HACETTEPE UNIVERSITY

INSTITUTE OF POPULATION STUDIES

FERTILITY HETEROGENEITY IN TURKEY: FERTILITY TRAJECTORY CLUSTERS THROUGH BIRTH COHORTS

Faruk KESKİN

Department of Demography

Ph.D. Thesis

Ankara

December 2022

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APPROVAL PAGE

Fertility Heterogeneity in Turkey: Fertility Trajectory Clusters Through Birth Cohorts

Faruk KESKİN

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ABSTRACT

The decline in fertility, rapid urbanization and the increase in women's education levels in Turkey are simultaneous transformations. The coexistence and mutual interaction of these transformations is the focal point for the interpretation of fertility trajectories in Turkey. This thesis explores Turkey's heterogeneous fertility structure by examining the fertility trajectories of women between 1944 and 1978 cohorts. Using six waves (1993, 1998, 2003, 2008, 2013, 2018) of the Turkey Demographic and Health Survey data, sequence analysis was employed to calculate fertility trajectories and form clusters from these trajectories. The background similarities of women in the same fertility trajectory cluster were investigated with distance analysis, calculated predicted probabilities of cluster membership from multinomial logistic regression results. Results show that the total time spent with 5 or more children decreased significantly, the time spent childless in the reproductive zone has been extended and spacing has increased, particularly between second and third births. Over time, types of fertility trajectory clusters remained similar (and named with respect to their tempo and quantum of fertility as; “one child-norm”, “two children-norm”, “three children-norm”, “four children-norm” and “five or more children-norm”). The emergence of the same heterogeneous fertility trajectories for each cohort confirmed that fertility is heterogeneous in Turkey. The heterogeneous structure of one child-norm cluster in the younger cohorts indicates an absence of a transition to childlessness from this cluster. The two children-norm dominates the fertility behavior. For three children-norm cluster, the fact that a subgroup that spent a longer time with two children in the most recent period can be an indication of the evolution of this fertility behavior into two children-norm. Women in one child-norm and two children-norm clusters were found to be highly similar to each other compared to their cohort. Greater spacing between births or even stopping after the first child became a preferred option among educated women who grew up in cities. For women who grew up in rural areas and uneducated women, the transition to lower fertility behaviors continues.

Key words: fertility, heterogeneity, Turkey

ÖZET

Türkiye'de doğurganlığın azalması ile hızlı kentleşme ve kadınların eğitim düzeylerindeki artış eş zamanlı dönüşümlerdir. Türkiye'deki doğurganlık davranışlarının yorumlanmasında bu dönüşümlerin bir arada gerçekleşmesi ve karşılıklı etkileşimleri odak noktası olmuştur. Bu tez, 1944 ile 1978 kuşakları arasındaki kadınların doğurganlık yörüngelerini inceleyerek Türkiye'nin heterojen doğurganlık yapısını ortaya çıkarmaktadır. Çalışmada altı Türkiye Nüfus ve Sağlık Araştırması veri seti (1993, 1998, 2003, 2008, 2013, 2018) kullanılarak doğurganlık yörüngelerini hesaplamak ve bu yörüngelerden kümeler oluşturmak için dizi analizi yapılmıştır. Aynı doğurganlık yörüngesi kümesindeki kadınların arka plan benzerlikleri için uzaklık analizi yapılmış, multinomial lojistik regresyon sonuçlarıyla küme üyelikleri olasılıkları tahmin edilmiştir. Sonuçlar, 5 ve daha fazla çocukla geçirilen toplam sürenin önemli ölçüde azaldığını, üreme çağında çocuksuz geçirilen sürenin uzadığını ve özellikle ikinci ve üçüncü doğumlar arasındaki aralığın arttığını göstermektedir. Zamanla, doğurganlık yörüngesi kümelerinin türleri (doğurganlık zamanlamaları ve sayılarına göre "bir çocuk normu", "iki çocuk normu", "üç çocuk normu", "dört çocuk normu" ve "beş veya daha fazla çocuk normu") benzer kalmıştır. Her bir kuşak için aynı heterojen doğurganlık yörüngelerinin ortaya çıkması, Türkiye'de doğurganlığın heterojen yapısını ortaya koymuştur. Daha genç kuşaklarda tek çocuk normu kümesindeki heterojen yapı, bu kümeden çocuksuzluğa geçiş olmadığını göstermektedir. İki çocuk normu genel doğurganlık davranışına hakimdir. Üç çocuk normu kümesi için, son dönemde iki çocukla daha uzun zaman geçiren bir alt grubun olması, bu doğurganlık davranışının iki çocuk normuna evirilebileceğini göstermektedir. Bir çocuk normu ve iki çocuk normu kümesindeki kadınların, kendi kuşaklarına kıyasla birbirlerine oldukça benzer olduğu bulunmuştur. Doğumlar arasında daha fazla süre bırakmak ve hatta ilk çocuktan sonra ara vermek, şehirