used to decompose components attributable to changes in characteristics difference and the changes in response to behavior. Changes in the proportion of the population having specific social, economic, and demographic features are referred to as changing characteristics, whereas changes in the population's behavior are referred to as changing behaviors as a result of changing characteristics (Daniel A. Powers and Myeong-Su Yun, 2009; Powers et al., 2011).

Table 3.1: Description of variables and their measurement used in the analysis

Type	Name and label	Description and measurement	Source
Outcome (numeric)	Age at first marriage (v511)	Age at the start of the first marriage or union is calculated from the date of start of the first marriage or union and the date of birth of the respondent.	CFIID
Independent (categorical)	Birth cohort (v011)	Two groups of birth cohorts, that is, those born in the years 1965-1969 and 1980-1984 (v011).	C
Independent	Place of residence	Type of place of residence (1=Urban, 2=Rural) (v102)	CFIID
Grouping var.	Region (V024)	A region in which the respondent was interviewed	CFIID
Independent (categorical)	Educational level (v106)	Highest education level attended. 0=No education, 1=Primary, 2=Secondary, and 3=Higher.	CFIID
Independent (categorical)	Occupation (v717)	Respondents' occupation 0=Not working,1=Agricultural employee, 2=Industry employee	CFIID
Independent (categorical)	Religion (v130)	1=Christians (Orthodox, Protestant, and Catholic), 2=Muslim, 3=Others)	CFIID
Independent (categorical)	Household wealth (hv271)	A composite measure of household's cumulative living standard.(1=Lowest,2=Lower,3=Middle,4=Richer,5=Richest)	CFHHD
Independent (numeric)	Community affluence	Percentage of population living in a well-off household in a community (enumeration area)	CFHHD
Independent (numeric)	Community literacy	Percentage of population with at least a secondary level of education in a community (enumeration area)	CFHHD

Note: C = Computed, CFIID = Computed from individual interview Data, CFHHD = Computed from Household Data

Space and time are essential attributes that enable individuals to comprehend and interpret events and phenomena and gain understanding and meaning from the world around them (Arega et al., 2023). The extended Oaxaca-Blinder Decomposition Approach was used to analyze the spatial and temporal trends in the nuptiality patterns, specifically examining the changes in nuptiality patterns across different regional states. The decomposition analysis of both levels and change over time was conducted using the Stata command mvdcmp, and

regression tree analysis from R software, which was used as a post-estimation command for various regression commands in the Stata. This method used Blinder Oaxaca decomposition, focusing on changes between groups over time and enabling decompositions pooled cross-section data. This approach is particularly suitable for evaluating interventions, policy changes, experiments with post-treatment follow-up, and facilitating before and after comparisons (Kröger & Hartmann, 2021). In this study, spatial analysis is a powerful tool for understanding the relationship between socio-economic factors and marriage incidence across different geographical areas. Furthermore, the spatial analysis adds spatial dimension, allowing for the uncovering of nuanced relationships between socioeconomic factors and marriage incidence that may not be apparent through traditional analytical approaches. These studies, use the birth cohort of 1965-1969 as the first cohort and 1980-1984 as the second cohort.

3.2.3. Ethical considerations

The study was conducted based on secondary data obtained from the Demographic and Health Surveys Program. The ICF/ORC Institutional Review Board has examined and approved the procedures and questionnaires for routine Demographic and Health Surveys (DHS). In addition, the Ethiopian Health and Nutrition Research Institute and the Institutional Review Board offices of the Ministry of Science and Technology of Ethiopia granted ethical approval to the study methods. After obtaining the respondents' oral agreement, interviews were undertaken. To safeguard respondent anonymity, the names of respondents and personal identifiers were not included in the final data.

3.3. Results

The study's findings revealed that the hazard of getting married exhibited variability across the nine regional states and two city administrations, starting from the age of 10. This indicates that the likelihood of individuals entering a first marriage differed significantly depending on geographical location in Ethiopia. Regarding the Southern, Nations, and Nationalities and Peoples' (SNNP) and Harari regions, there was almost no change between the birth cohorts in the timing of the first marriage. In Dire Dawa, the shift was reversed, that is, the second cohort had an earlier timing of entry to first marriage for ages below 20. After the age of 20, however, the entry rate for the first marriage was lower for the second cohort than the first cohort. In Addis Ababa, Amhara, and Benishangul Gumuz, the entry rate to the first marriage showed a delay starting from an early age. Further, it was noted that entry to marriage in Addis Ababa

did not show universality. Although the magnitude was small, the change in the timing of first marriage among women residing in the Tigray region showed a similar trend (Figure 3.1).

In Oromia and Gambella, the earliest early marriages remained the same for the two cohorts with lower rates of entry to marriage in Oromia. In these regional states, the entry to first marriage was postponed to later ages after about 15 years. The fact that the graph reaches the maximum level after the age of 30 for women residing in the Gambela region showed that there was a higher proportion of postponement of entry to first marriage in the Gambela region. In Afar and Somali, a slight shift in the timing and rate of entry to first marriage was observed, although almost all women still get married before age 20. The rate is, however, smaller for Somalis than for the Afar region (Figure 3.1).

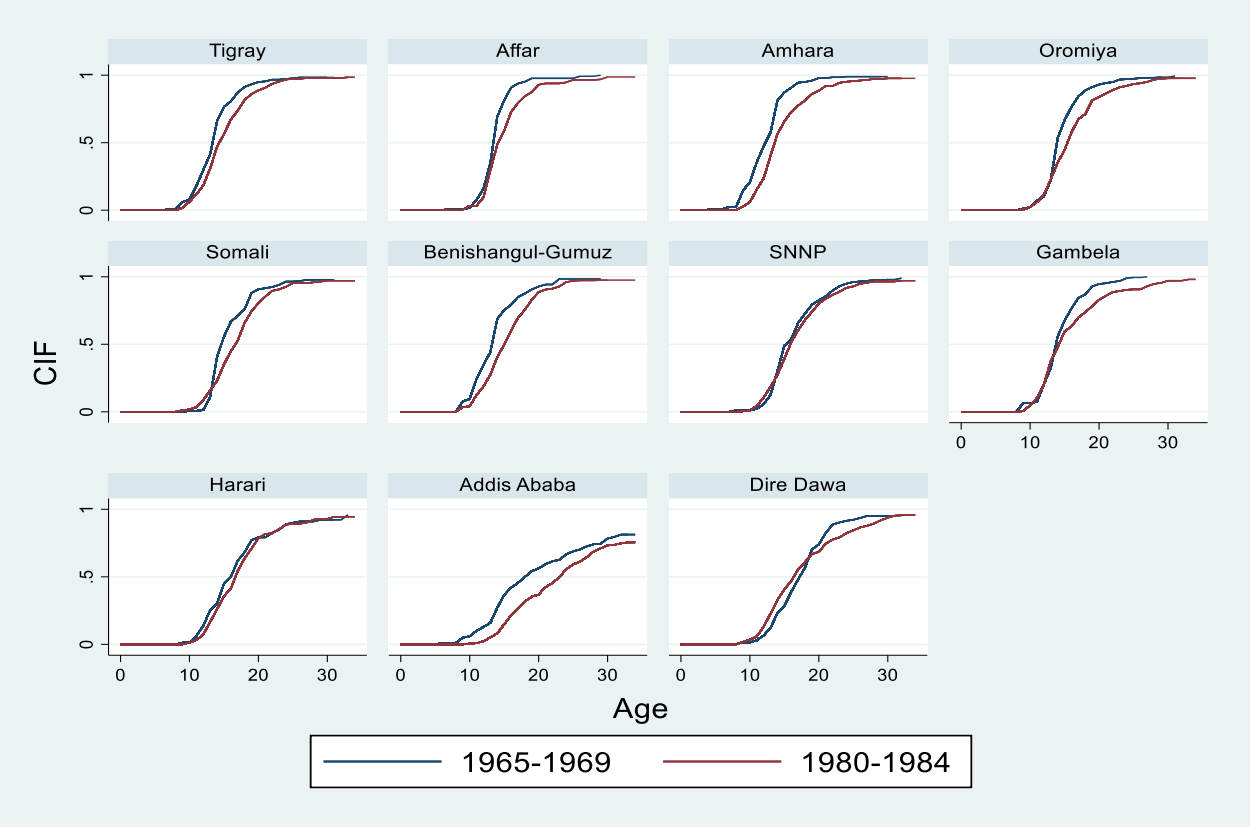

Figure 3.1: Spatial distribution of cumulative incidence of first marriage

The weighted sample constitutes a total sample of 3,873 women where 1,804 respondents were from the first birth cohort (1965 –1969) and 2,069 respondents from the second birth cohort (1980 –1984). The largest proportion of incidence of marriage contributed by Oromia, Amhara, and SNNPR was 38.49, 24.51, and 21.98 from the first cohort and (38.33, 23.16, and 20.47) from the second birth cohort, respectively. The study analyzed the cumulative incidence function to estimate the overall marriage patterns among nine regional states and two city

administrations in Ethiopia. The cumulative incidence function provides the probability of experiencing a particular event, in this case, getting married, over a specified period (Table *3.2*).

Table 3.2 shows that 38% of women were reported to have remarried in the first birth cohort, whereas 21% were in the latter at the national level. The magnitude of entry to remarriage was reduced by 17%. About 62% of women in the former cohort got married once and 79% in the latter cohort. We found that women in latter birth cohorts were significantly less likely to remarry than former cohorts. The incidence of remarriage declined across all regional states except Dire Dawa city administrations. The Amhara, Tigray, and Afar regional states were the highest contributors to the incidence of remarriage and the overall marital dissolution in the first birth cohorts. The second birth cohort includes Amhara, Tigray, and Gambela regional states. Dire Dawa, Somali regional states, and Addis Ababa were the least contributors to the incidence of remarriage to the overall marital dissolution in the first cohorts. Except for Tigray, Afar, Amhara, Gambela, and Benishangul-Gumuz, the rest of the regions and city administrations were smaller contributors to the incidence of remarriage and the overall marital dissolution in the second cohort (Table *3.2*).

The Amhara region had the highest marital dissolution rate in the first cohort. This indicates that a larger proportion of marriages in the Amhara region ended in separation or divorce compared to other regions during that period. The reasons for this higher rate of marital dissolution in the Amhara regional state could be cultural norms, socioeconomic conditions, access to education, and changing attitudes toward marriage and family. In contrast, in the second cohort, the Tigray region exhibited the highest marital dissolution rate. This suggests a shift in the regional dynamics of marital dissolution over time. The increase in marital instability in the Tigray region is attributed to various factors, such as socio-economic changes, urbanization, increased education levels, and cultural norms (Table *3.2*).

In the first cohorts, Dire Dawa had the lowest incidence of marital instability. This indicates that marriages in Dire Dawa were relatively stable compared to other regions during that period. The lower incidence of marital dissolution suggests that couples in Dire Dawa were experiencing fewer separations or divorces compared to other areas. Moving on to the second cohort, Somali and Addis Ababa cities had the lowest incidence of marital dissolution. This suggests a decline in marital instability in these regions compared to the first cohorts. The

reasons behind this relative instability attributed to a variety of factors, including cultural norms, social and economic conditions, and the prevalence of strong social support systems within the community (Table *3.2*).

Table 3.2: Spatial distribution of women's marital instability and cumulative incidence of marriage

Regions	Remarriage			Incidence of marriage		
	1965-1969 [n=1804]	1980-1984 [n=2069]	Difference	1965-1969 [n=1804]	1980 -1984 [n=2069]	Difference
Tigray	0.58	0.36	-0.22	6.48	6.85	0.37
Afar	0.53	0.24	-0.29	1.35	0.69	-0.66
Amhara	0.62	0.42	-0.20	24.51	23.16	-1.35
Oromia	0.32	0.12	-0.20	38.49	38.33	-0.16
Somali	0.21	0.05	-0.16	1.51	2.36	0.85
Benishangul-Gumuz	0.45	0.23	-0.22	1.10	1.10	0
SNNP	0.30	0.15	-0.15	21.98	20.47	-1.51
Gambela	0.35	0.28	-0.07	0.31	0.25	-0.06
Harari	0.33	0.15	-0.18	0.22	0.24	0.02
Addis Ababa	0.22	0.08	-0.14	3.50	5.98	2.48
Dire Dawa	0.16	0.19	0.03	0.54	0.57	0.03
National level	0.38	0.21	-0.17			

Generally, the rate of remarriage declined by (-0.17) between the two cohorts at the national level. This decline implies that individuals who had previously been married and divorced or widowed were less likely to enter into subsequent marriages compared to previous generations. There is a similarity in the disparity between the rates of remarriage (-0.20) for the Amhara and Oromia regional states across the two different cohorts. Additionally comparing the rates of remarriage (-0.22) between Tigray and Benishangul-Gumuz regional states, there is consistent and similar difference observed across the two different cohorts. The Afar regional state has experienced the highest reduction in remarriage rates (-0.29) compared to other regions and city administrations. The Gambela regional state has experienced the smallest reduction in the rate of remarriage (-0.07) compared to other regions and city administrations.

According to Figure 3.2, the regional states of Afar, Amhara, Oromia, SNNP, and Gambela have experienced a reduction in the cumulative incidence of marriage. On the other hand, Tigray, Somali, Harari, Addis Ababa, and Dire Dawa have shown an increase in the cumulative incidence of first marriage. Benishangul-Gumuz regional state has experienced no change in the cumulative incidence of marriage between the two birth cohorts, which means that marriage rates remained relatively stable over time. Addis Ababa has experienced the highest rate of increment in the cumulative incidence of marriage compared to the other regions and Dire Dawa in Ethiopia. This suggests that marriage rates have been increasing at a higher rate in Addis Ababa compared to other areas. The SNNP and Amhara regional states have experienced the highest rate of decline in the cumulative incidence of marriage compared to other regions

and city administrations. This indicates that marriage rates have been declining at a higher rate in these two regions. The spatiotemporal analysis of age at first marriage revealed no temporal change between the two cohorts in all regions except Addis Ababa as depicted in the regression tree analysis produced by R Software (Figure 3.2).

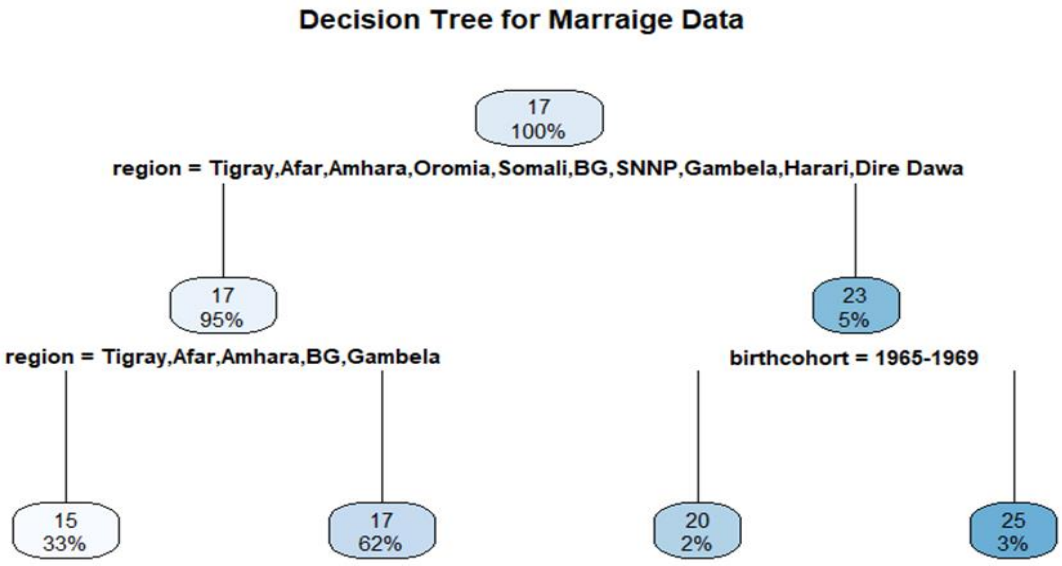

Figure 3.2: Regression tree of cumulative incidence of first marriage

3.3.1. Space-time analysis

Based on the space-time analysis using a regression tree, all regions had spatial differences in age at first marriage. The result of our analysis showed that no spatiotemporal variation has been observed in all regions except Addis Ababa. The temporal change was observed only in Addis Ababa. At the national level, the average age at first marriage is 17 years. However, when disaggregated by the regional states, the age at first marriage becomes 15 in Tigray, Afar, Amhara, Benishangul Gumuz, and Gambela indicating that practiced early marriage compared to 17 years in Oromia, Somali, SNNP, Harari, and Dire Dawa. Further, the average age at first marriage was 20 for the 1965 –1969 birth cohort and 25 for the 1980 –1984 birth cohort for Addis Ababa. This indicates a 5-year postponement in entry to the first marriage between the two birth cohorts, showing a trend towards later marriages over time (Figure 3.2).

Given the promising positive change in the age at first marriage seen in Addis Ababa, the reasons for the differential progress in the change in age at first marriage were assessed using Addis Ababa as a counterfactual in our analysis. Labeling Addis Ababa as a counterfactual is

due to its observed temporal changes in age at first marriage that provide a comparative framework for evaluating changes in nuptiality patterns across Ethiopia's diverse regions and Dire Dawa. As such, the decomposition analysis focused on the mean difference in age at first marriage among various regions and Addis Ababa for the second birth cohort. For this purpose, Amhara, Oromia, Afar, and Somali regional states were selected. The underlying reason for the selection of the Amhara and Oromia regions has to do with their large population, and that of the Afar and Somali regions is due to their highest fertility levels. Decomposition analysis compares mean differences in age at first marriage between Addis Ababa and the sleeted regions (Amhara, Oromia, Afar, and Somali) for the second birth cohort (1980 – 1984) (Table 3.3).

3.3.2. Spatial heterogeneity in cumulative incidence of first marriage

3.3.2.1. Decomposition at the age of 15

About 56.55% of women in the Amhara region and 8.08% in Addis Ababa married at age 15. This implies the proportion of women getting married at age 15 is approximately 7 times higher in the Amhara region compared to Addis Ababa. When we compare Addis Ababa and Amhara regional states at age 15 for the recent birth cohorts, almost all the differential factors in the proportion of married women explained by coefficient effects (48.72/48.47=100%) reveal that the variables included in the analysis (represented by coefficients) explained the vast majority of the variation in age at first marriage between the two regions. About 42.49% of the difference in the proportion of married women is attributed to other factors not accounted for by the coefficients. No significant characteristic difference has been noted in the main decomposition except its components. The differences in educational attainment (13.84/48.47=28.5%) and wealth index (12.82/48.47=26.44%) were the primary factors contributing to the variations in the age at first marriage between the two regions (Table 3.3).

Table 3.3: Decomposition of the proportion of married at age 15, 20, and 25 among regions, Ethiopia

Decomposition	Amhara Region Vs. Addis Ababa City					
	At Age 15		At Age 20		At Age 25	
	Coef.	P-val	Coef.	P-val	Coef.	P-val
Amhara	56.55	0.000	86.04	0.000	95.16	0.000
Addis Ababa	8.08	0.002	35.32	0.000	55.52	0.000
Difference	48.47	0.000	50.72	0.000	39.64	0.000
Explained	-0.25	0.990	28.42	0.448	7.84	0.844
Education	13.84	0.025	28.52	0.010		
Wealth	12.82	0.020				
Constant	42.49	0.045				
Unexplained	48.72	0.021	22.30	0.554	31.79	0.428

Decomposition	Oromia Region Vs. Addis Ababa City					
	At Age 15		At Age 20		At Age 25	
	P-val	Coef.	P-val	Coef.	P-val	Coef.
Oromia	35.29	0.000	81.45	0.000	92.14	0.000
Addis Ababa	8.08	0.002	35.32	0.000	55.52	0.000
Difference	27.23	0.000	46.13	0.000	36.61	0.000
Explained	7.26	0.591	21.84	0.365	9.31	0.717
Education	12.23	0.024	26.24	0.007		
Wealth	12.35	0.011				
Unexplained	19.95	0.147	24.28	0.320	27.31	0.293
Wealth	2.39	0.045				

Decomposition	Somali Region Vs. Addis Ababa City					
	At Age 15		At Age 20		At Age 25	
	Coef.	P-val	Coef.	P-val	Coef.	P-val
Somali	22.98	0.002	74.47	0.000	92.59	0.000
Addis Ababa	8.08	0.002	35.32	0.000	55.52	0.000
Difference	14.90	0.057	39.15	0.000	37.07	0.000
Explained	27.38	0.210	-2.60	0.947	-9.82	0.813
Education	15.27	0.026	31.00	0.012		
Wealth	34.36	0.043				
Unexplained	-12.48	0.589	41.75	0.294	46.90	0.263
Migration					10.73	0.047

Decomposition	Afar Region Vs. Addis Ababa City					
	At Age 15		At Age 20		At Age 25	
	Coef.	P-val	Coef.	P-val	Coef.	P-val
Afar	48.66	0.000	87.50	0.000	94.73	0.000
Addis Ababa	8.08	0.002	35.32	0.000	55.52	0.000
Difference	40.58	0.000	52.18	0.000	39.21	0.000
Explained	29.51	0.177	-1.05	0.978	-9.56	0.814
Education	14.38	0.029	29.69	0.012	23.73	0.055
Wealth	33.65	0.047				
Unexplained	11.07	0.620	53.23	0.173	48.77	0.235
Education			-40.21			

Decomposition	Other Regions Vs. Addis Ababa City					
	At Age 15		At Age 20		At Age 25	
	Coef.	P-val	Coef.	P-val	Coef.	P-val
Others	32.56	0.000	77.03	0.000	92.85	0.000
Addis Ababa	8.08	0.002	35.32	0.000	55.52	0.000
Difference	24.48	0.000	41.71	0.000	37.32	0.000
Explained	5.26	0.069	16.14	0.496	0.24	0.992
Education	10.75	0.024	23.84	0.005	19.34	0.033
Wealth	15.63	0.013				
Unexplained	19.22	0.157	25.57	0.287	37.09	0.147

In Oromia and Addis Ababa, the proportion of women married at age 15 is 35.29%, and 8.08%, respectively. This means the proportion of women married in the Oromia region is approximately 27.23% greater than in Addis Ababa. The overall difference of 27.23% in the proportion of married women is explained by detailed decomposition attributed to the wealth (12.35/27.23 = 45.35%) and educational achievements (12.23/27.23 = 44.9%) of women. Likewise, wealth has a coefficient effect to converge the gap between the proportions of married in the two regions at age 15. Among the total difference about 8.78% of the discriminatory effects were contributed by the wealth index as a response to behavior change. The result of the decomposition analysis compared the Somali region and Addis Ababa yielded a difference of 0.057, which is considered insignificant. Therefore, there was no decomposition result report at age 15. Regarding Afar and Addis Ababa the proportion of married women at the age of 15 was 48.66% in Afar as compared to Addis Ababa. The cumulative incidence of entry to the first marriage by Afar women was 40.58% higher than that of Addis Ababa women (Table *3.3*).

The overall difference in entry to first marriage is mainly attributed to the wealth and educational attainment of the women. Among the total difference in the proportion of married women, 82.92% is explained by the wealth index and 35.43% by educational achievements at the age of 15. Furthermore, when we compare other regional states with Addis Ababa, we see that 32.35% of the women in (Tigray, Gambela, Benishangul Gumuz, SNNP, Harari, and Dire Dawa) and 8.08% of the women in Addis Ababa got married at age 15. Collectively, other regions are 3 times higher than the capital in entry to the first marriage. The overall difference of 24.48% was attributed merely to the characteristics differences resulting from the level of educational achievements of women (10.75/24.48 = 43.91) and wealth (15.63/24.48 = 63.84%) (Table 3.3).

3.3.2.2. Decomposition at the age of 20

The proportion of married women is 86.04% for the Amhara region and 35.32% for Addis Ababa city. The women from the Amhara region enter their first marriage at a rate of 50.72% higher than women in Addis Ababa who enter their first marriage at the age of 20. It suggests that women in the Amhara region are more likely to be married, and they tend to enter their first marriage at a higher rate compared to women in Addis Ababa, specifically at the age of 20. The main contributor to the overall difference in the proportion of married women was education. The Level of educational achievement of the women was the only variable that

explains the overall difference of 56.23%. The cumulative incidence of the first marriage to the women living in the Oromia region was 81.45% as compared to that of Addis Ababa (35.32%). The proportion of women residing in the Oromia region who enter their first marriage is higher by 46.13% of women residing in the capital city of the country. Women's educational achievement was the only attribute that explain the overall difference of 56.88% (26.24/46.13). The proportion of married women was 74.47% in the Somali region as compared to women in Addis Ababa at age 20. The proportion of married women in the Somali region was 39.15% higher than that of Addis Ababa. This significant regional difference in the proportion of married women was obtained only because of a change in educational achievement (31/39.15 = 79.18%) in the Somali region. About 87.50% of women in the Afar region and 35.32% of women in Addis Ababa married at the age of 20. In the Afar region, 87.50% of women were married, while in Addis Ababa, only 35.32% of women did so. This indicates a significant difference in marriage patterns between these two regions (Table 3.3).

The proportion of married women in the Afar region was 52.18% higher than that of Addis Ababa. Here components of endowments and discriminatory effects contribute to the overall changes in marriage. The level of educational achievement plays a significant role in harnessing a large proportion of married women (26.69/52.18 = 51.15%) at the age of 20. We also found that coefficient effects, if education is as effective in Afar as that of Addis Ababa, more Afar women would postpone marriage to a later age than 20 than what would have been expected. The proportion of married women in other regions is 77.03% as compared to in Addis Ababa (35.32%). The proportion of married women in other regions was 41.71% higher than in Addis Ababa. The gap was obtained merely through the educational achievements of married women in other regions than that of Addis Ababa. About 57.16% of the overall difference in the proportion of married women is explained dominantly by the educational achievements of other regions (Table 3.3).

3.3.2.3. Decomposition at the age of 25

Most women of the Amhara region (95.16%) and slightly more than half (55.52%) of Addis Ababa married by age 25. The majority of women in the Amhara region (95.16%), married by the age of 25. Slightly more than half (55.52%) of the women, got married by the same age. The proportion of married women in the Amhara region is approximately 39.64% higher than that of Addis Ababa. At age 25, we observed that the two regions had significant differences

in the proportion of married women, though insignificant results in terms of endowments and coefficients effects. The proportions of married women in Oromia and Addis Ababa were 92.14%, and 55.52%, respectively (Table 3.3).

The proportion of married women in the Oromia region is 36.61% higher than that of Addis Ababa. This huge difference is not explained well, because of characteristics differences and coefficient effects loss of significance at the same age. About 92.59% of women were married in the Somali regional state. The difference between the groups was 37.07%. All the endowments and coefficient effects except migration that explain the total differences were insignificant at the age of 25. The discriminatory effects of migration for women in the Somali region accounted for 10.73% of the total difference in the proportion of married women. From the total difference of 37.07% in the proportion of married women, 28.95% of this difference is contributed by the coefficient effects of migration (Table 3.3).

The proportion of married women in the Afar region is 94.73%. The total difference between the two regions was 39.21%. The total difference, (23.73/39.21 = 60.52%) contributed by educational achievements of the women. From the total difference of 39.21% of the level of educational achievements of women in the Afar region contributed approximately (23.73/39.21 = 60.52%). The level of educational attainment was a significant factor contributing to the difference in the proportion of married women between the two groups. Regarding other regions and Addis Ababa city, the proportion of married women in the other regions was 92.85% at the age of 25. The overall difference between the two groups is 37.32%. Both explained and unexplained characteristics lost total significance at this particular age. However, the components of explained characteristics were significantly contributed by the level of women's educational achievements approximately (19.34/37.32 = 51.82%) from the total difference between the two groups (Table 3.3).

3.4. Discussion

This study compares the spatial heterogeneity of change in nuptiality patterns of the Ethiopian women using selected birth cohorts with, the identification of components and sources of the changes in the nuptiality patterns among nine regional state and two city administrations. Factors such as cultural traditions, religious beliefs, economic conditions, and levels of women's education influence the magnitude and timing of marriage. The probability of

individuals entering the first marriage differed significantly in the geographical location. The diverse geographical and cultural landscape of the country has contributed to variations in marriage patterns across different regions of the country.

In Ethiopia, marriage is universal and occurs early (Gurmu & Etana, 2014)**.** Similarly, the result of this study revealed that marriage is early and almost universal in all regions except in Addis Ababa in both birth cohorts**.** Among the regions where there is little change in the timing of first marriage between the two birth cohorts, this indicates a resilience of traditional marriage practices despite broader societal changes. The stability in the timing of first marriage between birth cohorts in the SNNP and the Harari region suggests that traditional marriage patterns have remained relatively consistent over time in these areas. Similarly, the median age at first marriage for women has also shown a relatively stable between the two cohorts in Indonesia (Ministry of Health Indonesia, 2018). This consistency could be influenced by factors such as strong adherence to persistent traditions and cultural norms, gradual changes in women's education social norms, and gradual shifts in gender roles and economic conditions that remained relatively stable over the years.

The reversal of the shift in marriage timing in Dire Dawa indicates that the earlier timing of marriage for ages below 20 in the second birth cohort reflects persistent cultural values or economic factors that encourage early marriage. The smaller rate of entry to first marriage after the age of 20 could reveal a shift in societal attitudes toward marriage, increased educational opportunities, or changing economic conditions that lead individuals to delay marriage. The delay in the entry rate to first marriage starting from an early age in Addis Ababa, Amhara, and Benishangul Gumuz regions indicates a significant shift in marriage patterns compared to the first cohorts. The rate of entry into first marriage has decreased in sub-Saharan Africa, but the extent of the change differs among the various nations and areas on the continent (Bongaarts et al., 2017b).

In Addis Ababa, marriage didn't show universality. Likewise, the increasing prevalence of non-marital cohabitation in Botswana, particularly among the educated urban population, suggests a departure from the traditional universal marriage pattern. According to studies, the percentage of never-married people in Ghana has been rising, particularly among women and people who live in urban areas (Chimbiri, 2007; Takyi & Gyimah, 2007). This shows that, especially among some demographic and socioeconomic groups, the nuptiality pattern has been changing,

with a rise in non-marital partnerships or delayed marriage in addition to an increasing diversity of marriage patterns.

The observation of a similar trend, although to a smaller degree, in the Tigray region suggests that this shift might not be exclusive to certain areas but could be indicative of broader societal changes or trends across Ethiopia. There has been consistency in the occurrence of early marriages in both Oromia and Gambella regions, with Oromia having lower rates of marriage entry compared to Gambella. This suggests that early marriage practices have remained relatively stable in the two regions. Additionally, a higher proportion of women residing in the Gambela region postpone their entry into first marriage beyond 30 compared to other regions of the country. Understanding why women in the Gambela region are delaying marriage entry could provide valuable insights into the dynamics of marriage and family formation in that specific context. However, Tessema (2020a) revealed that the Gambela region is one of the regions with the high-risk area of early marriage in the country.

TFR for the Somali region is higher (6.9) compared to the Afar region (5.5), and it's interesting to note that the rate of marriage before age 20 is smaller for Somali than in the Afar region (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016b). The smaller rate of marriage before age 20 among Somali women despite higher TFR, shows differences that could result from cultural norms regarding marriage age, variations in education and economic opportunities for women, differences in family structures, and variations in the prevalence of early marriage practices.

In the first birth cohort, 38% of women were reported to have remarried, whereas in the second birth cohort, this figure decreased to 21%. Understanding the trends provides an understanding of the dynamics of marriage and family structure over time and informs policies and interventions supporting individuals in different stages of marital transition in Ethiopia. The incidence of remarriage decreased across all regional states and, it remained stable or potentially increased in Dire Dawa. These potential factors could be cultural norms and attitudes towards divorce and remarriage, economic conditions, access to support services for divorced individuals, and variations in legal frameworks regarding marriage and divorce.

The rates of remarriage (-0.20) for Amhara and Oromia, and (-0.22) for Tigray and Benishangul-Gumuz regional states across two different cohorts indicate a stable pattern over

time. According to the study, Senegal's remarriage rate has been mostly constant over time, with very small differences observed between birth cohorts. For women, the proportion who had remarried by the age of 40 for both the 1938–1942 and 1948–1952 birth cohorts was almost 60% (Lambert et al., 2015). This consistent pattern implies that there may be underlying structural or cultural factors specific to these regions that influence remarriage patterns. The Afar regional state stands out with the highest decline in remarriage rates (-0.29), indicating a substantial decrease in the incidence of remarriage over time in this region. On the other hand, the Gambela regional state experienced the smallest reduction in the rate of remarriage (-0.07), suggesting a more modest decline compared to other regions and city administrations. It's interesting to note that between the two cohorts, Addis Ababa experienced the highest rate of increment in the cumulative incidence of marriage compared to other regions and Dire Dawa. This finding contradicts a previous study, where women retreat from marriage and spend most of their reproductive years being unmarried in Addis Ababa (Gurmu & Mace, 2021). Addis Ababa, the capital and largest city in Ethiopia, attracts people from diverse backgrounds and regions, which may contribute to a higher overall marriage rate.

3.4.1. Space-time decompositions at different ages

The findings from the space-time analysis using regression trees reveal that there are spatial differences in age at first marriage across all regions in Ethiopia. However, the analysis suggests that apart from temporal changes observed in Addis Ababa, there is no significant spatiotemporal variation in age at first marriage observed in the other regions. This means that while there are spatial differences in marriage age across regions, these differences have remained relatively stable over time within each region, except for Addis Ababa, where temporal changes are evident.

The disaggregated data on the average age at first marriage provides valuable insights into regional variations and temporal trends in marriage patterns across Ethiopia: Tigray, Afar, Amhara, Benishangul Gumuz, and Gambela have notably lower average ages at first marriage (around 15 years), indicating the prevalence of early marriage practices in these regions. On the other hand, Oromia, Somali, SNNP, Harari, and Dire Dawa regions exhibit higher average ages at first marriage (17 years), suggesting a tendency towards later marriages in these areas. The average age at first marriage in Addis Ababa increased from 20 years for the 1965-1969 birth cohorts to 25 years for the 1980-1984 birth cohorts. This 5-year postponement in entry to first marriage indicates a shift towards later marriages among individuals born in more recent

years in the capital city. Similarly, women residing in Addis Ababa face a lower risk of entering early marriage compared to other regions of Ethiopia (Tessema, 2020b).

In the Amhara region, approximately 56.55% of women marry at the age of 15. In Addis Ababa, only about 8.08% of women marry at the age of 15. This substantial gap underscores the importance of understanding regional variations in marriage practices and social norms. Similarly, the Amhara region has the greatest rate of early marriage, with 50% of females getting married at the age of 15 and 80% at 18 (Abera et al., 2020). This shows early marriage is highly prevalent. There are insignificant total characteristic differences noted between the regions except for component differences. This implies the overall structures or patterns are similar, and that specific elements contributing to those structures vary between the two regions. The difference in educational attainment contributes approximately 28.5% to the variation in the age at first marriage between Amhara and Addis Ababa. The difference in wealth index contributes approximately 26.44% to the variation in the age at first marriage between the two regions. Educational attainment and wealth index are indeed significant factors contributing to the differences in age at first marriage between the Amhara region and Addis Ababa. Sub-Saharan Africa has significant geographical variance in marriage trends, which can be attributed to factors such as household affluence and female education levels (Shapiro & Gebreselassie, 2014).

The detailed decomposition of the proportion of married women revealed that; the overall difference in the proportion of married women between the Oromia region and Addis Ababa city is 27.23%. Approximately the overall difference (12.35/27.23 = 45.35%) explains differences in the wealth index and (12.23/27.23 = 44.9%) explains differences in the educational achievements between the two regions. This analysis indicates that both wealth and educational achievements play significant roles in explaining the observed differences in the proportion of married women between the Oromia region and Addis Ababa.

The variables that were included in the analysis did not have a significant role in explaining the difference in the proportion of married women between Addis Ababa and the Somali region. Cultural norms, religious views, or other contextual factors specific to these areas may have a greater influence on the differences in marriage rates between the two regions at age 15. This could imply that unaccounted factors might be more influential in shaping marriage patterns in these two regions, other than demographic and socioeconomic considerations. The cumulative

incidence of entry to first marriage for women in Afar is 40.58% higher than for women in Addis Ababa. These figures highlight a significant disparity in marriage rates between the Afar region and Addis Ababa, with Afar women marrying at a much higher rate and at an earlier age compared to women in Addis Ababa.

Like that of the Oromia region and Addis Ababa city both the wealth and educational achievements of women play significant roles in explaining the observed differences in the proportion of married women between the two regions. The overall difference in the proportion of women marrying at the age of 15 between other regional states (including Tigray, Gambela, Benishangul Gumuz, SNNP, Harari, and Dire Dawa), and Addis Ababa is 24.48%. This difference is primarily attributed to two factors: women's educational achievements (10.75/24.48 = 43.91) and wealth index (15.63/24.48 = 63.84%). Addressing inequalities in education and wealth distribution could be key to promoting more equitable marriage practices across regions. The proportion of married women between the Amhara region and Addis Ababa is quite significant: In the Amhara region, approximately 86.04%, and in Addis Ababa, 35.32% of women are married at the age of 20. This substantial difference suggests notable variations in marriage patterns and possibly reflects differences in cultural norms, socio-economic factors, and urban-rural dynamics between the two areas. Educational attainment plays a significant role in shaping marriage patterns along, with other factors.

Women in the Oromia region enter their first marriage at a rate that is 46.13% higher than women in the capital city which is at the age of 20. Furthermore, women's educational achievement is the sole attribute that explains the overall difference, accounting for 56.88% of the variation. The proportion of married women in the Somali region is 39.15% higher than that of women in Addis Ababa which is at the age of 20. This significant regional difference in the proportion of married women is attributable solely to changes in educational achievement, accounting for 79.18% of the variation. This is aligned with the economic theory of marriage, which postulates that educated women would value advancing their careers over marriage since they see less financial gain from it. Higher-educated females tend to marry later and at a lower rate than in other regions (Oppenheimer, 1988b).

If education in Afar was as effective as in Addis Ababa, Afar women would be more likely to postpone marriage to a later age, potentially beyond 20 years old, compared to what is currently observed. This finding highlights improving educational opportunities and achievements in the Afar region could lead to positive outcomes such as delaying marriage, which can have various

socio-economic benefits for individuals and communities. The efforts to enhance education access and quality in Afar could contribute to positive social change and empowerment for women. Approximately, 57.16% of the overall difference in the proportion of married women is predominantly explained by differences in the educational achievements of women in other regions compared to those in Addis Ababa. The Amhara region and Addis Ababa reveal significant differences in the proportion of women marrying by age 25. In the Amhara region, an overwhelming majority of women (95.16%), and in Addis Ababa, slightly more than half of women (55.52%) are married by the age of 25. On the other hand, a small percentage of women in the Amhara region marry after the age of 25, with only 4.84% falling into this category. This indicates a strong cultural norm or social pattern where marriage tends to occur at younger ages in the region.

About 44.48% of women in Addis Ababa who marry after the age of 25 indicate that a significant portion of women in the city marry at later stages. In the Oromia region, approximately 92.14% of women are married by the age of 25. In Addis Ababa, approximately 55.52% of women marry by the age of 25, which reveals that a much higher proportion of women in the Oromia region marry at younger ages compared to women in Addis Ababa. The influence of migration is the only significant contributor to the observed differences in marriage rates in the Somali region at this particular age. Programs and policies aimed at changing nuptiality patterns in the Somali region might need to put more emphasis on the management of migration and addressing the socioeconomic factors that influence population mobility. From the total difference of 39.21% in the proportion of married women, the level of educational achievements of women in the Afar region contributed approximately 60.52% to this difference (23.73/39.21). This indicates that educational attainment is a significant contributing factor to the difference in marriage rates between the Afar region and Addis Ababa.

Generally, the Amhara region has the highest proportion of married women compared to other regions, particularly Addis Ababa at the age of 15. This underscores the significant demographic difference between rural and urban areas in Ethiopia. Oromia region has the smallest difference in the proportion of married women compared to Addis Ababa by the age of 15 among the regions analyzed. This suggests that, relative to other regions, there is less disparity in the prevalence of early marriage between Oromia and Addis Ababa at this age. Afar region has the highest proportion of married individuals compared to the other regions,

particularly compared to Addis Ababa at the age of 20. The Somali region has the smallest difference in the proportion of married women compared to Addis Ababa by the age of 20 among the regions analyzed. The Amhara and Afar regions have the highest proportion of married women compared to other regions at the age of 25. The Oromia region has the smallest difference in the proportion of married women compared to Addis Ababa by the age of 25 among the regions analyzed. This indicates the significant influence of education and economic factors on the marriage patterns among women in Ethiopia. The necessity of investigating spatial heterogeneity in change in nuptiality patterns is to underscore the importance of considering local contexts and specific challenges in different regions when developing policies and programs aimed at improving the well-being of women and girls.

This study compared two birth cohorts among nine regional states and two city administrations, as the first cohort lived in an era where Ethiopia had no population policy and girls' education was limited. Whereas, the second cohort lived through a policy period -population policy, and the times were characterized by a regime change and a rise in girls' enrollment and improved access to reproductive health services. Further, assuming that the first birth cohort represents the absence of population policy and the second cohort represents women's experience within police presence. This study uses Addis Ababa as a point of reference or counterfactual to better understand and contextualize the changes in nuptiality patterns across Ethiopia's various regions. The analysis of policy intervention revealed that there was hardly any variation between the birth cohorts in the Southern, Nations, and Nationalities and People (SNNP) and Harari regions, which meant the policy contribution was found to be negligible. However, when disaggregated by the regional states, the age at first marriage becomes 15 in Tigray, Afar, Amhara, Benishangul Gumuz, and Gambela indicating that practiced early marriage compared to 17 years in Oromia, Somali, SNNP, Harari, and Dire Dawa. Further, the average age at first marriage was 20 for the 1965 –1969 birth cohort and 25 for the 1980 –1984 birth cohort for Addis Ababa. This indicates a 5-year postponement in entry to the first marriage between the two birth cohorts, showing a trend towards later marriages over time.

In Southern, Nations, and Nationalities and People (SNNP) and Harari regions, there was almost no change between the birth cohorts showing policy contribution is insignificant. Dire Dawa policy did nothing to influence the reversal of marriage patterns for ages below 20; however, it contributed after the age of 20. Contrarily, beginning at relatively early ages, the policy reforms implemented in Addis Ababa, Amhara, and Benishangul Gumuz caused a delay

or postponement in the age at which people were entering their first marriage. In Addis Ababa, there is a deviation from universal marriage patterns due to effective policy implementation which almost holds for the Tigray region. In Oromia, the earliest early marriages remained similar for the two birth cohorts due to policy. In Gambela, the policy is very effective in postponing marriage beyond the age of 30. The policy seems to have successfully encouraged marriage to happen beyond the age of 20 in the Somali and Afar regions, but it had less of an effect on completely preventing early marriage before 20.

3.4.2. Strengths and limitations of the study

The main strength of this study is the use of nationally representative data, which was collected using the standard and validated data collection tools. Additionally, we used an advanced model (spatial-temporal) that accounts for understanding geographic variation in age at first marriage. However, this study is not free from limitations. Because of the secondary nature of the data, factors such as parents' knowledge of the best marital age and knowing someone who is accused of early marriage have not been included in the analysis. Besides, due to the cross-sectional nature of the data, we are also unable to show the cause-and-effect relationship. Secondly, the study does not include men. Despite these limitations, this study's finding contributes to the existing literature by exploring the spatial pattern of marriage and its determinants which provides evidence to target intervention programs in high-risk areas and populations in Ethiopia.

3.5. Conclusion

In the past, marriage was early and universal in Ethiopia. However, when disaggregated spatially it is not universal in Addis Ababa. Women residing in the Gambela region postpone entry to first marriage beyond the age of 30. The marital stability in the timing of first marriage between birth cohorts in the Southern Nations, Nationalities, and Peoples' (SNNPR) and Harari region suggests that traditional marriage patterns have remained relatively consistent over time. The incidence of remarriage reduced across all regional states between the two birth cohorts except for Dire Dawa. The Afar regional state is one of the regions with the highest decline in remarriage rates. The Gambela region has the smallest decline in the rate of remarriage. In the Benishangul-Gumuz no change in the cumulative incidence of marriage between the two birth cohorts. The SNNP and Amhara regional states show the highest rate of reduction in marriage rates. Temporal change in average age at first marriage is seen in Addis Ababa. The educational

attainment of women, wealth index, and migration are the only coefficient effects that explain the overall difference in the proportion of married women. The former two predictors were predominantly explain overall difference in the proportion of married women across different age groups, particularly at ages 15, 20, and 25, in all sectors of decomposition analysis. Addressing inequalities in education achievements and wealth distribution could be key to promoting equitable marriage practices across all regions. Understanding regional variations in change in nuptiality patterns is essential for policymakers and researchers to develop targeted interventions and policies that address the specific needs and challenges related to marriage and family formation.

Despite all of Ethiopia's regions and city administrations operating under the common national population policy framework, there was prominent regional variation in changes in nuptiality patterns. The national population policy contributed little to changes in nuptiality patterns in SNNP and Harari region. In Addis Ababa, there was a shift from traditional universal marriage to non-universal patterns as a result of policy. The national policy was well-implemented and enforced in the Gambela region, leading to tangible outcomes in delaying marriage. The regional heterogeneity in policy outcomes underscores the importance of considering sub-national factors when designing and evaluating demographic policies.

3.5.1. Recommendation for further research

The lack of adequate data limited an examination of the pathways through which the covariate influences change in nuptiality patterns in each regions, because this required longitudinal data, and EDHS used cross-sectional data. Due to a lack of sufficient resources, including money and time, the cultural concerns surrounding the nuptiality patterns were not investigated. Future research should look for pathways and examine how different covariates interact with one another. To determine the cultural concerns related to Ethiopians' change in nuptiality patterns both at the national and regional levels, I suggest a comprehensive qualitative methodology.

Chapter 4. Exploring the Contributions of Change in Nuptiality Patterns to Fertility Transition among Ethiopian Women

Fertility changes in sub-Saharan Africa are strongly linked to the institution of marriage; primarily, childbearing within marriage is depicted as the ideal issue. The age of a woman at initial childbirth is a crucial factor in shaping future life and is directly connected to her lifetime fertility. However, Ethiopia has not adequately explored the role of changes in nuptiality patterns in lifetime fertility transition. Data from Ethiopian Demographic and Health Surveys conducted in 2000 and 2016 were used. A Poisson-based multivariate decomposition for the nonlinear response model was performed to identify and quantify the contribution of the shift in nuptiality patterns to the change in lifetime fertility. The lifetime fertility significantly declined between the survey periods. Early marriage and marriage instability are highly prevalent in Ethiopia. Marriage stability increased across the two surveys. The timing of marriage with subsequent stability increases lifetime fertility. Timing of marriage with subsequent marital instability decreases lifetime fertility. The Changes in the nuptiality patterns have significantly contributed to lifetime fertility transition. The huge amount of reduction in lifetime fertility is attributed to the number of deceased children. Furthermore, improvement in socioeconomic conditions contributed to lifetime fertility transition. The complex and dynamic shifts observed in the nuptiality patterns among Ethiopian women equally contributed to the lifetime fertility transition as modern family planning used. Changes in nuptiality patterns inform family planning policies and programs and highlight the need for targeted interventions that address specific reproductive health aspects of different nuptiality patterns. Governments and non-government organizations better navigate complexities of the nuptiality patterns and their contributions to the fertility transitions, ultimately promoting family planning and reproductive health outcomes.

4.1. Introduction

Fertility changes in sub-Saharan Africa (SSA) are strongly linked to the institution of marriage, primarily because childbearing within marriage is portrayed as ideal. In most SSA countries, the mean age at first marriage is below 20 years (John & Adjiwanou, 2022). Early fertility studies in SSA examined the contribution of nuptiality to fertility variation and the prospects of fertility decline in the region (Grant & Kohler, 2022). The period when fertility decline begins is characterized by changes in nuptiality, specifically the collapse of early marriage

patterns was still common. On the eve of fertility transition, the median age at first marriage declined below age 19 (Hertrich, 2017).

Marriage among women in most countries of SSA is often characterized as early and nearly universal. The rising age at first marriage, in turn, has played an important role in the ongoing fertility transition (Shapiro & Gebreselassie, 2014). The age at which the women marry is one of the primary determinants of fertility. Women who marry early, on average, are more likely to have their first child at a young age and give birth to many children, obviously contributing to high fertility (Shakya & Gubhaju, 2016). A decline in fertility is linked to the transition from marrying early to marrying later in life. The percentage of people getting married at various ages varies significantly across countries and changes over time, exerting notable influences on fertility rates. Delaying the age of first marriage is a viable strategy to lower fertility, particularly in populations with limited contraceptive usage or access to induced abortion services (Muhoza, 2022).

The process and timing of marriage differed by economic and socio-demographic factors. The age of a woman at initial childbirth is a crucial factor in shaping her future life and is directly connected to her lifetime fertility (Chernet *et al.*, 2019). Similarly, marriage is still regarded as a prerequisite for childbearing in Italy (Vitali & Billari, 2017). The Ethiopian Revised Family Code 2000 limits the minimum legal age for marriage to 18 years for both sexes though, the country still experiences one of the highest rates of early marriage among countries of SSA (Gazeta, 2000b). There has been a slight decrease in the proportion of women marrying before the age of 18, dropping from 63% in 2011 to 58% in 2016 among those of reproductive age (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2011, 2016a). The age at which someone gets married influences fertility in two manners. Firstly, marrying at a young age is directly linked to having children early, which results in a larger family because of an extended period of potential childbearing. Secondly, postponing marriage directly impacts the overall fertility within marriage by reducing the number of years in which couples can have children (Palamuleni, 2011).

Marriage and fertility are institutions that comprise a fundamental part of adult life in Africa. The universality and early marriage ensured that women spent most of their reproductive lives married, and marriage was the main pillar of childbearing. However, while both institutions , changes in relationships between marriage and fertility have not yet been established (Sayi,

2015). The idea that changes in nuptiality are part of a demographic transition was conceptualized in the 1960s (Muhoza, 2022). The nuptiality patterns of any country influences the level of fertility (Erulkar, 2022). The study of the contribution of shifts in nuptiality patterns to the fertility transition among Ethiopian women is significant and multifaceted (Kedir et al., 2024). However, the role of changes in nuptiality patterns in fertility transition has not been adequately explored. Therefore, this study provides updated evidence on how changes in nuptiality patterns contribute to fertility transition in Ethiopia.

4.1.1. Theoretical grounding of the study

Diffusion theory provides a useful framework for understanding how changes in nuptiality patterns influenced lifetime fertility transition between 2000 and 2016 in Ethiopia. Diffusion theory explains how new ideas, innovations, technologies, or practices spread within a society or from one society to another across time. The shift from early marriage to later marriage, as well as the increasing acceptance of cohabitation and singlehood, represents an innovation in social norms regarding marriage (Pandey et al., 2018). Different segments of the population adopt new marriage patterns at varying rates. Early adopters, often more educated women, led the way in delaying marriage and having fewer children, setting examples for others. The changing cultural and economic landscape, including increased educational opportunities for women and improved access to family planning resources, created a conducive environment for these changes in nuptiality patterns (Zabak et al., 2023). As nuptiality patterns became more widespread, they contributed to significant changes in reproductive behaviors, leading to a notable decline in lifetime fertility rates (Gatera, 2021).

The relationship of nuptiality and fertility has garnered significant attention in demographic research, particularly through the lens of diffusion theory. This theory posits that changes in social norms and behaviors, such as marriage patterns, spread through populations and influence fertility rates. Examination of nuptiality patterns' contribution to fertility changes is particularly relevant in the context of various global regions, where shifts in marriage practices have observed alongside fertility transitions. Schneider's findings that economic conditions significantly affect family formation and fertility behaviors, reinforce the notion that socio-economic factors are integral to understanding the diffusion of nuptiality patterns (Schneider, 2015). As societies evolve, the diffusion of new ideas changes norms surrounding marriage and family formation continues to reshape fertility landscapes.

Increased access to education serves as an innovation that empowers women with knowledge about reproductive health, family planning, and the benefits of smaller family sizes. As more women access education, the flow of information increases, leading to broader acceptance of contraceptive use. Women who adopt contraceptive use share their experiences with peers, further accelerating the diffusion of this practice within communities. With the rise in the levels of education and contraceptive use becoming more common, societal norms around marriage and family size may shift. Over time, as more women observe the benefits of education and contraceptive use, these practices may become normalized, leading to widespread adoption across various demographics. The combined effects of nuptiality patterns, socioeconomic factors and contraceptive use are likely to lead to a measurable decline in fertility rates by 2016.

4.2. Data and methods

This study used the EDHSs that were carried out in 2000 and 2016. These nationally representative surveys collected information on geographic, socioeconomic, demographic, health, and nutrition-related characteristics of individuals and households from women aged 15 – 49 years. The study employed a repeated cross-sectional comparative study design and used pooled data from the 2000 and 2016 DHS. The data were obtained using a stratified two-stage cluster sampling approach. In the first stage, a total of 645 enumeration areas (EAs) from 2016 and 539 clusters for the 2000 survey were selected with probability proportional to EA size (based on the 2007 PHC) and independent sample selection in each sampling stratum. Because of its design, which is extremely comparable across settings and time, demographic and health surveys are recognized as an important source for monitoring population indicators and vital statistics in middle and low-income countries (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016a; CSA [Ethiopia] and ORC Macro, 2001).

The DHS data is freely available and the public can access it upon a formal request. We applied to use the data and the required access was granted to us, which is at: http://www.measuredhs.com/data/available-datasets.cfm . This study used women aged 35 and above from in 2000 and 2016 EDHS. In other words, individuals aged 35 and above were examined to evaluate changes in the extent of lifetime fertility and its influencing factors. This age range was chosen because their impact on overall fertility is negligible, making it a suitable approximation for completed fertility.

4.2.1. Variables and measurements

In this study, the main outcome variable was measured as a discrete count of the number of children ever born alive (CEB) among married a woman aged 35 and above in the 2000 and 2016 surveys at the time of the survey data collection The CEB assesses the actual fertility accumulated by a woman, while the Total Fertility Rate relies on recent behavior (typically over the last 3 or 5 years), excluding consideration for children born earlier. CEB includes all live-born children and excludes stillbirths. The choice of CEB over TFR is based on the recognition that TFR, though widely used, has limitations. TFR projects the number of children a woman would have starting from childbirth at age 15 to the end of her reproductive life span if the age-specific fertility patterns remain constant. The assessment of how the change in nuptiality patterns is contributing to fertility transition analyzes individual and group-level characteristics as the predictors. The descriptions of many variables are available in the standard recode manual of DHS (ICF, 2018a) and the specific descriptions of the variables and their measurements utilized for this study are shown in the table below (Table 4.1).

Table 4.1: Description of variables and their measurement used in the analysis

Type	**Name and label**	**Description and measurement**	**Source**
Outcome (numeric)	Children ever born (v201)	Lifetime fertility of women	Individual interview data
Independent (numeric)	Age at first marriage (v511)	Age at the start of the first marriage or union is calculated from the date of start of the first marriage or union and the date of birth of the respondent.	Individual interview data
Independent (numeric)	Age at first birth of baby (v212)	All respondents with one or more births had a record of this variable. The age of the respondent at first birth is calculated from the date of first birth and the date of birth of the respondent.	Individual interview data
Independent (numeric)	Age at first sex (v531)	Age at first sexual intercourse - imputed. This variable was chosen for the reason that it had a complete record in that data editions have been made on it and inconsistent records were avoided.	Individual interview data
Independent (categorical)	Region(V224)	The place resident of each respondent along with the regional state (1= Agrarian, 2= Emerging, 3= Mainly urban)	Computed
Independent (categorical)	Place of residence (v102)	Type of place of residence where the respondent was interviewed as either urban or rural (1=Urban, 2=Rural)	Individual interview data

Type	Name and label	Description and measurement	Source
Independent (categorical)	Educational level (v106)	Highest education level attended. This is a variable that shows the level of education in the following categories: 0=No education, 1= Primary, 2 = Secondary and 3 = Higher.	Individual interview data
Independent (categorical)	Occupation (v717)	Respondents' occupation group classified as 0=Not working (student and pensioner), 1=Agricultural employee, 2=Industry employee	Computed from individual interview data
Independent (categorical)	Religion (v130)	The religious affiliation of respondents which will be recoded to 1=Christians (Orthodox, Protestant, and Catholic), 2=Muslim, 3=Others)	Computed from individual interview data
Independent (categorical)	Contraceptive use (v302)	Ever use of any type of modern contraceptive use. It will be computed from interview data and recoded as 0=No, never used a modern method, 1=Yes, used a modern method.	Computed from individual interview data
Independent (categorical)	Household wealth (hv271)	A composite measure of a household's cumulative living standard. It is calculated using the household's ownership of selected assets. It is generated with a statistical procedure known as principal components analysis. It places individual households on a continuous scale of relative wealth and all interviewed households into five wealth quintiles (1=Lowest, 2=Lower, 3=Middle, 4=Richer, 5=Richest)	Household interview data
Independent (numeric)	Community affluence	Percentage of population living in a well-off household in a community (enumeration area)	Computed from Household data
Independent (numeric)	Community literacy	Percentage of population (age-appropriate) with at least a secondary level of education in a community (enumeration area)	Computed from Household data

4.2.2. Data processing and analysis

The data were cleaned and analyzed using the STATA version 16 software. A multivariate Poisson decomposition model was employed. This model aimed to separate the change in the average number of children ever born into components attributable to the evolving characteristics of women and changes in the reproductive behavior of women. Poisson regression has the advantage of fitting nonlinear models over linear regression models including situations involving the number of occurrences of an event. Poisson regression with situations in which the dependent variable is counted. Changes in the proportion of the population having specific social, economic, and demographic features changing

characteristics, whereas changes in the population's behavior are referred to as changing behaviors as a result of changing characteristics. Decomposition analysis was selected because useful approach that identifies the main sources of change in an outcome. The method also divides the two elements into segments that illustrate the distinct contribution of each predictor to both components through a detailed decomposition process. Finally, a Poisson-based multivariate decomposition model for nonlinear responses (mvdcmp in Stata version 17) was performed to identify factors contributing to the change in the lifetime fertility between 2000 and 2016 to identify the sources of changes in the CEB among married women aged 35 and above (Daniel A. Powers and Myeong-Su Yun, 2009; Powers et al., 2011). The general decomposition equation is as below:

$\bar{Y}_{2016} - \bar{Y}_{2000} \doteq \overline{F(X_{2000}\beta_{2000})} - \overline{F(X_{2016}\beta_{2016})}$ ……..…….. (1)

The eq. 1 will further decompose to eq. 2 below

$\bar{Y}_{2016} - \bar{Y}_{2000} = \{\overline{F(X_{2000}\beta_{2000})} - \overline{F(X_{2016}\beta_{2000})}\} +$

$\{\overline{F(X_{2016}\beta_{2000})} - \overline{F(X_{2016}\beta_{2016})}\}$ ..(2)

Where; $\bar{Y}_{2016} - \bar{Y}_{2000}$ is the mean difference in children ever born between the Year (2016) and year (2000), F (·) is a logarithmic function mapping a linear combination of X (Xβ) to Y, X represents predictors and β represents regression coefficients.

The year 2000 was the comparison group and the year 2016 was the reference group. The compositional characteristics reflect the expected difference if the year 2016 was given the Year 2000's distribution of covariates. The coefficient reflects the expected difference if the year 2016 experienced the year 2000's behavioral responses to X. This study is based on secondary data of women aged 35 years and above collected in the 2000 and 2016 demographic and health surveys. The women aged 35 years and above in both the 2000 and 2016 surveys were asked about their birth histories and this provided information on the total number of children ever born. Since we were interested in examining the contribution of change in nuptiality pattern to fertility transition.

4.2.3. Ethical consideration

The study was conducted based on secondary data from the Demographic and Health Surveys Program. The ICF/ORC Institutional Review Board has examined and approved the procedures and questionnaires for routine Demographic and Health Surveys. In addition, the Ethiopian Health and Nutrition Research Institute and the Institutional Review Board offices of the

Ministry of Science and Technology of Ethiopia granted ethical approval to the study methods. After the respondents' oral agreement, interviews were undertaken. To safeguard respondents' anonymity, the names of respondents and personal identifiers were not included in the final data.

4.3. Results

Table 4.2 shows the distribution of women by selected demographic and socio-economic variables in Ethiopia. The weighted sample constituted a total sample of 8610 women aged 35 and above; whereas 4371 were from 2000 and 4238 were from the 2016 survey. The total number of children ever born was 28230 in 2000 and 24757 the 2016. Three regions, Amhara, Oromiya, and SNNP, contributed more than four in five of the samples in both surveys. A sizable portion of the samples was from rural residents. Between the two survey years, there was a decrease in the percentage of women living in rural areas from 85.52% to 81.36%. In terms of educational attainment, there was a slight increase in literacy. For instance, there was a 13.18% rise in the level of primary education among women aged 35 and above years. Similarly, there was a slight increase (5%) in secondary-level education achievement among women aged 35 and above.

The proportion of women with no work has increased between the two surveys (from 32.81% to 46.29%). Whereas engagement in agricultural activity as livelihood means sharply dropped between the two surveys. The decline from 42.25% to 26.77% signifies a major transition in the occupational landscape for women over 16 years the makeup of the women in terms of religion remained unchanged between the two survey periods with nearly two-thirds of women being affiliates of Christianity religion. Community affluence has shown a slight decrease in the percentage of women in both low and high-wealth categories. At the same time, a significant increase is observed in the medium-wealth category between the two surveys. By 2000, half of the women surveyed lived in communities with low levels of education. However, in 2016, this percentage dropped to 22.51%. The proportion of women who lived in well-informed communities significantly improved over the course of 16 years (Table 4.2**).**

All wealth index quintiles, except for the lowest one, increased between the two surveys. In 2000, a large number of women (94.89%) relied on no or traditional methods of contraception, while 5.11% used modern methods. By 2016, a quarter of women (25.62%) used modern methods, indicating a shift towards increased use of modern methods among women. The average number of deceased children was 1.6 per woman in 2000, and 1 in 2016. On average

child survival increased by (50%) among women aged 35 and above between the two surveys periods (Table 4.2**)**.

Table 4.2: The percentages of women by selected characteristics and survey year, Ethiopia

Variables and Categories	**Survey years**	
	2000	**2016**
Educational level		
No education	91.51	73.37
Primary	5.76	18.92
Secondary+	2.73	7.72
Place of residence		
Urban	14.88	18.64
Rural	85.12	81.36
Agrarian region	**91.99**	**89.22**
Tigray	6.65	7.63
Amhara	28.19	25.58
Oromiya	34.84	35.06
SNNP	22.31	20.95
Emerging region	**3.67**	**4.91**
Affar	1.33	0.67
Somali	1.15	2.97
Benishangul-Gumuz	0.99	1.02
Gambela	0.20	0.25
Mainly urban region	**4.34**	**5.87**
Harari	0.25	0.24
Addis Ababa	3.66	5.14
Dire Dawa	0.43	0.49
Religious affiliation		
Christians	67.16	68.75
Non-Christian	32.84	31.25
Occupation		
Not working	32.81	46.29
Agricultural Employee	42.10	26.77
Industry Employee	25.09	26.94
Community Affluence		
Low	28.25	24.75
Medium	43.25	49.68
High	28.50	25.56
Community Education		
Low	50.86	22.51
Medium	34.33	46.66
High	14.81	30.83
Contraceptive use		
No method and traditional	94.89	74.38
Modern method	5.11	25.62
Wealth index		
Lowest quintile	22.50	20.11
Second quintile	17.64	18.90
Middle quintile	17.59	20.17
Fourth quintile	20.17	21.90
Highest quintile	19.62	22.17
Number of deceased children	1.6	0.8
Number of children ever born	28230	24757
Number of women aged 35^{+}	4371	4238

Although the percentage of illiterate women has decreased, the average number of children born to this group of women remained relatively unchanged between the two surveys. Among women who achieved a secondary and above level of education, nearly a 40% drop in the average CEB was observed, from 4.1 to 2.5. The average number of children ever born significantly decreased among urban dwellers (27%), and slightly decreased among rural residents. The average number of CEB among women living in Tigray, Amhara, Oromia, Benishangul-Gumuz, SNNP, Gambela, and Dire Dawa regions slightly decreased. Particularly, the average number of CEB in Addis Ababa and Harari region decreased almost by two children between the two survey periods. However, the average number of CEB in Affar and Somali regions increased. Collectively, the average number of CEB of agrarian regions, and mainly urban areas decreased by 0.6 and 1.9, respectively. Whereas, in emerging regions increased by (0.5) between the two survey periods (Table 4.3**)**.

The average number of CEB among Christian religious followers decreased by 0.9. No significant reduction in the average number of CEB was observed among women without work between the two surveys. On the contrary, the average number of CEB was reduced by one child between the two survey periods. Similarly, the average number of CEB was reduced by 0.5 among women engaged in agricultural means of livelihood. The average number of CEB for women living in medium and high community affluence equally decreased by the same amount (0.7 birth per woman). The decline was 0.4 birth per woman for women residing in low community affluence between the two survey periods. Similarly, both the women living in low and medium or high community education was reduced the average number of CEB. Regarding CEB among modern contraceptive users, the average number of CEB reduced by 0.8. Likewise, the average number of CEB was reduced by 0.6 among non-users or traditional method utilizers. Women in all wealth categories showed a decline in CEB across the two survey periods. More noticeably, the women living in the highest wealth indexes showed the highest reduction in the average number of CEB, one birth per woman, between the two survey periods (Table 4.3).

Table 4.3: Average number of children ever born by selected characteristics and survey year, Ethiopia

Characteristics	Survey year	
	2000	2016
Educational Level		
No education	6.6	6.3
Primary	5.1	5.4
Secondary+	4.1	2.5
Place of residence		
Urban	5.1	3.7
Rural	6.7	6.3
Region		
Tigray	6.3	5.7
Affar	5.9	6.4
Amhara	6.3	5.7
Oromiya	6.8	6.1
Somali	7.0	7.2
Benishangul-Gumuz	6.4	6.2
SNNP	6.5	6.4
Gambela	5.6	4.7
Harari	6.1	4.2
Addis Ababa	4.2	2.2
Dire Dawa	5.0	4.7
Region		
Agrarian	6.6	6.0
Emerging	6.4	6.9
Mainly Urban	4.5	2.6
Religious affiliation		
Christians	6.4	5.5
Non-Christians	6.6	6.5
Occupation		
Not working	6.5	6.2
Agricultural Employee	6.8	6.3
Industry Employee	5.8	4.8
Community education		
Low	6.7	6.5
Medium	6.7	6.3
High	5.0	4.6
Community affluence		
Low	6.8	6.4
Medium	6.7	6.0
High	5.7	5.0
Contraception use		
No method and traditional	6.4	5.8
Modern method	6.7	5.9
Wealth index		
Lowest quintile	7.1	6.6
Second quintile	6.8	6.3
Middle quintile	6.4	6.1
Fourth quintile	6.6	6.2
Highest quintile	5.4	4.2

4.3.1. Nuptiality and sexual union patterns

The percentage of never-married women increased from 0.68% in 2000 to 2.28% in 2016. A unique characteristic of Ethiopian women in both surveys is that early marriage is highly

prevalent. Although, the magnitude of early marriage has shown a reduction from 87.93% in 2000 to 75.17% in 2016. Regardless of the high prevalence of early marriage, marital unions among early-married women showed marital stability across the two survey periods. In addition, the two groups of women significantly differed in terms of postponing marriage to age beyond 20 years, from 11.39% in 2000 to 22.56% in 2016. In 2000, only 7.93% of marriages were considered "late and stable," characterized by long-term commitment. In contrast, the recent survey shows this percentage has increased to 17.54%. In 2000, 3.46% of marriages were late and unstable, while in the 2016 survey, it rose to 5.02% (Table 4.4)

Regarding the combined patterns of nuptiality and sexual union, a significantly higher proportion of women who postponed marriage to late age practiced premarital sex in recent years as compared to their predecessors (1.10% in 2000 vs. 6.46% in 2016). What is more, the marital relationship of this group of women was stable. Further, women in the recent survey group showed a varying and complex type of behavior in terms of sexual and nuptial unions. The percentages of women with such nuptiality patterns and sexual unions, shown as other category patterns, increased from 3.70% in 2000 to 7.79% in 2016 (Table 4.4)**.**

Table 4.4**:** Nuptiality patterns and sexual union of Ethiopian women

Characteristics	Survey year 2000	2016
Nuptiality patterns		
Never married	0.68	2.28
Early and stable	46.47	53.79
Early but unstable	41.46	21.38
Late and stable	7.93	17.54
Late but unstable	3.46	5.02
Nuptiality Patterns and Sexual Union		
Never married	0.62	2.28
Early stable	46.41	51.53
Early unstable	41.35	20.96
Early PMS & LSM	1.10	6.46
Late stable	6.82	10.99
Others	3.70	7.79

PMS = Premarital sex LSM = Late stable marriage

4.3.2. Decomposition analysis

4.3.2.1. Decomposition of lifetime fertility among all women

The decomposition of lifetime fertility showed an average difference of 617 children ever born per 1,000 women between the two survey periods. This difference was attributed to variations

in characteristics or endowments alone. All differences in lifetime fertility were attributed to changes in the demographic and socioeconomic condition of the women. The detailed decomposition analysis revealed differences in the characteristics of the women including educational achievement, region of residence, religious affiliation, household wealth, community education, community wealth, contraception, nuptiality and sexual union patterns, and number of deceased children significantly contributed to the lifetime fertility differential across the two survey periods **(**Table 4.5**)**.

The detailed decomposition analysis showed a 16% of the differences in lifetime fertility were attributed to differences in the composition of educational attainment across the survey periods. Of these, 77 per 1000 women's lifetime fertility (12.5%) was a result of the reduction in the proportion of women with no formal schooling. While 21 per 1000 women's lifetime fertility difference was attributed to changes in women's achievement of education beyond the primary level of schooling. The analysis also revealed that the reduction in the proportion of women residing in agrarian regions across the survey period resulted in a reduction of 5 births lifetime per 1,000 women between the survey periods. In addition, the decrease in the percentage of non-Christian religious affiliation, and an increase in the Christian religious affiliation across the survey period resulted in an increase of four in lifetime fertility per 1000 women. Further, the reduction in the percentage of households with the poorest wealth indexes across the survey period resulted in a reduction of 16 lifetime fertility per 1000 women (2.64%). However, the rise in the percentage of households with the middle wealth indexes across the survey periods resulted in a reduction of nearly seven in lifetime fertility per 1000 women **(**Table 4.5**)**.

The significant increment in the proportion of women living in communities with medium education increased nearly 41 lifetime fertility per 1000 women (6.7%). Contrarily, the significant increment in the proportion of women living in communities with the highest education resulted in a reduction of 76 lifetime fertility per 1000 women (12.3%). The increase in the percentage of women living in the communities with medium wealth significantly contributed to a rise in lifetime fertility, which went up by 5 per 1,000 women between the survey periods. Whereas the contraceptive use change between the two surveys was associated with an increase in 173 lifetime fertility. The change in the nuptiality patterns between the two survey periods contributed to 26.57% of the change in the lifetime fertility. Specifically, it is the combination of reductions in the proportion of married women (2%), reduction in early

marriage and postponement of marriage, and increase in marital stability contributed to the reduction in lifetime fertility **(**Table 4.5**)**.

A reduction in early marriage instability (20%) across survey periods also reduced the lifetime fertility of women by nearly 319 births per 1000 women. The rise in early stable marriage (6%) across survey periods increased the lifetime fertility of women by nearly 129 births per 1000 women. Similarly, an increase (5%) in early premarital sex with subsequent late stable marriages added 83 births per 1000 women over the survey periods. The rise in late stable marriage (4%) across survey periods increased the lifetime fertility of women by nearly 66 births per 1000 women. The reduction in the average number of deceased children (50%) across survey periods reduced the lifetime fertility of women by nearly 476 births per 1000 women (77.17%). Moreover, a reduction in the average number of deceased children in the women shared of overall decline in lifetime fertility **(**Table 4.5**)**.

Table 4.5**:** Decomposition of lifetime fertility among all women

Decomposition	Coef.	P>|Z|	95% Conf.		Pct.
Endowments	644.93	**0.00**	530.92	758.94	**104.57**
Coefficients	-28.17	0.71	-179.28	122.93	**-4.57**
Difference	617	**0.00**			

Difference in Characteristics (E)						**Difference in Coefficients (C)**				
Variables	**Coef.**	**P-value**	**95% Conf.**		**Pct.**	**Coef.**	**P-value**	**95% Conf.**		**Pct.**
Place of residence										
Urban	-3.78	0.45	-13.58	6.02	-0.61	-81.06	0.81	-735.61	591.50	-13.14
Rural	-3.78	0.45	-13.58	6.02	-0.61	353.80	0.81	-2581.85	3289.44	57.36
Educational level										
No education	76.58	**0.00**	37.50	115.66	**12.42**	67.95	0.81	-487.86	623.75	11.02
Primary	1.49	0.93	-31.10	34.08	0.24	54.38	0.81	-395.65	504.40	8.82
Secondary+	20.28	**0.02**	3.42	37.54	3.32	-29.33	0.81	-270.46	211.80	-4.76
Region										
Agrarian	5.33	**0.04**	0.34	10.34	0.87	70.45	0.82	-90.43	115.02	11.42
Emerging	-1.01	0.53	-4.17	2.15	-0.16	12.39	0.81	-180.90	141.93	2.01
Mainly urban	4.20	0.06	-0.24	8.65	0.68	-19.48	0.81	-202.23	256.80	-3.16
Occupation										
Not working	-4.34	0.48	-16.44	7.76	-0.7	27.28	0.81	-202.23	256.80	4.42
Agricultural Employee	7.48	0.30	-6.74	21.7	1.21	-2.61	0.86	-33.51	28.28	-0.42
Industry Employee	1.50	0.13	-0.47	3.47	0.24	-13.24	0.81	-125.15	98.66	-2.15
Religion										
Christians	-2.01	**0.00**	-3.10	-0.92	-0.33	-128.39	0.81	-1184.8	928.02	-20.82
Non-Christian	-2.01	**0.00**	-3.10	-0.92	-0.33	58.37	0.81	-421.92	538.66	9.46
Wealth index										
Poorest	16.27	**0.00**	10.32	22.21	**2.64**	-36.11	0.81	-333.6	261.40	-5.86
Poorer	-1.64	0.32	-4.87	1.6	-0.27	-12.75	0.81	-119.18	93.67	-2.07
Middle	6.40	**0.00**	2.82	9.98	1.04	15.80	0.81	-117.41	149.10	2.57
Richer	0.58	0.61	-1.66	2.83	0.09	17.52	0.81	-129.35	164.40	2.84
Richest	0.58	0.83	-4.89	6.06	0.09	25.05	0.81	-181.81	231.92	4.06
Community literacy										

Low	39.74	0.11	-9.23	88.71	6.44	-25.45	0.82	-244.54	193.64	-4.13
Difference in Characteristics (E)						**Difference in Coefficients (C)**				
Variables	**Coef.**	**P-value**	**95% Conf.**		**Pct.**	**Coef.**	**P-value**	**95% Conf.**		**Pct.**
Medium	-41.21	**0.00**	-60.72	-21.69	**-6.68**	-67.85	0.81	-636.67	500.96	-11.00
High	76.00	**0.00**	28.00	123.99	**12.32**	79.69	0.81	-595.03	754.41	12.92
Community wealth										
Low	-1.16	0.57	-5.19	2.87	-0.19	46.70	0.81	-339.60	433.01	7.57
Medium	-5.93	**0.04**	-11.81	-0.05	-0.96	-9.61	0.82	-94.36	75.13	-1.56
High	-1.74	0.41	-5.87	2.4	-0.28	-43.28	0.81	-403.06	316.49	-7.02
Contraceptive use										
No method and traditional	-86.70	**0.00**	-113.76	-59.63	**-14.06**	147.44	0.80	-1042.7	1337.6	23.91
Modern method	-86.70	**0.00**	-113.76	-59.63	**-14.06**	-50.78	0.80	-460.6	359.12	-8.23
Nuptiality and sexual union										
Never married	123.77	**0.00**	98.68	148.86	**20.07**	3.81	0.86	-40.64	48.26	0.62
Early Stable	-128.83	**0.00**	-144.29	-113.36	**-20.89**	-82.28	0.82	-796.71	632.13	-13.33
Early Unstable	318.95	**0.00**	250.14	387.74	**51.71**	-4.88	0.90	-80.91	71.15	-0.79
Early PMS and SLM	-83.76	**0.00**	-117.09	-50.43	**-13.58**	-1.35	0.92	-29.98	27.26	-0.22
Late Stable	-65.84	**0.00**	-81.95	-49.72	**-10.68**	-50.48	0.81	-471.45	370.47	-8.19
Others	-9.96	0.33	-30.31	10.4	-1.61	38.62	0.81	-277.54	354.79	6.26
Number of deceased children	475.97	**0.00**	431.95	519.97	**77.17**	2.86	0.86	-30.08	35.81	0.46

4.4. Discussion

This study sought to examine how changes in nuptiality patterns influence the lifetime fertility transition among Ethiopian women aged 35 and older between the years 2000 and 2016. A multivariate decomposition method was employed to quantify changes in lifetime fertility and identify the main factors driving these changes throughout the study period. The entire difference in lifetime fertility was explained by the endowments. The decomposition of lifetime fertility showed an average difference of 617 children ever born per 1,000 women between the two survey periods. On average, child survival rates among women aged 35 and older increased by 50% between the two survey periods. The finding revealed that the change in lifetime fertility explained mainly by shifts in the nuptiality patterns, improvement in socioeconomic conditions, contraceptive use dynamics, and changes in child survival. The result of the study generally revealed that gains in child survival (77.71%), shifts in nuptiality patterns (27%), and socioeconomic factors (19.74%) contributed to lifetime fertility transition between the two survey periods.

4.4.1. The role of nuptiality patterns in declining lifetime fertility rates

Generally, early marriage and marital instability are highly prevalent in Ethiopia (Kedir et al., 2024). However, the results of the study revealed that marriages were more stable in 2016 compared to the situation in 2000. Early marriage does not necessarily contribute to the increase in fertility. Rather, marital stability positively contributes to the rise in fertility. In agreement with our findings, prior research indicates that many couples experience stability or even improving satisfaction levels, suggesting that marriages become more stable as couples navigate their relationships (Karney & Bradbury, 2020). This increase in the stability of marriage contributed to a lifetime fertility increase (45%); however, this increase was counterweighted by the positive contribution of the decline in the proportion married, the postponement of marriage to late age, and the high prevalence of marital instability to the lifetime fertility decline (72%). Thus, the evolving nuptiality patterns among Ethiopian women resulted in a net 27% decline in lifetime fertility between the two survey periods.

Women who marry early or maintain stable marriages likely to have longer reproductive years and give too many births, obviously contributing to high fertility (Shakya & Gubhaju, 2016). Those with multiple marriages typically experience diverse reproductive patterns and behaviors that facilitate lower fertility rates. Conversely, women married once may adhere

more closely to traditional family structures, which results in higher fertility rates due to societal pressures and norms surrounding childbearing (Orwa et al., 2023; Tsegaye Negash, 2023). This complex interplay highlights how marital stability significantly influences fertility outcomes among women.

4.4.2. Contraceptive use and the shift in lifetime fertility.

The study sheds light on the contribution of the rise in family planning use among Ethiopian women between the two survey periods to the fertility transition. The evidence indicates that if women from earlier survey periods had adopted modern family planning methods with the same intensity as those in more recent surveys, their lifetime fertility rates would likely have been lower. This finding highlights the substantial impact of the increased prevalence of modern contraceptive use on fertility trends. The analysis underscores the critical role that access to and utilization of effective family planning resources play in shaping reproductive outcomes over time. Premarital sex increases fertility in communities with limited access or knowledge of effective contraceptive methods. This lack of access leads to higher rates of unintended pregnancies and, consequently, increased lifetime fertility (Smith-Greenaway, 2016). However, in stable marriages, couples communicate about family planning and reproductive health. This open dialogue leads to the use of contraceptives and a mutual agreement to space or limit births, thus contributing to lower lifetime fertility (Walle, 2012).

4.4.3. Socioeconomic shifts and lifetime fertility transition

The reduction in the proportion of women with no formal education has significantly contributed to the decline in lifetime fertility than secondary and above education between the survey periods. Individuals who marry later tend to have higher educational attainment and career aspirations. This personal development leads to a preference for delayed childbearing, contributing to lower fertility (Gündoğdu & Bulut, 2022). In addition, Women living in areas with medium levels of community education have shown an increase in lifetime fertility. Conversely, women living in medium-community education resulted in a rise in lifetime fertility. Between 2000 and 2016, the reduction in the number of women classified in the poorest wealth index significantly contributed to the decrease in lifetime fertility rates in Ethiopia. As economic conditions improved for many women, particularly those in lower wealth categories, there was a notable shift in fertility preferences and behaviors. Women with higher educational attainment and improved economic status were more likely to desire fewer children, leading to a decline in overall fertility rates (Alemu et al., 2024). Socioeconomic

factors are important in shaping reproductive choices and highlight the need for targeted interventions to support women's empowerment and health in Ethiopia

4.4.4. The role of the child replacement effect in shaping the lifetime fertility transition

The decline in lifetime fertility among women aged over 35 has been attributed to the child replacement effect. Higher overall fertility rates in this age range are the result of families having more children to compensate for those they have lost. The improvement in child survival across the 16-year period has largely contributed to the drop in lifetime fertility (77%). In agreement with our findings, improved child survival increases the size of the family to be supported and lowers the likelihood of having many births (N. & Simon, 2001). Higher child survival rates often lead to lower lifetime fertility rates. When parents are confident that their children will survive to adulthood, they may choose to have fewer children. The interplay between improved child survival and fertility decisions highlights the importance of health interventions in shaping demographic trends in Ethiopia. Focusing on child mortality and maternal health is essential for accelerating the reduction of lifetime fertility rates.

4.4.5. Strengths and limitations

Demographic and health surveys provide a robust dataset that captures factors influencing nuptiality and fertility. As a limitation, the study used partially completed fertility for women aged 35 and above, assuming that the contribution of lifetime fertility of women of these age groups is less than one child. Postpartum insusceptibility, cohabitation, and abortion rates were excluded from the analysis. The emphasis on women's experiences may overlook the role of men and broader family dynamics in shaping nuptiality and fertility patterns. Since the study subjects are women aged 35 and above and hence aging, memory lapses may influence the quality and reliability of the data.

4.5. Conclusions

Lifetime fertility has significantly declined across the 16 years. The lifetime fertility transition results from changes in nuptiality patterns, socioeconomic shifts, improvement in child survival, and changes in modern family planning use. The huge amount of reduction in lifetime fertility is attributed to the child replacement effect. The complex and dynamic shifts observed in nuptiality patterns among Ethiopian women equally contributed to the lifetime fertility transition as modern family planning used. Marital instability, regardless of the timing of

marriage, increase in the proportion not married, and shifts observed in the timing of marriage combined played a significant role in shaping the fertility transition of Ethiopia. The changing patterns of nuptiality inform family planning policies and programs, highlighting the need for targeted interventions that address the specific reproductive health needs of different marriage patterns. Governments and non-government organizations should focus on the complexities of the nuptiality patterns and contributions to the fertility transitions, ultimately promoting healthier family planning and reproductive health outcomes.

Based on the observed shifts in lifetime fertility and their associated factors, particularly nuptiality patterns, here are recommendations for demographic policy:

1. Integrate evolving nuptiality patterns into reproductive health policies
2. Provide support systems for marital challenges: offer counseling and legal support for individuals facing marital instability to reduce socioeconomic pressures contributing to fertility decisions.
3. Provide information about child survival improvements to shift perceptions and reduce the need for high fertility due to the child replacement effect.
4. Adopt region-specific policies: Customize interventions to align with the cultural, socioeconomic, and religious contexts of different regions within Ethiopia.
5. Engage local leaders and influencers: Collaborate with traditional leaders and religious authorities to promote acceptance of family planning and the shift in marriage patterns.
6. Encourage collaboration between government agencies, non-governmental organizations, and community-based organizations to address fertility and nuptiality changes holistically.

Chapter 5. Sources of Spatial Heterogeneity in Fertility Transition with Specific Emphasis on Oromia and Amhara Regional States of Ethiopia

Abstract

Fertility transition refers to the process of declining fertility rates, typically from high to low levels, as a society progresses through stages of development. This demographic shift is influenced by a combination of socioeconomic, cultural, and policy factors that vary across different regions and countries. This study examined the factors influencing fertility trends among women aged 15-49 in the Amhara and Oromia regions of Ethiopia over 16 years, from 2000 to 2016. Recentered influence function Oaxaca decomposition analysis, the key demographic, socioeconomic, and cultural variables that contributed to spatial and fertility changes were identified. The findings reveal a significant decline in fertility in the Amhara region, with births per 1,000 women decreasing from 480 in 2000 to 320 in 2016. In contrast, the fertility rate in Oromia remained relatively stable over the same period. The analysis highlights the role of urbanization, women's employment in industrial sectors, community education levels, wealth distribution, and marital patterns in shaping fertility outcomes. Additionally, the study finds that rural residence, early and unstable marriages, and changes in religious affiliation and child survival rates were crucial factors contributing to the observed fertility disparities. This research provides valuable insights into the socio-economic drivers of fertility change and underscores the complex interplay between region-specific characteristics.

5.1. Introduction

Fertility transition refers to the process of declining fertility rates, typically from high to low levels, as a society progresses through stages of development. This demographic shift is influenced by a combination of socioeconomic, cultural, and policy factors that vary across different regions and countries (Bongaarts, 2017). In sub-Saharan Africa, including Ethiopia, fertility transition has been relatively slow compared to other regions despite significant national efforts in family planning and reproductive health (Laelago et al., 2019). Ethiopia is the second most populous nation in sub-Saharan Africa; its fertility rate declined steadily from 5.5 in 2000 to 4.6 in 2016. However, this national reduction masks widening regional disparities. For instance, in 2016, the Total Fertility Rate (TFR) was 3.7 in the Amhara region compared to 4.6 in Oromia, reflecting significant variations across the country (Central

Statistical Agency (CSA) [Ethiopia] and ICF, 2016a; Central Statistical Authority [Ethiopia] and ORC Macro, 2001).

Ethiopia's two largest regional states, Oromia and Amhara, provide a compelling context for studying spatial heterogeneity in fertility transition. These regions are characterized by distinct ethnic groups, cultural practices, levels of urbanization, and access to resources, which contribute to differences in fertility rates. Oromia, the largest region in terms of both population and geographic size, is home to a diverse mix of ethnic groups, largely inhabited by Oromo people, and has a relatively high level of rurality. Amhara, also largely rural, is predominantly inhabited by the Amhara people and is primarily Orthodox Christian, with a strong emphasis on traditional family structures and values. These cultural and religious norms are known to play a crucial role in shaping fertility preferences and reproductive behaviors (Tsegaye Negash, 2023). In both regions, the slow pace of fertility transition is attributed to a variety of factors, including limited access to education, healthcare, and family planning services in rural areas. While urbanization in places like Addis Ababa (in Oromia) and Bahir Dar (in Amhara) has led to lower fertility rates due to increased education and access to contraceptive methods, rural populations continue to maintain higher fertility rates (Gebeyehu et al., 2023).

The spatial heterogeneity of fertility transition in Ethiopia, particularly in the Oromia and Amhara regions, is a function of a complex interplay of socioeconomic, cultural, and healthcare access factors. For instance, the differences in educational attainment between the regions play a crucial role; women with higher education levels are more likely to utilize family planning services and delay childbirth, leading to reduced fertility rates. Additionally, healthcare access is another factor influencing fertility transition in these regions (Asmamaw et al., 2023). Ethiopia has not yet adequately conducted regional spatiotemporal analyses and pinpointed the factors contributing to these regional differences in fertility transition. Moreover, information regarding the sources of spatial variability in fertility transition in Amhara and Oromia among reproductive-age women remains unclear. Understanding the level and geographical variation of fertility transition can help health planners, programmers, partners in the health sector, and policymakers formulate region-specific strategies and interventions and provide quality reproductive health services to reduce high fertility. Hence, this study aimed to assess the sources of spatial heterogeneity fertility transition in the Amhara and Oromia regions.

5.2. Data and methods

The study used Ethiopia Demographic and Health Surveys (DHS), which were conducted in 2000 and 2016. To provide estimates of important demographic and health factors for the whole country, as well as urban and rural areas, each of the nine regions and two city administrations were included. The EDHS was a substantial cross-sectional survey. The data were obtained using a stratified two-stage cluster sampling approach. The probability proportional to the EA size was applied to choose 645 clusters for the 2016 survey and 539 clusters for the 2000 survey. Because of its design, which is extremely comparable across settings and time, demographic and health surveys are recognized as an important source for monitoring population indicators and vital statistics in middle and low-income countries (Central Statistical Agency (CSA) [Ethiopia] and ICF, 2016a; Central Statistical Authority [Ethiopia] and ORC Macro, 2001). The information used in our study is freely accessible to the public at the following website (The DHS Program, 2023). This study is based on secondary data, which includes women aged 15-49, in the 2000 and 2016 demographic and health surveys.

5.2.1. Variables and measurements

The primary outcome variable is births in the last three years. The assessment of fertility transition was conducted by recent fertility of women aged 15-49. The analysis used individual and group-level characteristics (household and community level). The descriptions of many variables are available in the standard recode manual of DHS (ICF, 2018a). The DHS invests significant effort in ensuring that dates of key events, including marriage, are accurately reported through multiple data checks and procedures for reconciling discrepant reports and imputing missing information (MacQuarrie & Juan, 2019). Like most dates, the date of marriage is recorded in DHS recode datasets in century month codes (CMC), which is the number of months since January 2000. Age at first marriage is calculated as the difference between the CMC of marriage and the CMC of date of birth. Study variables: The outcome variable of the study was births in the last three years. The independent variable of the study consists of individual-level factors: place of residence, education level, religion, occupation, and wealth index. Community-level variables: regions, community education, and community wealth.

5.2.2. Data processing and analysis

The management of data, editing, and analysis were conducted using STATA 16. 0. We adopted a multivariate decomposition analysis. Multivariate decomposition analysis was used to quantify recent fertility into components attributable to changes in characteristics difference and the changes in response to behavior. Changes in the proportion of the population having specific social, economic, and demographic features are referred to as changing characteristics, whereas changes in the population's behavior are referred to as changing behaviors as a result of changing characteristics. This analysis was carried out using a user-written Oaxaca command. The Oaxaca-rif decomposition is a method that breaks down the overall changes into two components: the structure effect between characteristics/covariates and outcomes and the composition effect, which is caused by changes in the distribution of covariates themselves. This decomposition provides the additional benefit of separating the contributions of each covariate to the structure and composition effects. The Oaxaca-rif tool allows the utilization of various options available in Oaxaca while maintaining internal syntax compatibility (Sharaf et al., 2015).

5.2.3. Ethical consideration

The study was conducted based on secondary data from the Demographic and Health Surveys Program. The ICF/ORC Institutional Review Board has examined and approved the procedures and questionnaires for routine Demographic and Health Surveys. In addition, the Ethiopian Health and Nutrition Research Institute and the Institutional Review Board offices of the Ministry of Science and Technology of Ethiopia granted ethical approval to the study methods. After obtaining the respondents' oral agreement, interviews were undertaken. To safeguard respondent anonymity, the names of respondents and personal identifiers were not included in the final data.

5.3. Results

Table 5.1 depicts the distribution of women by selected demographic and socio-economic variables in Ethiopia. The weighted sample constituted 19,172 women aged 15 - 49, whereas 7534 were from the Amhara region and 11,638 were from the Oromia region. The highest proportion of women is from the Oromia region. In the Amhara region, there were 3,820 births in the last three years of 2000, which decreased to 3,714 in 2016. Similarly, in the Oromia region, births were 5,937 in 2000 and dropped to 5,701 in 2016. A significant number of the

samples came from rural residents. In the Amhara region, rural-to-urban migration increased by 7%, while it remained negligible in the Oromia region. Between the two survey periods, the proportion of women living in rural areas of Amhara decreased from 87.8% to 80.7%, with no changes noted in Oromia.

Regarding educational attainment, in both regions, a notable decline in the percentage of women without formal education was observed between the two survey periods. Additionally, the level of primary education increased by 17.3% in the Amhara region and by 20.4% in the Oromia region. Similarly, advancements in secondary education and higher levels rose significantly, with an increase of 11.9% in Amhara and 4.3% in Oromia. The percentage of women without work rose between the two surveys, increasing from 24.5% to 38.5% in the Amhara region and from 43.6% to 54.3% in the Oromia region. In contrast, participation in agriculture as a means of livelihood sharply declined in Amhara, and a slight decrease in Oromia was experienced. Meanwhile, the proportion of women working in the industrial sector significantly increased in the Amhara and a slight rise in the Oromia. There was a 2.6% increase in the number of women affiliated with Christianity in the Amhara region. In contrast, the percentage of women affiliated with Christianity decreased by 2.6% in the Oromia region. Throughout both survey periods, the proportion of women in the Oromia region identified as non-Christians was consistently higher than that of the Amhara region (Table 5.1).

The decline from 42.25% to 26.77% signifies a major transition in the occupational landscape for women over 16 years. The makeup of the women in terms of religion remained unchanged between the two survey periods, with nearly two-thirds of women being affiliates of Christianity religion. The percentage of women residing in low-income communities has fallen by 7.7% in the Amhara region, while it has risen by 2% in the Oromia region. In Amhara, the share of women living in medium-wealth communities has declined by 2.6%. In Oromia, there has been a decrease in the percentage of women in both medium and high-income communities between the two survey periods. Conversely, the proportion of women living in affluent communities in the Amhara region has seen a significant increase of 10.3%. The percentage of women living in communities with low education levels dropped significantly by 39.9% in the Amhara region, while it saw a smaller decrease of 21.9% in the Oromia region. In both regions, the share of women residing in communities with medium education levels has increased between the two surveys. Similarly, the proportions of women who lived in well-informed communities significantly improved over the course of 16 years (Table 5.1).

In the Amhara region, the percentage of women classified in the poorest and poorer wealth categories has declined between the two survey periods. Conversely, there has been an increase in the middle, richer, and richest wealth categories in the region. In the Oromia region, all wealth categories except for the poorest wealth categories have increased. The proportion of married women in the Amhara region has declined by 10%, while it has increased by 5.4% in the Oromia region among women aged 15-49. Marital stability increased by 8.8% in Amhara and 16.5% in Oromia. Throughout the surveys, the Amhara region exhibited higher levels of marital instability compared to Oromia. Specifically, marital instability in Amhara decreased from 48.4% to 30.1%, and in Oromia, it dropped from 19.3% to 8.2% between the two survey periods. The proportion of never-married and sexually inactive women increased in the Amhara region while it decreased in the Oromia region. The proportion of women in early and stable marriages increased by 4.2% in Amhara and by 7.1% in Oromia. Conversely, the percentage of women with early and unstable marriages decreased by 20.5% in Amhara and by 11.4% in Oromia. Additionally, the proportion of women in late and stable marriages increased in both regions. In both regions, a rise in complex marriage patterns has been observed between the two surveys (Table 5.1).

In both surveys, the percentage of women not using any method or relying on traditional contraceptives significantly declined in both regions. Meanwhile, the proportion of women using modern contraceptive methods increased by 28.3% in the Amhara region and by 17.9% in the Oromia region. In both regions, the average child survival rate increased by 50% between the two survey periods. In the Amhara region, the average birth rate over the past three years has decreased from 480 births per 1,000 women to 320 births per 1,000 women. Conversely, in the Oromia region, the average birth rate during the same period has risen from 500 births per 1,000 women to 510 births per 1,000 women. In 2000, the birth rate in Oromia was 20 births per 1,000 women, higher than in Amhara. By 2016, the difference had increased to 190 births per 1,000 women, with Oromia still having a higher rate than the Amhara region (Table 5.1).

Table 5.1**:** The percentages of women aged 15 - 49 by selected socioeconomic characteristics

Characteristics	Survey years			
	2000		2016	
	Region		Region	
	Amhara	Oromia	Amhara	Oromia
Place of Residence				
Urban	12.2	15.4	19.3	15.2
Rural	87.8	84.6	80.7	84.8
Educational Level				
No education	83.5	75.8	54.1	51.1
Primary	10.7	16.4	28.0	36.8
Secondary+	5.8	7.8	17.9	12.1
Occupation				
Not working	24.5	43.6	38.5	54.3
Agricultural employee	61.3	31.6	38.0	18.8
Industry employee	14.1	24.8	23.5	26.9
Religious				
Christians	81.7	49.6	84.3	46.0
Non-Christians	18.3	50.4	15.7	54.0
Community Affluence				
Low	32.3	25.2	24.6	27.2
Medium	53.2	51.8	50.6	50.3
High	14.5	23.1	24.8	22.5
Community Literacy				
Low	59.2	51.6	19.3	29.7
Medium	28.6	34.1	52.1	45.5
High	12.2	14.3	28.6	24.9
Wealth Index				
Poorest	25.4	18.0	13.4	15.0
Poorer	19.5	18.4	18.6	20.5
Middle	18.9	19.8	22.6	20.2
Richer	18.0	21.3	24.0	22.0
Richest	18.2	22.4	21.3	22.5
Number of Marriage				
Never-Married	12.4	27.6	22.3	22.2
Married Once	39.2	53.1	47.6	69.6
Married more than once	48.4	19.3	30.1	8.2
Nuptiality Patterns and Sexual Union				
Never married and sexually inactive	11.1	26.8	19.7	20.6
Early and stable	35.8	45.3	39.6	52.4
Early and unstable	47.4	17.5	26.9	6.1
Late and stable	2.2	6.7	5.0	10.2
Others	3.5	3.7	8.8	10.7
Contraceptive Use				
No method and traditional	94.6	97.0	66.3	79.1
Modern method	5.4	3.0	33.7	20.9
The average number of child death	0.8	0.7	0.4	0.3
Births in the last three years	0.48	0.50	0.32	0.51

The difference in age-specific fertility rates between the Amhara and Oromia regions is smaller in the 2000 but larger in the 2016 survey. In the Amhara region, the gap in fertility rates has significantly declined across all age groups and a huge drop in the number of births per 1000

women across the period. In the Oromia region, adolescent fertility remained the same, increased swiftly before the age of 22, and started to diverge after the age of 25. Amhara region's teenage fertility significantly differs and drops sharply across the period. The fertility rate of the women residing in the Amhara region is lower than women living in the Oromia region in both surveys. The fertility of women in both regions has similar patterns towards the end of reproductive years. In both regions, nearly 100 births per 1000 women were observed after the age of 40 (Figure 5.1).

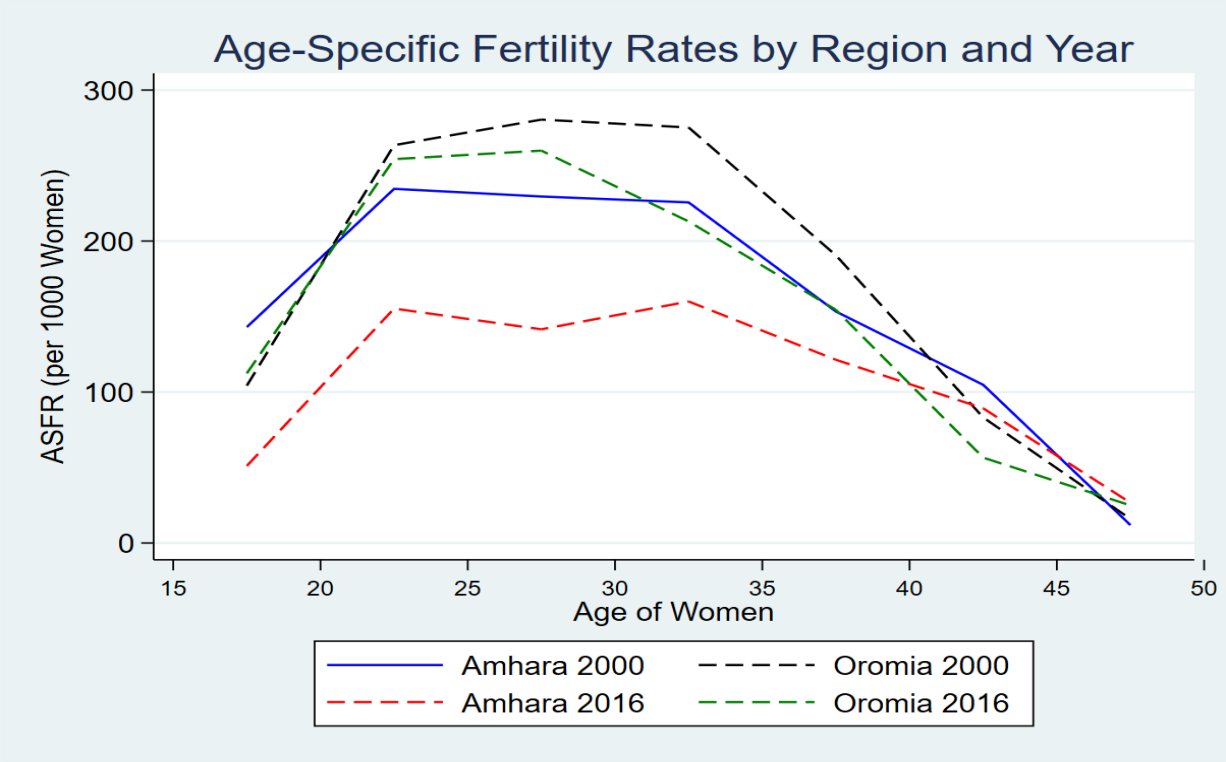

Figure 5.1: Births in the Last Three Years by Region and Year

In the year 2000, recent fertility of Amhara (480 births per 1000 women) and Oromia (500 births per 1000 women) regions coincided. The fertility rate in the Oromia region remained relatively stable over a decade and a half. In contrast, the fertility rate among women in the Amhara region has depicted a significant decline, showing a drop of 160 births per 1000 women over a similar period. In light of these facts, the drivers of the temporal shift in fertility among women of Amhara region and the slight spatio-temporal variation of fertility between Amhara and Oromia regions were explored using recentered influence function Oaxaca decomposition analysis. Since the fertility rates were similar in the year 2000 between the two regions

considered, the fertility of the Amhara region of the year 2000 was considered as a comparator for the spatio-temporal decomposition of fertility (Figure 5.2).

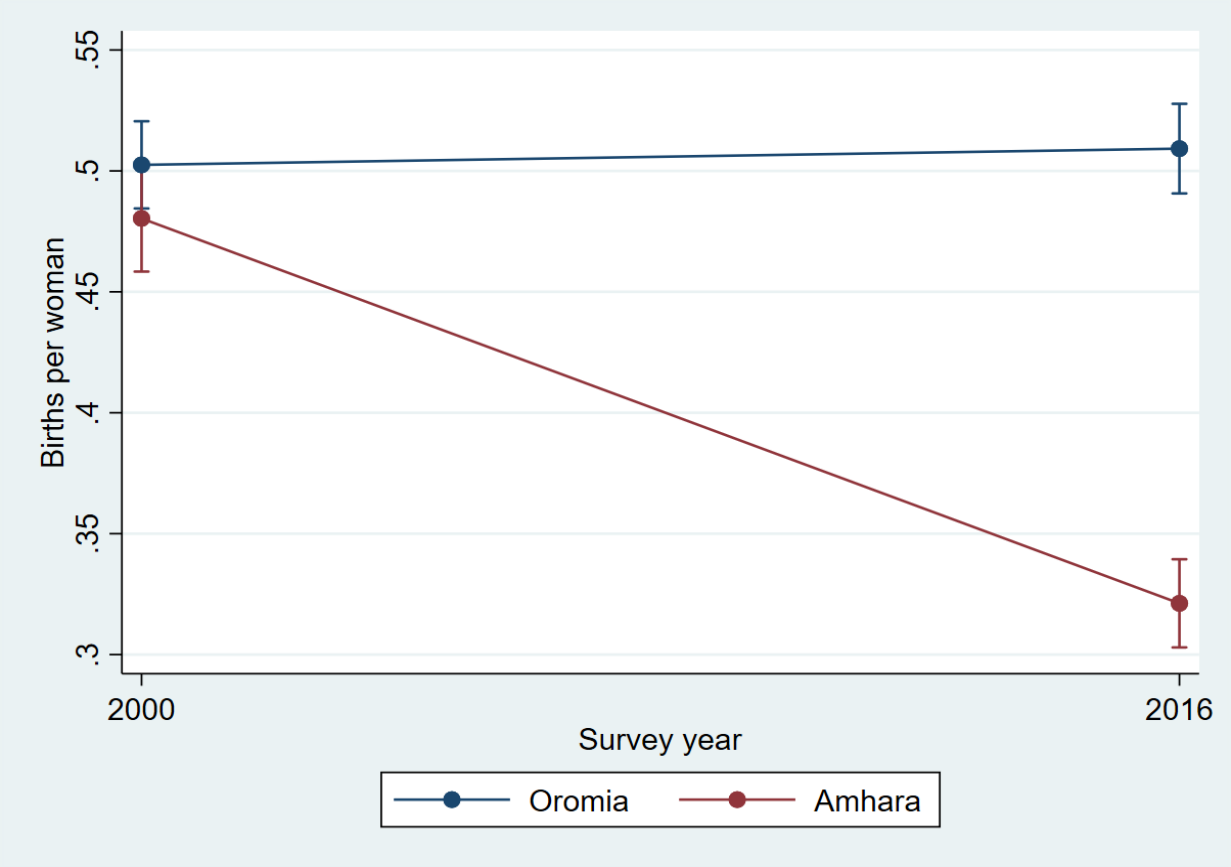

Figure 5.2: Average births per woman in the last three years

5.3.1. Decomposition analysis

5.3.1.1. Spatio-temporal decomposition of births in the last three years

In 2000, the average fertility rate in the Amhara region was 509 births per 1,000 women, while in the Oromia region, it was 480 births per 1,000 women in 2016. A space-time analysis of recent fertility revealed an average difference of 29 births per 1,000 women between the two regions over time. This disparity was linked to variations in both characteristics and coefficients. A detailed decomposition analysis identified that differences in place of residence, occupation, community education levels, community wealth, nuptiality patterns, and sexual unions were the primary factors that contributed to variations in recent fertility among the regions across the periods. Similarly, the coefficient effects revealed that occupation, religious affiliation, community education levels, community wealth, marriage patterns, sexual unions,

and the number of deceased children were the key factors derived from variations in recent fertility across regions over the periods **(**Table 5.2**).**

The analysis revealed that a 3% rise in urbanization between Amhara and Oromia resulted in a drop of 7 births per 1000 women over the period. The increased percentage of women working in industrial sectors by 10% across the two regions resulted in a reduction of the average number of current fertility by 20 births per 1000 women over the survey periods. The significant increment in the proportion of women living in communities with medium and high education contributed to the reduction of 17 births per 1000 women. The reduction in the percentage of households with medium wealth indexes across the survey period between the two regions resulted in a reduction of 2 births per 1000 women. Additionally, the increased percentage of households with high wealth indexes between the two regions across the survey period resulted in a rise of 18 births per 1000 women. The increased proportion of early and stable marriages (17%) contributed to the rise in the current fertility, 90 births per 1000 women. The decline in the proportion of early and unstable marriages (41%) between Amhara in 2000 and the Oromia region in 2016 was attributed to the reduction in current fertility, 205 births per 1000 women. The increase in the proportion of late and stable marriages (8%) contributed to the rise in the current fertility, 56 births per 1000 women. Similarly, the increased proportion of other marriage forms (7%) contributed to the rise in the current fertility, with 19 births per 1000 women **(**Table 5.2**).**

The significant reduction in women working in the agricultural sector resulted in a change in women's response to behavior, which reduced current fertility by 26 births per woman. The discriminatory effect of women working in the industry sector contributed to 21 births per 100 women. The coefficient effects of women with non-Christian affiliates and communities with medium plus high literacy attributed to 95 and 31 births per 100 women, respectively. The discriminatory impact of women living in communities with medium and high affluence reduced current fertility to 162 births per 1000 women. The discriminatory effects of women's early and stable marriage contributed to 51 births per 100 women. Similarly, the coefficient effects of women with other marriage patterns contributed to current fertility by 51 births per 100 women. The discriminatory effects of improved child survival have resulted in a reduction in 22 births per 100 women **(**Table 5.2**).**

Table 5.2**:** Spatio-temporal decomposition of recent fertility

Births in the last three years	**Coef.**	**P-value**	**95% CI**	
Amhara 2000	0.509	0.000	0.493	0.526
Oromia 2016	0.480	0.000	0.462	0.499
Difference	0.029	0.021	0.004	0.053
Explained	-0.080	0.000	-0.114	-0.047
Unexplained	0.109	0.000	0.070	0.149

	Explained				**Unexplained**			
	Coef.	**P-value**	**95% CI**		**Coef.**	**P-value**	**95% CI**	
Place of residence [Rural]	-0.007	**0.014**	-0.012	-0.001	-0.089	0.192	-0.223	0.045
Educational level								
Primary	0.012	0.127	-0.003	0.027	-0.018	0.170	-0.043	0.008
Secondary and above	0.005	0.072	-0.000	0.011	-0.006	0.395	-0.018	0.007
Occupation								
Agricultural Employee	-0.010	0.293	-0.030	0.009	-0.026	**0.000**	-0.037	-0.015
Industry Employee	-0.020	**0.000**	-0.028	-0.012	0.021	**0.028**	0.002	0.040
Religion [Non-Christian]	-0.013	0.112	-0.029	0.003	0.095	**0.000**	0.064	0.125
Wealth index								
Poorer	-0.000	0.491	-0.001	0.000	-0.007	0.364	-0.021	0.008
Middle	-0.001	0.169	-0.003	0.001	0.007	0.382	-0.008	0.022
Richer	-0.002	0.120	-0.004	0.000	-0.014	0.107	-0.031	0.003
Richest	-0.003	0.130	-0.007	0.001	-0.000	0.995	-0.025	0.025
Community literacy [Medium + high]	-0.017	**0.002**	-0.028	-0.006	0.031	**0.035**	0.002	0.060
Community wealth								
Medium	-0.002	**0.039**	-0.004	-0.000	-0.071	**0.000**	-0.100	-0.042
High	0.018	**0.001**	0.007	0.028	-0.091	**0.000**	-0.124	-0.058
Nuptiality patterns and sexual union								
Early and stable	0.090	**0.000**	0.075	0.105	0.051	**0.012**	0.011	0.091
Early and unstable	-0.205	**0.000**	-0.232	-0.177	-0.002	0.505	-0.008	0.004
Late and stable	0.056	**0.000**	0.044	0.068	-0.004	0.573	-0.018	0.010
Others	0.019	**0.000**	0.011	0.027	0.022	**0.001**	0.009	0.035
Modern contraceptive use	0.001	0.933	-0.012	0.013	0.001	0.946	-0.017	0.019
Number of deceased children	-0.002	0.624	-0.007	0.004	-0.022	**0.000**	-0.030	-0.014

5.3.1.2. Temporal decomposition of births in the last three years

In the Amhara region, the fertility rate was 480 births per woman in 2000, while in 2016, it was 321 births per 1,000 women. The variation between the two survey periods in the same region amounted to 159 births. Of this difference, 50 births were attributed to endowment effects, while 109 births per 1,000 women were explained by coefficient effects. The increase in the percentage of women employed in the industrial sector across the periods contributed to 5 births per 1,000 women. Additionally, the rise in the proportion of women living in communities with middle, richer and richest wealth attributed to 23 births between the surveys. Furthermore, the rise in the percentage of women living in communities with medium and higher education as compared to lower literacy is attributed to the reduction of 23 births per 1000 women. In the Amhara region, a small rise in the proportion of early and stable marriages reduced current fertility by 14 births per 1,000 women between the two survey periods. In contrast, a significant decline in early and unstable marriages (20.5%) resulted in a reduction of 69 births per 1,000 women across these periods. Additionally, the increase in both late unstable and other types of marriages contributed to a decrease of 27 births per 1,000 women **(**Table 5.3**)**.

The discriminatory effects of women living in rural areas accounted for 171 births per 1,000 women. Likewise, an increase of 16 births was attributed to coefficient effects among women with primary education and higher. The impact of women employed in industry reduced the current fertility by 15 births over the two periods. The coefficient effects of women living in communities with the richest and richer resulted in 48 births between the survey periods. The reduction of 37 births per 1,000 women was attributed to coefficient effects among women living in communities with medium and high levels of education. In contrast, an increase of 106 births was attributed to coefficient effects among women in communities with medium and high affluence. Additionally, a rise of 143 births was associated with the discriminatory effects of nuptiality patterns, including early stable, early unstable and late stable marriages **(**Table 5.3).

Table 5.3**:** Temporal decomposition of recent fertility

Births in the last three years	Coef.	P>|z|	[95% CI]	
Amhara 2000	0.480	0.000	0.462	0.499
Amhara 2016	0.321	0.000	0.305	0.338
Difference	0.159	0.000	0.135	0.184
Explained	0.050	0.000	0.029	0.071
Unexplained	0.109	0.000	0.079	0.139

	Explained				**Unexplained**			
	Coef.	**P-value**	**95% CI**		**Coef.**	**P-value**	**95% CI**	
Place of residence [Rural]	0.001	0.685	-0.005	0.008	0.171	**0.023**	0.023	0.318
Educational level								
Primary	0.006	0.100	-0.001	0.013	0.009	**0.029**	0.001	0.016
Secondary and above	0.005	0.165	-0.002	0.012	0.007	**0.024**	0.001	0.013
Occupation								
Agricultural Employee	0.003	0.552	-0.006	0.011	0.008	0.661	-0.028	0.044
Industry Employee	0.005	**0.019**	0.001	0.009	-0.015	**0.007**	-0.025	-0.004
Religion [Non-Christian]	-0.000	0.471	-0.002	0.001	-0.004	0.533	-0.015	0.008
Wealth index								
Poorer	-0.000	0.392	-0.002	0.001	0.007	0.364	-0.008	0.022
Middle	0.006	**0.002**	0.002	0.009	0.009	0.234	-0.006	0.024
Richer	0.010	**0.000**	0.005	0.014	0.020	**0.009**	0.005	0.035
Richest	0.007	**0.004**	0.002	0.012	0.028	**0.010**	0.007	0.049
Community literacy [Medium and above]	-0.023	**0.001**	-0.036	-0.010	-0.037	**0.000**	-0.054	-0.021
Community wealth								
Medium	-0.002	0.090	-0.004	0.000	0.071	**0.000**	0.036	0.105
High	0.002	0.600	-0.007	0.012	0.035	**0.002**	0.013	0.058
Nuptiality patterns and sexual union								
Early and stable	-0.014	**0.001**	-0.022	-0.006	0.062	**0.000**	0.033	0.091
Early and unstable	0.069	**0.000**	0.055	0.083	0.075	**0.000**	0.035	0.115
Late and stable	-0.013	**0.000**	-0.017	-0.008	0.006	**0.002**	0.002	0.009
Others	-0.014	**0.000**	-0.019	-0.010	-0.000	0.920	-0.005	0.004
Modern contraceptive use	0.002	0.729	-0.008	0.012	0.001	0.827	-0.004	0.005
Number of deceased children	0.001	0.749	-0.007	0.009	0.000	0.977	-0.018	0.019
Constant					-0.342	**0.001**	-0.536	-0.149

5.4. Discussion

This study explored factors that contributed to spatial variation in the recent fertility among women aged 15-49 in the Amhara and Oromia regions. The difference in the current fertility between Amhara and Oromia regions is smaller in the 2000 but larger in the 2016 survey. The fertility rate in the Oromia region remained relatively stable over a decade and a half. In contrast, the fertility rate among women in the Amhara region has depicted a significant decline across all age groups, showing a drop of 160 births to women over a similar period. Multivariate Oaxaca decomposition analysis used a recentered influence function that quantifies changes in the current fertility and identifies the main factors driving these changes throughout the study period. The entire variation in current fertility was accounted for by both endowments and coefficients. The spatio-temporal decomposition showed an average difference of 29 births per 1,000 women between the two regions over time. In general, the fertility levels of women in rural areas, those employed in industry, community literacy rates, community wealth, and patterns of nuptiality and sexual unions were the key factors that contributed to the differences between the regions over the periods. Regarding discriminatory effects, agricultural and industry employees, non-Christian affiliates, community literacy rates, community wealth, early stable and other marriages, and the number of deceased children were the key sources of variation between the two regions over the periods.

In the Amhara region, temporal decomposition of recent fertility showed that the fertility rate was 480 births per woman in 2000, and by 2016, it had decreased to 321 births. In general, the fertility levels of women employed in industry, community literacy, community wealth, and patterns of nuptiality and sexual unions were the key factors that contributed to the differences over the periods. Further, among characteristics differences, early and unstable marriage was the most significant source of variability that contributed to higher current fertility rates over time. Regarding discriminatory effects, women residing in rural areas, industry employees, community wealth, community education, nuptiality patterns and sexual unions except other marriage patterns, and deceased children were over the periods.

5.4.1. Spatio-temporal variation in recent fertility in the Amhara and Oromia regions

The analysis revealed that a 3% increase in urbanization between Amhara (2000) and Oromia (2016), dropped recent fertility to 7 births per 1,000 women highlighting the transformative role of urbanization in reducing fertility. This finding was consistent with urban migration

significantly reducing fertility by altering socioeconomic and cultural conditions (Brockerhoff & Yang, 1994). Urban areas provide better access to education, healthcare, and family planning resources, leading to reduced fertility rates. Conversely, rural areas continue to exhibit higher fertility rates, influenced by traditional cultural practices and limited access to healthcare (Abate & Desta, 2024).

The increased number of women working in the industrial sectors by 10% across two regions has led to a 20-birth reduction in the average fertility rate, measured per 1,000 women, over the survey periods. Similarly, industrialization opens up new job opportunities and encourages women to pursue careers. The demands of modern employment create significant time constraints for women, making it challenging to manage larger families (Kidie et al., 2024). The spatial heterogeneity in fertility rates across the two regions is attributed to the varying levels of community education in shaping reproductive choices and demographic trends. Educated women prioritize careers and personal development, delay childbearing and prefer smaller families (Adebe et al., 2023).

The sources of spatial heterogeneity in fertility rates between the Amhara region in 2000 and the Oromia region in 2016 attributed to household wealth indexes. Specifically, the reduction in the percentage of households classified with medium wealth indexes led to a decrease of 2 births per 1,000 women, suggesting that economic instability or limited resources discourage larger family sizes. In contrast, women residing in communities with a high poverty level were less likely to limit childbearing (Kidie et al., 2024). The increase in households with high wealth indexes resulted in a rise of 18 births per 1,000 women, indicating that wealthier families may have the means to support more children, thus influencing their reproductive choices.

The dynamic marriage patterns and their stability significantly influence reproductive behavior, contributing to the spatial heterogeneity observed in fertility rates across the Amhara and Oromia regions of Ethiopia. In regions where early and stable marriages are prevalent, women tend to have higher fertility rates due to earlier childbearing and extended reproductive periods. Conversely, areas with declining rates of early and unstable marriages often experience lower fertility, as these shifts may promote delayed childbearing and smaller family sizes. Additionally, the emergence of late and stable marriages can also affect fertility positively, as those who marry later may choose to have more children when their circumstances are more

favorable. Early stable marriages (0.090) and late unstable marriages (0.056) widened the fertility gap between the two regions across the survey, reflecting their association with higher fertility due to prolonged reproductive periods and less exposure to union dissolution. In contrast, early unstable marriages (-0.205) significantly reduced the fertility gap, likely due to shorter durations of marital unions or reduced childbearing in disrupted partnerships, a trend observed in studies of marital instability in sub-Saharan Africa (Clark & Brauner-Otto, 2015). These findings align with broader evidence from the region showing that early and stable marriages often facilitate higher fertility, while unstable marriages can curtail reproductive output (Gyimah, 2018; Shapiro & Tambashe, 2000).

The negative coefficient for agricultural employment suggests that this sector reduces the fertility gap between the two regions, likely reflecting the slower pace of fertility decline in predominantly rural agricultural settings, consistent with findings across sub-Saharan Africa that highlight the persistence of high fertility in rural, agrarian regions due to labor demands and cultural norm (Jayne et al., 2014). Conversely, the positive coefficient for industry employment indicates that industrial workers contributed to widening the fertility gap, potentially due to differences in urbanization and industrialization levels, as fertility transitions in urban or industrialized settings are often more advanced, with delayed childbearing and reduced fertility rates observed (Shapiro & Gebreselassie, 2014).

The positive discriminatory effect of early stable marriages suggests that differences in fertility outcomes shaped by varying social or economic returns to early and stable unions, potentially driven by regional differences, access to reproductive health services, or childbearing expectations (Bongaarts, 2017). Similarly, the smaller but significant contribution of other marriage patterns indicates nuanced fertility dynamics tied to less common marital arrangements. These findings align with evidence from sub-Saharan Africa showing that cultural and structural factors often mediate the relationship between marriage and fertility, emphasizing the importance of addressing context-specific drivers of reproductive inequality (Shapiro & Gebreselassie, 2014).

The negative coefficient of wealthier households in Oromia experienced a stronger fertility limiting effect compared to counterparts in Amhara, which links increased wealth to lower fertility rates due to greater access to education, healthcare, and family planning services (Cleland, 2002). The impact of improved child mortality on fertility was stronger in Amhara in

2000 than in Oromia in 2016, potentially reflecting differences in child survival improvements over time and across regions. In sub-Saharan Africa, higher child mortality leads to higher fertility through replacement behavior, where families compensate for child loss by having additional children (Caldwell et al., 1992). This finding underscores the importance of sustaining child health interventions to further decouple child mortality from fertility decisions and support fertility decline in the region.

5.4.2. Sources of temporal variation in recent fertility in the Amhara region

The endowment of women in industrial employment (5 births per 1000 women) significantly explains the temporal variation in births in the last three years between 2000 and 2016 in the Amhara region. Industrial employment is typically associated with economic empowerment, delayed marriage, and greater access to family planning, all contribute to reduced fertility rates. As the proportion of women working in industry increased, their low fertility rates played a critical role in the observed decline in aggregate fertility. The women's wealth categories medium, richer, and richest played a crucial role in explaining the variation in birth rates in the Amhara region, where the birth rate is reported at 23 births per 1000 women. Women from wealthier households exhibited significantly different reproductive behaviors compared to those from poorer backgrounds. Wealthier women typically have greater access to education and healthcare services, which empower them to make informed decisions about family planning and childbearing. For instance, the 2016 Ethiopian Demographic Health Survey revealed that women from the richest households had a lower fertility preference, with only 25.7% desiring five or more children, compared to 64.5% among the poorest households (Alemu et al., 2024).

Between the survey years 2000 and 2016, an increase in educational attainment within communities has been associated with a notable reduction in fertility rates. Women in communities with higher educational levels tend to marry later and have fewer children, as education enhances their awareness of family planning and reproductive health options (Dessie et al., n.d.). Furthermore, educated women are more likely to utilize healthcare services effectively, which leads to better reproductive health outcomes and lower birth rates (Tekeba et al., 2024). The positive coefficient of early and stable marriages is associated with higher recent birth rates, reflecting how prolonged marital duration increases exposure to childbearing. In 2000, early marriage was prevalent in Amhara, with half of women marrying before age 15, resulting in higher fertility rates due to an extended reproductive window. However, between 2000 and 2016, efforts to delay marriage through advocacy and legal enforcement likely influenced the fertility decline observed during this period.

5.4.3. Strengths and limitations

This study has successfully established temporal relationships among the regions examined. However, we faced certain limitations, particularly in the choice to focus on the number of births in the last three years instead of using the Children Ever Born (CEB) metric. This decision was largely influenced by the scarcity of CEB data for women aged 35 and older, especially given that the research encompasses two distinct regions. Furthermore, we observed that the fertility transition rates in both regions displayed similar trends when analyzed using the CEB measure, which proved to be inconvenient for our decomposition analysis and less relevant to the study's title. While CEB offers valuable insights into fertility patterns across a woman's lifetime, its absence may limit the comprehensiveness of our findings. Future research would benefit from incorporating both measures to capture a more complete picture of fertility dynamics. Additionally, this study does not consider potential confounding factors, such as cultural practices and variations in local policies, which may also influence fertility rates independently of geographic factors.

5.5. Conclusion

This study has provided a comprehensive analysis of the changing fertility patterns among women in the Amhara and Oromia regions of Ethiopia over 16 years. While the fertility rate in Oromia remained relatively stable from 2000 to 2016, the Amhara region experienced a significant decline in fertility, with a marked reduction in births per 1,000 women. The findings of this study indicate that variations in fertility rates between the two regions are influenced by several socio-economic and demographic factors, including place of residence, occupation, community education levels, community wealth, and marital patterns.

Specifically, the rise in urbanization, the increase in women employed in the industrial sector, and improvements in community education and wealth have contributed to a decline in fertility rates, particularly in the Amhara region. Additionally, changes in nuptiality patterns, such as the decline in early and unstable marriages and the rise in late and stable marriages, played a crucial role in shaping fertility trends. The Oaxaca decomposition analysis further revealed that both endowments (such as women's education and employment) and coefficients (such as changes in marital status and community wealth) contributed to the observed fertility differences. Given the disparities between Amhara and Oromia, targeted interventions based

on region-specific characteristics are essential for promoting sustainable population growth and improving socio-economic outcomes for women in Ethiopia.

Chapter 6. General discussion

Nuptiality is a demographic concept that refers to the patterns and trends of marriage within a population. It encompasses various aspects, including the frequency of marriages, the age at which individuals marry, and the rates of marriage dissolution (divorce or separation). A change in nuptiality patterns can indeed contribute significantly to the fertility transition, as shifts in marriage age, marriage prevalence, and marital dissolution rates influence reproductive behavior and outcomes. Nuptiality patterns determine the timing and context in which childbearing occurs, given that, in many societies, marriage remains a critical social institution for childbearing. An increase in the average age at first marriage, for instance, often shortens the reproductive window, thereby reducing the potential for higher fertility rates. Additionally, a decline in marriage rates or an increase in cohabitation without formal unions can alter traditional pathways to reproduction, influencing fertility trends. Government policies and institutional frameworks also interact with nuptiality patterns to shape fertility outcomes. Policies promoting gender equality, access to education, and economic opportunities for women often lead to delayed marriage and lower fertility.

Early marriage refers to the practice of marrying at a young age, often before the age of 18. Universality, in the context of marriage, refers to the widespread prevalence of marriage across all segments of society. In the past, marriage was highly prevalent and highly concentrated towards an early age. In recent years, however, with modernization, women's education, employment, economic empowerment, and cultural changes, people are looking for alternative ways of life; and have started to postpone their time of first marriage. Previous research that focused on nuptiality merely evaluated determinants of age at first marriage and the change in nuptiality patterns and its contribution to fertility dynamics in Ethiopia is rarely addressed.

The present study focused on assessing components of change in nuptiality patterns among Ethiopian women, providing valuable insights into the dynamic interplay between social, economic, and policy factors. Nuptiality patterns, which include changes in marriage age, union formation, and marital dissolution, are critical for understanding broader demographic transitions, particularly in societies undergoing significant socioeconomic and cultural shifts. One unique contribution of the present study is its application of synthetic birth cohorts to evaluate policy effectiveness in altering nuptiality patterns. This innovative methodological approach allows for the comparison of marriage trends across different policy periods, offering

robust framework to assess temporal impact of interventions. Additionally, this methodological framework enabled the study to evaluate the contribution of changes in nuptiality patterns to the fertility transition in Ethiopia. By analyzing the relationship between nuptiality patterns and reproductive outcomes, the study provides evidence of how shifts in the timing, prevalence and stability of marriage affect fertility rates.

In this synthesis, we expounded upon our study's key findings on changes in nuptiality patterns among Ethiopian women and its association with the fertility transition in Ethiopia. The findings highlighted how these shifts in nuptiality patterns contribute to the fertility transition by narrowing the reproductive window, and altering traditional reproductive behaviors. We also discussed the broader implications of these findings for policy, practice, and future research. From a policy perspective, the results underscore the critical role of interventions targeting early marriage and promoting gender equality. In terms of practice, the study underscores the importance of integrating nuptiality considerations into reproductive health and family planning programs. Future research directions were also identified, emphasizing the need for longitudinal studies to track the long-term effects of policy interventions on nuptiality and fertility.

6.1. Major findings

The study revealed significant shifts in nuptiality patterns among Ethiopian women over time, reflecting broader demographic and social changes in the country. A key finding was the slight delay in the age at first marriage, which signals progress in challenging traditional norms that historically prioritized early marriage. This shift is particularly relevant given its implications for women's autonomy and life opportunities. Alongside this, a notable reduction in marital instability across birth cohorts points to a growing trend of more stable unions, possibly influenced by changing societal attitudes and policies that promote gender equality and protect women’s rights within marriage.

While marriage remains nearly universal in Ethiopia, the persistence of regional disparities underscores the complex interplay between culture, policy, and socioeconomic conditions. Early marriage rates continue to be highest in Amhara and Tigray, where entrenched cultural practices and limited access to education have slowed progress. Conversely, Addis Ababa has experienced the most significant delays in marriage age, driven by rapid urbanization, and

expanded access to education for women. These trends highlight how urban centers serve as catalysts for nuptiality transitions by fostering environments where traditional practices are challenged, and individual agency is emphasized.

The introduction of national policies like the 2000 Revised Family Code has been instrumental in curbing early marriage, as it sets a legal minimum age for marriage and strengthens protections against forced unions. However, the study highlights the uneven effects of these interventions across Ethiopia's regions. In Somali and Afar, for instance, cultural traditions continue to sustain high rates of early marriage, demonstrating the need for region-specific strategies. Addressing these disparities requires not only robust enforcement of legal frameworks but also targeted community-based initiatives that engage local leaders and stakeholders to promote cultural change. The findings also revealed a nationwide decline in remarriage rates, signaling a shift toward greater marital stability. This trend may reflect a combination of improved spousal relations and better conflict resolution mechanisms. Nevertheless, regional hotspots of marital instability, particularly in Amhara and Tigray, highlight ongoing challenges.

The study highlights significant findings on the decline in lifetime fertility among Ethiopian women aged 35 and older between 2000 and 2016, driven by a multifaceted interplay of factors. Evolving nuptiality patterns, including delays in marriage age and a reduced proportion of married women, contributed to a 27% net decline in fertility, with marital stability increasing fertility by 45% but offset by a 72% decline due to delays and instability.

Improved child survival was the largest determinant, accounting for 77.71% of the fertility decline, as families' adjusted reproductive behavior with increased confidence in child survival. Socioeconomic factors, such as higher educational attainment and poverty reduction, further shaped fertility trends by shifting preferences toward smaller families, while modern contraceptive use played a critical role in managing family size and reducing unintended pregnancies.

Regional and contextual variations revealed urbanization and education as drivers of fertility reduction in urban areas, while medium community education and persistent early marriage rates in regions like Somali and Afar slowed transitions. The interplay between marital stability, and family planning further highlighted the complexities of fertility dynamics, emphasizing the

need for targeted, region-specific interventions. These findings underline the importance of integrating family planning, educational advancement, and economic empowerment into policy frameworks to support Ethiopia's ongoing fertility transition that in part propels demographic transition.

The study underscores the transformative impact of shifting nuptiality patterns on Ethiopia's fertility transition. While national progress is evident, significant regional disparities persist, driven by sociocultural, economic, and policy implementation gaps. Recognizing and responding to these differences through targeted, context-sensitive policies will be vital in advancing equitable demographic outcomes and sustaining the momentum of Ethiopia's demographic transition.

1. Country Context: Ethiopia

Ethiopia is characterized by early and nearly universal marriage, a long-standing demographic pattern rooted in tradition. However, recent decades show variation in marriage timing and trajectories across different regions and cohorts. The significant sub-national diversity. Regions like Addis Ababa and Gambela show substantial delays in marriage timing, while Harari and the Southern Nations, Nationalities, and Peoples' Region (SNNP) exhibit persistent early marriage patterns, underlining strong cultural and contextual differences. Ethiopia is undergoing a demographic shift marked by delayed marriage and reduced fertility, suggesting a transition toward lower population growth.

2. Policy Environment

The observed changes in nuptiality patterns in regions such as Addis Ababa and Gambela are attributed in part to targeted government policies that enhance access to education and economic opportunities. In contrast, the minimal change in regions like Harari and SNNP suggests that policy interventions have been less effective or inadequately implemented there, pointing to gaps in policy reach and execution. The decline in fertility is also linked to improved availability of modern family planning methods, indicating the presence of national reproductive health policies aimed at fertility reduction. The nuptiality patterns into population and family planning policies to better manage demographic change and improve program outcomes.

3. Social and Economic Context

Key drivers of delayed marriage and improved marital stability include rising female education levels and increased workforce participation. These improvements signify broader socioeconomic advancement and changing gender roles in Ethiopian society. Urban centers like Addis Ababa benefit from enhanced access to education, economic opportunities, and services, which contribute to shifts in marriage behavior. This urban advantage contrasts sharply with rural or less developed regions. In regions with less change in marriage timing, entrenched cultural norms continue to promote early marriage, resisting the influence of national policies and economic development. Reductions in child mortality and greater access to reproductive health services reflect broader improvements in health infrastructure and living conditions.

4. Political Climate

Governance Structure and Regional Autonomy not explicitly stated, the abstract implies a decentralized or regionally varied policy environment, characteristic of Ethiopia's ethnic federalist system. This structure often results in uneven implementation of national policies across regions. The focus on enhancing education, economic opportunity, and access to services in some regions reflects a developmental policy orientation at the national level, albeit with mixed regional outcomes. The abstract's emphasis on region-specific interventions implies political recognition of Ethiopia's heterogeneity, and possibly political willingness to pursue decentralized, tailored approaches to policy implementation.

6.2. Implications

Based on the findings of the study, the following implications could be derived both for policy and practice and research:

6.2.1. Policy and practice

1. The success of the 2000 Revised Family Code in reducing early marriages demonstrates the importance of legal interventions. Policymakers need to prioritize enforcing and monitoring compliance with existing marriage laws, especially in regions with high early marriage rates like Somali and Afar.
2. Regional disparities in nuptiality patterns and fertility transitions highlight the need for tailored interventions. Policies ought to be designed to address cultural practices and

provide targeted support for regions with persistent challenges, such as Amhara and Tigray.

3. Expanding access to education for girls and integrating family planning services within community health initiatives amplify the effects of policy changes. These interventions can simultaneously delay marriage, reduce fertility rates, and improve women's autonomy.
4. Urban centers like Addis Ababa serve as models for nuptiality and fertility transitions. Expanding urban infrastructure and resources in rural areas may help replicate this progress, promoting equitable demographic change nationwide.
5. Increased access to modern contraceptives and education about their use should be a priority in both urban and rural settings. Tailoring these services to meet the needs of different marital patterns can improve uptake and effectiveness
6. Socioeconomic improvements have proven instrumental in shaping fertility transitions. Expanding initiatives focused on women's economic empowerment, such as education programs and vocational training, can further support fertility declines.

6.2.2. Research

7. Future research should explore the drivers of marital stability and its impact on fertility over time, with a focus on regional variations.
8. Investigating the specific sociocultural and economic factors that sustain early marriage in regions like Somali and Afar can inform more effective interventions.
9. Research comparing urban and rural nuptiality and fertility trends can offer insights into how urbanization influences demographic changes and how these lessons can be applied to rural areas.
10. Understanding how different levels of education influence nuptiality and fertility behaviors can guide educational reforms to maximize their impact on demographic transitions.

REFERENCES

Abate, & Desta. (2024). Examining the Relationship Between Fertility Rates and Socioeconomic Development in Rural and Urban Ethiopia: A Demographic Analysis from 2000 to 2020. *Journal of Research in Social Science and Humanities*, *3*(8), 57–65. https://doi.org/10.56397/jrssh.2024.08.08

Abera, Nega, Tefera, & Gelagay. (2020). Early marriage and women's empowerment: the case of child-brides in Amhara National Regional State, Ethiopia. *BMC International Health and Human Rights*, *20*(1), 1–16. https://doi.org/10.1186/s12914-020-00249-5

Adebe, Wake, Mekebo, Dessalegn, DarajeYadata, Wolde, Gondol, Galdassa, Amega, & Gefela. (2023). Analysis of regional heterogeneity and determinants of perinatal mortality in Ethiopia: review. *Annals of Medicine and Surgery*, *85*(4), 902–907. https://doi.org/10.1097/MS9.0000000000000400

Agegenehu, Tesema, Teshale, Alem, Yeshaw, Kebede, & Liyew. (2021). Spatial distribution and determinants of iron supplementation among pregnant women in Ethiopia: a spatial and multilevel analysis. *Archives of Public Health*, *79*(1), 1–13. https://doi.org/10.1186/s13690-021-00669-2

Ahmed Shallo. (2020). Roles of Proximate Determinants of Fertility in Recent Fertility Decline in Ethiopia: Application of the Revised Bongaarts Model . *Open Access Journal of Contraception*, *Volume 11*, 33–41. https://doi.org/10.2147/oajc.s251693

Alazbih, Kaya, Mengistu, & Gelaye. (2023). Determinants of time to first marriage and birth intervals among women of child bearing age in Dabat Health and demographic surveillance system site, Northwest Ethiopia. *PLoS ONE*, *18*(2 February), 1–17. https://doi.org/10.1371/journal.pone.0281997

Aldy, & Viscusi. (2008). Adjusting the value of a statistical life for age and cohort effects. *The Review of Economics and Statistics*, *90*(3), 573–581.

Alemu, Debie, Alemu, & Tessema. (2024). Residential and wealth-related disparities of high fertility preferences in Ethiopia: A decomposition analysis. *PLoS ONE*, *19*(3.0), 1–17. https://doi.org/10.1371/journal.pone.0299443

Alteneiji. (2023). Value changes in gender roles: Perspectives from three generations of Emirati women. *Cogent Social Sciences*, *9*(1), 2184899. https://doi.org/10.1080/23311886.2023.2184899

Ambel, Andrews, Bakilana, Foster, Khan, & Wang. (2017). Examining changes in maternal and child health inequalities in Ethiopia. *International Journal for Equity in Health*, *16*(1), 1–16. https://doi.org/10.1186/s12939-017-0648-1

Amoo. (2017). Trends and determinants of female age at first marriage in Sub-Saharan Africa (1990-2014): What has changed? *African Population Studies*, *31*(1), 3565–3577.

Arega, G., Mitku, A., Fenta, & M. (2023). Spatio-temporal pattern of short birth interval and associated factors on women in Ethiopia: Using Ethiopian demographic and health surveys 2000–2016. *Frontiers in Medicine*, *10*(April). https://doi.org/10.3389/fmed.2023.1131794

Asfaw, & Alene. (2023). Marital dissolution and associated factors in Hosanna, Southwest

Ethiopia: a community-based cross-sectional study. *BMC Psychology*, *11*(1), 1–11. https://doi.org/10.1186/s40359-023-01051-3

Asmamaw, Negash, Aragaw, Belay, Asratie, Endawkie, & Belachew. (2023). Spatial distribution, magnitude, and predictors of high fertility status among reproductive age women in Ethiopia: Further analysis of 2016 Ethiopia Demographic and Health Survey. *PLoS ONE*, *18*(9 September), 1–15. https://doi.org/10.1371/journal.pone.0290960

Audrey Harwood-Lejeune. (2000). Rising Age at Marriage and Fertility in Southern and Eastern Africa. *European Journal of Population*, *17*(3), 261–280.

Ayiga, & Rampagane. (2013). Determinants of age at first marriage in sub-Saharan Africa: A comparative study of Uganda and South Africa. *Journal of Social Development in Africa*, *28*(1), 9–34.

Barton, & Bruder. (2020). Community Awareness. *A Guide to Local Environmental Auditing*, *20*, 227–236. https://doi.org/10.4324/9781315070568-25

Batyra, & Pesando. (2021). Trends in child marriage and new evidence on the selective impact of changes in age-at-marriage laws on early marriage. *SSM - Population Health*, *14*, 100811. https://doi.org/10.1016/j.ssmph.2021.100811

Becker. (1973). A Theory of Marriage: Part I. *Journal of Political Economy*, *81*(4), 813–846. https://doi.org/10.1086/260084

Becker, Landes, & Michael. (1977). An Economic Analysis of Marital Instability. *Journal of Political Economy*, *85*(6), 1141–1187. https://doi.org/10.1086/260631

Berger. (2010). Modernization theory. *The Battle for Asia*, 86–116. https://doi.org/10.4324/9780203358207_chapter_3

Bongaart. (2017). Africa ' s Unique Fertility. *Population and Development Review*, *43*(2017), 39–58.

Bongaarts. (2003). Completing the fertility transition in the developing world: The role of educational differences and fertility preferences. *Population Studies*, *57*(3), 321–335. https://doi.org/10.1080/0032472032000137835

Bongaarts. (2017). Africa's Unique Fertility Transition. *Population and Development Review*, *43*, 39–58. https://doi.org/10.1111/j.1728-4457.2016.00164.x

Bongaarts, & Casterline. (2013a). Fertility Transition: Is sub-Saharan Africa Different? *Population and Development Review*, *38*(SUPPL.1), 153–168. https://doi.org/10.1111/j.1728-4457.2013.00557.x.Fertility

Bongaarts, & Casterline. (2013b). Fertility Transition: Is sub-Saharan Africa Different?file:///D:/Project/PMA Action/Papers/Determinants of cumulative fertility/Literature/58ba699f-fa52-4a9e-b4e3-0735fd3fd123_20585_-_vincent_otieno.pdf. *Population and Development Review*, *38*(SUPPL.1), 153–168. https://doi.org/10.1111/j.1728-4457.2013.00557.x.Fertility

Bongaarts, Mensch, & Blanc. (2017a). Trends in the age at reproductive transitions in the developing world: The role of education. *Population Studies*, *71*(2), 139–154. https://doi.org/10.1080/00324728.2017.1291986

Bongaarts, Mensch, & Blanc. (2017b). Trends in the age at reproductive transitions in the

developing world: The role of education. *Population Studies*, *71*(2), 139–154. https://doi.org/10.1080/00324728.2017.1291986

Bras, Remund, & Delaunay. (2023). Childbearing Trajectories in a West African Setting: A Sequence Analysis Approach. *Demography*, *60*(3), 891–913. https://doi.org/10.1215/00703370-10714477

Brockerhoff, & Yang. (1994). Impact of migration on fertility in sub-Saharan Africa. *Social Biology*, *41*(1–2), 19–43. https://doi.org/10.1080/19485565.1994.9988857

Brons, Liefbroer, & Ganzeboom. (2021). Parental socioeconomic status and the timing of first marriage: What is the role of unmarried cohabitation? Results from a crossnational comparison. *Demographic Research*, *45*(December), 469–516. https://doi.org/10.4054/DEMRES.2021.45.15

Caldwell, Orubuloye, & Caldwell. (1992). Fertility decline in Africa: a new type of transition? *Population & Development Review*, *18*(2), 211–242. https://doi.org/10.2307/1973678

Casterline, & Agyei-Mensah. (2017). Fertility Desires and the Course of Fertility Decline in sub-Saharan Africa. *Population and Development Review*, *43*, 84–111. https://doi.org/10.1111/padr.12030

Central Statistical Agency (CSA) [Ethiopia] and ICF. (2011). *Ethiopia Demographic and Health Survey*.

Central Statistical Agency (CSA) [Ethiopia] and ICF. (2016a). Demographic and Health Survey ethiopia. In *Proceedings of the International Symposium on the Physical and Failure Analysis of Integrated Circuits, IPFA*. https://doi.org/10.1109/ipfa.2004.1345625

Central Statistical Agency (CSA) [Ethiopia] and ICF. (2016b). *Ethiopia Demographic and Health Survey 2016*.

Central Statistical Agency (CSA) [Ethiopia] and ICF International. (2011). *Ethiopia Demographic and Health Survey 2011*.

Central Statistical Agency [Ethiopia] and ORC Macro. (2005). Ethiopia Demographic and Health Survey, 2005. *Health San Francisco*, *March*, 1–5.

Central Statistical Authority [Ethiopia] and ORC Macro. (2001). *Ethiopia Demographic and Health Survey 2000*. 1–299.

Cheng, Brand, Zhou, Xie, & Hout. (2021). Heterogeneous returns to college over the life course. *Science Advances*, *7*(51), 1–15. https://doi.org/10.1126/sciadv.abg7641

Cherlin. (2004). The deinstitutionalization of American marriage. *Journal of Marriage and Family*, *66*(4), 848–861. https://doi.org/10.1111/j.0022-2445.2004.00058.x

Chernet, Shebeshi, & Banbeta. (2019). Determinant of time-to-first birth interval after marriage among Ethiopian women. *BMC Women's Health*, *19*(1), 1–6. https://doi.org/10.1186/s12905-019-0858-3

Chimbiri. (2007). The condom is an "intruder" in marriage: Evidence from rural Malawi. *Social Science and Medicine*, *64*(5), 1102–1115. https://doi.org/10.1016/j.socscimed.2006.10.012

Cho, & Tien. (2014). Sub-Saharan Africa's recent growth spurt: An analysis of the sources of

growth. *World Bank Policy Research Working Paper*, *No. 6862*(May), 1–40.

Chojnacka. (1995). *The role of nuptiality in the demographic transition . The case of africa : a conceptual essay*. *51*(3), 117–150.

Clark, & Brauner-Otto. (2015). Divorce in sub-Saharan Africa: Are Unions Becoming Less Stable? *Population and Development Review*, *41*(4), 583–605. https://doi.org/10.1111/j.1728-4457.2015.00086.x

Cleland. (2002). Education and future fertility trends, with special reference to mid-transitional countries. *Population Bulletin of the United Nations, Special Issue: Completing the Fertility Transition*, 187–202. http://books.google.com/books?hl=en&lr=&id=0kf-RSigx5kC&oi=fnd&pg=PA183&dq=%22schooling+and+material+circumstances%3B+schooling+was+typically+taken+to+be+an+indicator+of%22+%22of+better+schooling+for+girls+as+a+means+of+achieving+lower+mortality+and+ferti

Coale. (1967). Trends in Age at Marriage and the Onset of Fertility Transition in sub-Saharan Africa. *Population and Development Review*, *43*, 112–137. https://doi.org/10.1111/padr.12043

Coale. (1974). Trends in Age at Marriage and the Onset of Fertility Transition in sub-Saharan Africa. *Population and Development Review*, *43*, 112–137. https://doi.org/10.1111/padr.12043

Colleran, Jasienska, Nenko, Galbarczyk, & Mace. (2014). Community-level education accelerates the cultural evolution of fertility decline. *Proceedings of the Royal Society B: Biological Sciences*, *281*(1779), 2–8. https://doi.org/10.1098/rspb.2013.2732

Crenshaw. (2018). Demarginalizing the intersection of race and sex: A black feminist critique of antidiscrimination doctrine, feminist theory, and antiracist politics. *Living With Contradictions: Controversies In Feminist Social Ethics*, *1989*(1), 39–52. https://doi.org/10.4324/9780429499142-5

Crosnoe, & Riegle-Crumb. (2007). A life course model of education and alcohol use. *Journal of Health and Social Behavior*, *48*(3), 267–282. https://doi.org/10.1177/002214650704800305

CSA [Ethiopia] and ORC Macro. (2001). *Ethiopia Demographic and Health Survey 2000*.

Dadzie, Yengnone, Frimpong, Agbaglo, Seidu, & Ahinkorah. (2024). Association between women's empowerment and fertility preferences in Ghana. *International Health*, *16*(5), 512–522. https://doi.org/10.1093/inthealth/ihae043

Daniel A. Powers and Myeong-Su Yun. (2009). Multivariate Decomposition for Hazard Rate Models. *American Sociological AssociationJ*, *15*(2), 9–25.

Davis. (2008). A sociology of science perspective on what makes a feminist theory successful. *Feminist Theory*, *9*(1), 67–85. https://doi.org/10.1177/1464700108086364

Dejene, & Gurmu. (2022). Exploring reproductive trajectories of youths of Oromia, Ethiopia: A life course approach. *PLoS ONE*, *17*(12 December), 1–14. https://doi.org/10.1371/journal.pone.0279773

Dejene, & Gurmu. (2023). Explaining the gender gap in reproductive transition of Ethiopian youths: A decomposition analysis. *International Journal of Population Studies*, *9*(2),

476.

Dessie, Anley, Zemene, Gebeyehu, Adella, Kassie, Mengstie, Seid, Abebe, Gesese, Tegegne, Anteneh, Solomon, Moges, & Bantie. (n.d.). *prospect of child marriage in the Amhara region , Ethiopia : a multivariate decomposition analysis*.

Dribe, Oris, & Pozzi. (2014). Socioeconomic status and fertility before, during, and after the demographic transition. *Demographic Research*, *31*(1), 161–182. https://doi.org/10.4054/DemRes.2014.31.7

Dureti, Nega, & Yemane. (2022). Early Marriage among young girls in Eastern Ethiopia: trend during 2008-2018. *F1000Research*, *10*.

Elder. (2018). The Life Course as Developmental Theory. *Child Development*, *69*(1), 1–12.

Elder Jr, & George. (2016). Age, cohorts, and the life course. In *Handbook of the life course: Volume II* (pp. 59–85). Springer.

Erulkar. (2013). Early marriage, marital relations and intimate partner violence in Ethiopia. *International Perspectives on Sexual and Reproductive Health*, *39*(1), 6–13. https://doi.org/10.1363/3900613

Erulkar. (2022). Changes in the prevalence of child marriage in Ethiopia, 2005–2016. *Reproductive Health*, *19*(1), 1–6. https://doi.org/10.1186/s12978-021-01234-4

The Revised Family Code of FDRE, Federal Negarit Gazetta (2000).

Garenne. (2004). Age at marriage and modernisation in sub-Saharan Africa. *Southern African Journal of Demography*, *9*(2), 59–79.

Garenne. (2014). Trends in marriage and contraception in sub-Saharan Africa: A longitudinal perspective on factors of fertility decline. *DHS Analytical Studies*, *42*(January), 1–166.

Gashaw. (2019). Statistical analysis of early marriage among women in Ethiopia by using multilevel logistic regression. *Global Journal of Fertility and Research*, *4*, 001–009. https://doi.org/10.17352/gjfr.000011

Gatera. (2021). The Demographic Transition: Analysis of Nuptiality Component on Change of Fertility in Rwanda. *Annales Universitatis Paedagogicae Cracoviensis Studia Geographica*, *16*, 99–116. https://doi.org/10.24917/20845456.16.6

Gazeta. (2000a). Proclamation No. 213/2000 The Revised Family Code of FDRE. *Federal Negarit Gazetta*, *Extra Ordinary Issue No. 1*.

Gazeta. (2000b). The Revised Family Code of FDRE. *Federal Negarit Gazetta*, *Extra Ordinary Issue No. 1*.

Gebeyehu, Gesese, Tegegne, Kebede, Kassie, Mengstie, Zemene, Moges, Bantie, Feleke, Dejenie, Abebe, Anley, Dessie, Bayih, & Adella. (2023). Early marriage and its associated factors among women in Ethiopia: Systematic reviews and meta-analysis. *PLoS ONE*, *18*(11 November), 1–20. https://doi.org/10.1371/journal.pone.0292625

Geist. (2017). Marriage formation in context: Four decades in comparative perspective. *Social Sciences*, *6*(1). https://doi.org/10.3390/socsci6010009

Gelgelo, Debu, Hinew, Worku, Tumiso, Hadera, Hassen, Ebabey, Abdiyo, Berhe, & Bizuneh. (2020). *MODULE HISTORY OF ETHIOPIA AND THE HORN (Hist . 102)*. *December*

2021, 1–187.

GetnetMasrie, Chaltu, & ShewanoTamrat. (2019). *Determinants of age at first marriage in Ethiopia using 2016 Ethiopian Demographic and Health Surveys: Application of Cox Proportional Hazard model*. 1–15.

Grant, & Kohler. (2022). *Marriage Change and Fertility Decline in sub-Saharan Africa, 1991-2019*. 1–49.

Gündoğdu, & Bulut. (2022). The Positive and Negative Effects of Late Marriage. *Open Journal of Depression*, *11*(04), 63–71. https://doi.org/10.4236/ojd.2022.114005

Gurmu, & Etana. (2014). Age at first marriage and first birth interval in Ethiopia: analysis of the roles of social and demographic factors. *African Population Studies*, *28*(3), 1332–1344.

Gurmu, & Mace. (2021). Fertility decline driven by poverty: the case of addis ababa, ethiopia. *J.Biosoc.Sci*, *40*, 339–358. https://doi.org/10.1017/S002193200700260X

Gyimah. (2018). *Southern Demographic Association Cohort Differences in Women ' s Educational Attainment and the Transition to First Marriage in Ghana Author (s): Stephen Obeng Gyimah Source : Population Research and Policy Review , Vol . 28 , No . 4 (Aug ., 2009), pp*. *28*(4), 455–471.

Hailemariam. (2016). Implementation of the Population Policy of Ethiopia: Achievements and Challenges. *Population Horizons*, *13*(1), 19–30. https://doi.org/10.1515/pophzn-2016-0002

Hailemariam, Alayu, & Teller. (2011). The National Population Policy (NPP) of Ethiopia: achievements, challenges and lessons learned, 1993–2010. *The Demographic Transition and Development in Africa: The Unique Case of Ethiopia*, 303–321.

Hamedanchi, Momtaz, Khankeh, & Zanjari. (2020). The growth trend of never-married elderly population in Iran in the third millennium. *Journal of Family Medicine and Primary Care*, *9*(6), 2837–2842.

Haydam, & Steenkamp. (2020). A Methodological Blueprint for Social Sciences Research– The Social Sciences Research Methodology Framework. *The International Conference 'The European Integration - Realities and Perspectives*, *15*(1), 304–325.

Hertrich. (2017). Trends in age at marriage and the onset of fertility transition in sub-Saharan Africa. *Population and Development Review*, *43*, 112–137.

Hillard Kaplan. (1996). Theory Of Fertility and Parental Investiment in Traditional and Modern Human Societies. *Physical Anthropology*, 91–135.

Himawan, Bambling, & Edirippulige. (2019). Modernization and singlehood in Indonesia: Psychological and social impacts. *Kasetsart Journal of Social Sciences*, *40*(2), 499–506. https://doi.org/10.1016/j.kjss.2017.09.008

Huber, & Spitze. (1980). Considering divorce: an expansion of Becker's theory of marital instability. *American Journal of Sociology*, *86*(1), 75–89. https://doi.org/10.1086/227203

ICF. (2018a). Demographic and Health Surveys Standard Recode Manual. *Usaid*, 145.

ICF. (2018b). *Demographic and Health Surveys Standard Recode Manual for DHS7. The Demographic and Health Surveys Program. Rockville, Maryland, U.S.A.: ICF*.

Ikamari. (2005). The effect of education on the timing of marriage in Kenya. *Demographic Research*, *12*(June), 1–28. https://doi.org/10.4054/DemRes.2005.12.1

Ikamari. (2023). Regional Variation in Early Marriage in Kenya. *Journal of African Population Studies*, *36*(1), 1–16. https://doi.org/10.59147/ea88lpdq

Imron, Habibah, & Aziz. (2020). Determinant Age At First Marriage Among Women in East Java. *Jurnal Biometrika Dan Kependudukan*, *9*(2), 104–111. https://doi.org/10.20473/jbk.v9i2.2020.104-111

Irenso, Chamberlain, Zheng, Campbell, & Laws. (2022). The role of household structure and composition in influencing complementary feeding practices in Ethiopia. *Nutrients*, *14*(1), 1–16. https://doi.org/10.3390/nu14010130

Islam, Haque, & Hossain. (2016). REGIONAL VARIATIONS in CHILD MARRIAGE in Bangladesh. *Journal of Biosocial Science*, *48*(5), 694–708. https://doi.org/10.1017/S0021932016000110

Jayne, Chamberlin, & Headey. (2014). Land pressures, the evolution of farming systems, and development strategies in Africa: A synthesis. *Food Policy*, *48*, 1–17. https://doi.org/10.1016/j.foodpol.2014.05.014

John, & Adjiwanou. (2022). Fertility decline in sub-Saharan Africa: Does remarriage matter? *Population Studies*, *76*(2), 213–233. https://doi.org/10.1080/00324728.2021.1933148

Johnson, Abu, & Utazi. (2019). Geospatial correlates of early marriage and union formation in Ghana. *PLoS ONE*, *14*(10), 1–17. https://doi.org/10.1371/journal.pone.0223296

Jones. (2007). Delayed marriage and very low fertility in Pacific Asia. *Population and Development Review*, *33*(3), 453–478. https://doi.org/10.1111/j.1728-4457.2007.00180.x

Karney, & Bradbury. (2020). Research on Marital Satisfaction and Stability in the 2010s: Challenging Conventional Wisdom. *Journal of Marriage and Family*, *82*(1), 100–116. https://doi.org/10.1111/jomf.12635

Kedir, Dejene, & Degefa. (2024). Components of changes in nuptiality patterns among Ethiopian women : A decomposition analysis of demographic and health surveys. *International Journal of Population Studies*, *X*(X), 14.

Khalajabadi farahani, & rahimi. (2019). Determinants of Age at First Marriage in Selected Countries of Asia & the Pacific Region; A Systematic Review. *Sociological Review*, *25*(2), 299–336. https://doi.org/10.22059/jsr.2019.70357

Kidie, Aychiluhm, Ayal, Kodo, Fentie, Masresha, & Boye. (2024). Women's desire to limit child-bearing and its associated factors in rural Ethiopia: A multilevel analysis. *Heliyon*, *10*(3), e25372. https://doi.org/10.1016/j.heliyon.2024.e25372

Kingsley Davis. (1963). The Theory of Change and Response in Modern Demographic History. *Population Index*, *29*(4), 345–366.

Kröger, & Hartmann. (2021). Extending the Kitagawa–Oaxaca–Blinder decomposition approach to panel data. *Stata Journal*, *21*(2), 360–410. https://doi.org/10.1177/1536867X211025800

Laelago, Habtu, & Yohannes. (2019). Proximate determinants of fertility in Ethiopia; An application of revised Bongaarts model. *Reproductive Health*, *16*(1), 1–9.

https://doi.org/10.1186/s12978-019-0677-x

Lambert, Rossi, Lambert, Rossi, Insurance, & Rossi. (2015). *Sons as Widowhood Insurance : Evidence from Senegal WORKING PAPER N ° 2014 – 05 Sons as Widowhood Insurance : Evidence from Senegal Sylvie Lambert*.

Lesthaeghe. (1983). A Century of Demographic and Cultural Change in Western Europe: An Exploration of Underlying Dimensions. *Population and Development Review*, *9*(3), 411. https://doi.org/10.2307/1973316

Lesthaeghe. (2014). The second demographic transition: A concise overview of its development. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(51), 18112–18115. https://doi.org/10.1073/pnas.1420441111

Letamo. (2014). Nuptiality Levels and Trends in Botswana. *Procedia Manufacturing*, *1*(22 Jan), 1–17.

Liefbroer, & Corijn. (1999). Who, What, Where, and When? Specifying the Impact of Educational Attainment and Labour Force Participation on Family Formation. *European Journal of Population / Revue Européenne de Démographie*, *15*(1), 45–75. https://doi.org/10.1023/A:1006137104191

Lindstrom, & Woubalem. (2003). The demographic components of fertility decline in Addis Ababa , Ethiopia : a decomposition analysis. *Genus*, *LIX*(3–4), 147–158.

MacQuarrie, & Juan. (2019). Trends and factors associated with child marriage in four Asian countries. *Gates Open Research*, *3*, 1467. https://doi.org/10.12688/gatesopenres.13021.1

Magagula. (2009). *Examining the effect of changing marriage patterns on fertility among African South African women*. *November*, 98.

Makheti. (2008). *Determinants of Age at first marriage in Kenya: A comparative analysis between men and women*.

Malhotra, & Tsui. (1996). Marriage Timing in Sri Lanka: The Role of Modern Norms and Ideas. *Journal of Marriage and the Family*, *58*(2), 476. https://doi.org/10.2307/353511

McAdams, & Olson. (2010). Personality development: Continuity and change over the life course. *Annual Review of Psychology*, *61*, 517–542. https://doi.org/10.1146/annurev.psych.093008.100507

Ministry of Health Indonesia. (2018). Indonesia Demographic and Health Survey 2017. In *Bps*. https://dhsprogram.com/pubs/pdf/FR342/FR342.pdf

Mooyaart, Liefbroer, & Billari. (2022). The changing relationship between socio-economic background and family formation in four European countries. *Population Studies*, *76*(2), 235–251. https://doi.org/10.1080/00324728.2021.1901969

Muhoza. (2022). Fertility transition in Rwanda: what does the trend in nuptiality reveal? *Genus*, *78*(1), 1–18.

N., & Simon. (2001). The Effects of Income on Fertility. *Population and Development Review*, *1*(2), 329. https://doi.org/10.2307/1972244

Nobles, Frankenberg, & Thomas. (2015). The Effects of Mortality on Fertility: Population Dynamics After a Natural Disaster. *Demography*, *52*(1), 15–38. https://doi.org/10.1007/s13524-014-0362-1

Ntoimo, & Akokuwebe. (2014). Prevalence and Patterns of Marital Dissolution in Nigeria. *The Nigerian Journal of Sociology and Anthropology*, *12*(2). https://doi.org/10.36108/njsa/4102/12(0210)

Oppenheimer. (1988a). A Theory of Marriage Timing. *American Journal of Sociology*, *94*(3), 563–591. https://doi.org/10.1086/229030

Oppenheimer. (1988b). A Theory of Marriage Timing 1. *American Journal of Sociology*, *94*(0), 563–591.

Orwa, Gatimu, Ariho, Temmerman, & Luchters. (2023). Trends and factors associated with declining lifetime fertility among married women in Kenya between 2003 and 2014: an analysis of Kenya demographic health surveys. *BMC Public Health*, *23*(1), 1–12. https://doi.org/10.1186/s12889-023-15620-z

Palameleni E. Martin. (2011). Socioeconomic determinants of age at marriage in Malawi. *International Journal of Sociology and Anthropology*, *3*(7), 224–235.

Palamuleni. (2011). Socioeconomic determinants of age at marriage in Malawi. *International Journal of Sociology and Anthropology*, *3*(7), 224–235.

Pandey, Singh, Awasthi, & Kaur. (2018). Construction of nuptiality tables for the hilly rural population of Uttarakhand: 1931-2000. *International Journal Of Community Medicine And Public Health*, *5*(3), 1054. https://doi.org/10.18203/2394-6040.ijcmph20180760

Parsons, Edmeades, Kes, Petroni, Sexton, & Wodon. (2015). Economic Impacts of Child Marriage: A Review of the Literature. *Review of Faith and International Affairs*, *13*(3), 12–22. https://doi.org/10.1080/15570274.2015.1075757

Paul. (2019). Effects of education and poverty on the prevalence of girl child marriage in India: A district–level analysis. *Children and Youth Services Review*, *100*, 16–21. https://doi.org/10.1016/j.childyouth.2019.02.033

Peng. (2007). Trends in delayed and non-marriage in peninsular Malaysia. *Asian Population Studies*, *3*(3), 243–261. https://doi.org/10.1080/17441730701746391

Pintilie. (2006). *Competing risks: a practical perspective*. John Wiley & Sons.

Pothisiri, Teerawichitchainan, & Kaewbuadee. (2023). Remarriage in Thailand: A Study of Emerging Trends, Correlates, and Implications for Women's Well-Being. *Journal of Family Issues*, *0*(0), 1–25. https://doi.org/10.1177/0192513X231155659

Powers, Yoshioka, & Yun. (2011). Mvdcmp: Multivariate Decomposition for Nonlinear Response Models. *The Stata Journal*, *11*(4), 556–576. https://doi.org/10.1177/1536867x1201100404

Rafael Caro-Barrera, de los Baños García-Moreno García, & Pérez-Priego. (2022). Projecting Spanish fertility at regional level: A hierarchical Bayesian approach. *PLoS ONE*, *17*(10 October), 1–27. https://doi.org/10.1371/journal.pone.0275492

Rahimi, & Hashemi Nazari. (2021). A detailed explanation and graphical representation of the Blinder-Oaxaca decomposition method with its application in health inequalities. *Emerging Themes in Epidemiology*, *18*(12), 1–15. https://doi.org/10.1186/s12982-021-00100-9

Rao. (2016). The Rising Price of Husbands : A Hedonic Analysis of Dowry Increases in Rural

India Author (s): Vijayendra Rao Source : Journal of Political Economy , Vol . 101 , No . 4 (Aug ., 1993), pp . 666-677 Published by : The University of Chicago Press Stable. *Journal of Political Economy*, *101*(4), 666–677.

Reniers, & Watkins. (2010). Polygyny and the spread of hiv in sub-saharan africa: A case of benign concurrency. *Aids*, *24*(2), 299–307. https://doi.org/10.1097/QAD.0b013e328333af03

Rios-Avila. (2020). Recentered influence functions (RIFs) in Stata: RIF regression and RIF decomposition. *Stata Journal*, *20*(1), 51–94. https://doi.org/10.1177/1536867X20909690

Roy. (2014). Fathering From the Long View: Framing Personal and Social Change Through Life Course Theory. *Journal of Family Theory & Review*, *6*(4), 319–335. https://doi.org/10.1111/jftr.12050

Sarkar. (2009). Determinants and effect of early marriage in Bangladesh, 2007. *Research Journal of Applied Sciences*, *4*(5), 178–184.

Sayers, Evans, Whitehouse, & Blom. (2018). Are competing risks models appropriate to describe implant failure? *Acta Orthopaedica*, *89*(3), 256–258. https://doi.org/10.1080/17453674.2018.1444876

SAYI. (2015). *Relationships between marriage and fertility changes in six sub-saharan african countries* (issue 16.1.2015).

Schneider. (2015). The Great Recession, Fertility, and Uncertainty: Evidence From the United States. *Journal of Marriage and Family*, *77*(5), 1144–1156. https://doi.org/10.1111/jomf.12212

Schneider, & Goody. (1984). The Development of the Family and Marriage in Europe. In *Man* (Vol. 19, Issue 4, p. 686). https://doi.org/10.2307/2802351

Schwanitz, & Mulder. (2015). Living arrangements of young adults in Europe. *Comparative Population Studies*, *40*(4), 367–398. https://doi.org/10.12765/CPoS-2015-14en

Sear, & Coall. (2011). How Much Does Family Matter? Cooperative Breeding and the Demographic Transition. *Population and Development Review*, *37*(SUPPL. 1), 81–112. https://doi.org/10.1111/j.1728-4457.2011.00379.x

Setognal Birara, Kassie, Ayenew, Woday, & Abay. (2021). Early Marriage and Its Determinants among Married Reproductive Age Group Women in Amhara Regional State, Ethiopia: A Multilevel Analysis. *BioMed Research International*, *2021*. https://doi.org/10.1155/2021/1969721

Sewnet. (2022). *Demographic Transition in Ethiopia : Evidence of Change from 1990 to 2016*. *December 2020*.

Shakya, & Gubhaju. (2016). Factors Contributing to Fertility Decline in Nepal. *Journal of Population and Social Studies*, *24*(1), 13–29. https://doi.org/10.14456/jps.2016.2

Shapiro. (2012). Women's education and fertility transition in sub-saharan Africa. *Vienna Yearbook of Population Research*, *10*(1), 9–30. https://doi.org/10.1553/populationyearbook2012s009

Shapiro, & Gebreselassie. (2014). Marriage in Sub-Saharan Africa: Trends, Determinants, and Consequences. *Population Research and Policy Review*, *33*, 229–255.

https://doi.org/10.1007/s11113-013-9287-4

Shapiro, & Tambashe. (2000). Fertility Transition in Urban and Rural Areas of Sub-Saharan Africa. *Working Papers from the Department of Economics Pennsylvania State University*, *February 1999*, 1–29.

Sharaf, Rashad, & Shoukry Rashad. (2015). *Recentered Influence Functions in Stata*. *927*, 2015–2032.

Shetty. (2015). Role of education in women empowerment and development: issues and impact samprathi. *Electronic Copy Available at: Https://Ssrn.Com/Abstract=2665898*, *151*, 10–17.

Sibanda, Woubalem, Hogan, & Lindstrom. (2003). The proximate determinants of the decline to below-replacement fertility in Addis Ababa, Ethiopia. *Studies in Family Planning*, *34*(1), 1–7. https://doi.org/10.1111/j.1728-4465.2003.00001.x

Singh, Shekhar, & Shri. (2023a). Patterns in age at first marriage and its determinants in India: A historical perspective of last 30 years (1992–2021). *SSM - Population Health*, *22*(February), 101363. https://doi.org/10.1016/j.ssmph.2023.101363

Singh, Shekhar, & Shri. (2023b). Patterns in age at first marriage and its determinants in India: A historical perspective of last 30 years (1992–2021). *SSM-Population Health*, *22*, 101363.

Smith-Greenaway. (2016). Premarital childbearing in sub-Saharan Africa: Can investing in women's education offset disadvantages for children? *SSM - Population Health*, *2*, 164–174. https://doi.org/10.1016/j.ssmph.2016.02.001

Sobotka, & Toulemon. (2008). Changing family and partnership behaviour: Common trends and persistent diversity across Europe. *Demographic Research*, *19*(December), 85–138. https://doi.org/10.4054/DemRes.2008.19.6

Stevenson, & Wolfers. (2007). Marriage and divorce: Changes and their driving forces. *Journal of Economic Perspectives*, *21*(2), 27–52. https://doi.org/10.1257/jep.21.2.27

Szente, Hoot, & Tadesse. (2007). Early Childhood in Ethiopia: Initiatives in Education. *Contemporary Issues in Early Childhood*, *8*(3), 275–281. https://doi.org/10.2304/ciec.2007.8.3.275

Taghizadeh, Behmanesh, & Ebadi. (2015). Marriage Patterns and Childbearing: Results From a Quantitative Study in North of Iran. *Global Journal of Health Science*, *8*(3), 1–9. https://doi.org/10.5539/gjhs.v8n3p1

Takyi, & Gyimah. (2007). Matrilineal family ties and marital dissolution in Ghana. *Journal of Family Issues*, *28*(5), 682–705. https://doi.org/10.1177/0192513X070280050401

Tekeba, Tamir, Workneh, Zegeye, Gonete, Alemu, Wassie, Kassie, Ali, & Mekonen. (2024). Early neonatal mortality and determinants in Ethiopia: multilevel analysis of Ethiopian demographic and health survey, 2019. *BMC Pediatrics*, *24*(1), 1–9. https://doi.org/10.1186/s12887-024-05027-z

Tessema. (2020a). Spatial distribution and associated factors' of early marriage among reproductive age women in Ethiopia: a secondary data analysis of Ethiopian Demographic and Health Survey 2016. *BMC Women's Health*, *20*(1), 1–11. https://doi.org/10.1186/s12905-020-01103-5

Tessema. (2020b). Spatial distribution and associated factors' of early marriage among reproductive age women in Ethiopia: a secondary data analysis of Ethiopian Demographic and Health Survey 2016. *BMC Women's Health*, *20*(268), 1–11. https://doi.org/10.1186/S12905-020-01103-5/TABLES/3

TGE. (1993). *National Population Policy of April 1993*. *April 1993*, 1–22.

Thornton, & Fricke. (1987). Social Change and the Family: Comparative Perspectives from the West, China, and South Asia Sociological Forum Volume 2 N u m b e r 4. *Sociological Forum*, *2*(4), 746–779. https://link.springer.com/content/pdf/10.1007%2FBF01124383.pdf

Torr. (2011). The changing relationship between education and marriage in the United States, 1940-2000. *Journal of Family History*, *36*(4), 483–503. https://doi.org/10.1177/0363199011416760

Tsegaye Negash. (2023). Fertility intention among married women in Ethiopia: a multilevel analysis of Ethiopian demographic health survey 2016. *Contraception and Reproductive Medicine*, *8*(1), 1–10. https://doi.org/10.1186/s40834-022-00201-z

USAID Demographic and Health Surveys Program. (2023). *The DHS Program - Ethiopia*. https://dhsprogram.com/Countries/Country-Main.cfm?ctry_id=65&c=Ethiopia

van Bavel. (2010). Subreplacement fertility in the West before the baby boom: Past and current perspectives. *Population Studies*, *64*(1), 1–18. https://doi.org/10.1080/00324720903362806

Vitali, & Billari. (2017). Changing Determinants of Low Fertility and Diffusion: a Spatial Analysis for Italy. *Population, Space and Place*, *23*(2). https://doi.org/10.1002/psp.1998

Walle. (2012). Marriage and Marital Fertility. *American Academy of Arts & Sciences and The MIT Press Are*, *97*(2), 486–501.

Witty. (1982). Joseph Chamie. Religion and Fertility: Arab Christian-Muslim Differentials. Cambridge/New York: Cambridge University Press, 1981. xvi + 131 pages. $19.95/$6.95 - Edwin T. Prothro and Lutfy Najib Diab. Changing Family Patterns in the Arab East. Beirut: Ame. *Middle East Studies Association Bulletin*, *16*(2), 38–39. https://doi.org/DOI: 10.1017/S0026318400011792

Zabak, Varma, Bansod, & Pohane. (2023). Exploring the Complex Landscape of Delayed Childbearing: Factors, History, and Long-Term Implications. *Cureus*, *15*(9). https://doi.org/10.7759/cureus.46291

Zegeye, Olorunsaiye, Ahinkorah, Ameyaw, Budu, Seidu, & Yaya. (2021). Individual/Household and Community-Level Factors Associated with Child Marriage in Mali: Evidence from Demographic and Health Survey. *BioMed Research International*, *2021*. https://doi.org/10.1155/2021/5529375

Zhang. (2021). *Bard Digital Commons Decision Making on Fertility of Married Urban Women in China*.

APPENDICES

Addis Ababa University
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COLLEGE OF DEVELOPMENT STUDIES (CoDS)
Institutional Review Board (IRB)

No: 058/03/2023

Ph.D. Proposal Ethical Clearance Certificate

1. Student's name: Deme Kedir Nuna Gender: Male Birth Date: May 09, 1989
   Id No: GSR/6627/13 e-mail: d.kedir@yahoo.com
2. Home Center/Dep't: CoDS: Center for Population Studies Stream: Populations Studies
3. PhD Dissertation Supervisor:

   Prof. Terefe Degefa Email: terefe.degefa@aau.edu.et

4. Title of the Proposal: ASSESSMENT OF NUPTIALITY PATTERNS AND IMPLICATIONS FOR FERTILITY TRANSITION IN ETHIOPIA.
   a. Proposal No: N.A. Date accepted: December 6, 2023
   b. Amendment No (if any): N.A. Date: N.A.

5. A clear statement of the decision: The Academic Commission of the Center for Population Studies reviewed and approved this proposal, adhering to the University's standards and academic rules. The applicant's statement revealed the necessity of an ethical clearance certificate for data collection and subsequent publication. Consequently, the CoDS IRB examined the proposal's content, its associated research tools, and the respondents' informed consent. The proposal was deemed eligible for ethical clearance.

6. Decision: This proposal fulfills the standard requirements described in IRB-CoDS Standard operating Procedure (SoP) and ethical clearance is hereby awarded.
7. This certificate is issued upon the consent of: IRB-CoDS.

IRB-CoDS
Name: Teshome Tafesse (Ph.D.)
Designation: Chairperson of CoDS/IRB
E-mail: cods.irb@aau.edu.et
Signature.....
Date: January 10, 2023

Addis Ababa University College of Development Studies Institutional Review Board (IRB)

This certificate is valid only sealed and signed

Appendix 1: Ethical clearance letter

Turnitin Originality Report

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ADDIS ABABA UNIVERSITY COLLEGE OF DEVELOPMENT STUDIES CENTER FOR POPULATION STUDIES ASSESSMENT OF NUPTIALITY PATTERNS AND IMPLICATIONS FOR FERTILITY TRANSITION IN ETHIOPIA BY DAME KEDIR (MSc) SUPERVISORS TEREFE DEGEFA (Prof.) TARIKU DEJENE (PhD) DECEMBER 2024 ADDIS ABABA, ETHIOPIA ADDIS ABABA UNIVERSITY COLLEGE OF DEVELOPMENT STUDIES CENTER FOR POPULATION STUDIES ASSESSMENT OF NUPTIALITY PATTERNS AND IMPLICATIONS FOR FERTILITY TRANSITION IN ETHIOPIA BY DAME KEDIR (MSc) SUPERVISORS TEREFE DEGEFA (Prof.) TARIKU DEJENE (PhD) A DISSERTATION SUBMITTED TO THE CENTER FOR POPULATION STUDIES, COLLEGE OF DEVELOPMENT STUDIES, ADDIS ABABA UNIVERSITY FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN POPULATION STUDIES DECLARATION I, the undersigned, declare that this dissertation entitled "Assessment of Nuptiality Patterns and Implications for Fertility Transition in Ethiopia" is my original work and has not been presented for a degree in any other University or organization and that all sources of materials used for the dissertation have been duly acknowledged, Declared by: Name: Dame Kedir Signature: Date: Publications 1. Chapter Two: Components of Change in Nuptiality Patterns Among Ethiopian Women: A Decomposition Analysis of Demographic and Health Survey Kedir, D., Dejene, T., & Degefa, T. (2024). Components of changes in nuptiality patterns among Ethiopian women: A decomposition analysis of demographic and health surveys. International Journal of Population Studies, 3531. https://doi.org/10.36922/ijps.3531 2. Chapter Three: Spatial Heterogeneity of Nuptiality Patterns in Ethiopia: A Decomposition Analysis Dame, K., Tariku, D., & Terefe, D. (2024). Spatial Heterogeneity of Nuptiality Patterns in Ethiopia: A Decomposition Analysis. Ethiopian Journal of Development Research, 46(1), 116-153. http://213.55.95.79/index.php/EJDR/article/view/10441 3. Chapter Four: Exploring the Contribution of Change in Nuptiality Patterns to Fertility Transition among Ethiopian Women Under Review – International Journal of Population Studies 4. Chapter Five: Sources of Spatial Heterogeneity in Fertility Transition with Specific Emphasis on Oromia and Amhara Regional States of Ethiopia Submitted to International Journal of Population Studies Table of Contents LIST OF TABLES ..... 4 LIST OF FIGURES..... 5 LIST OF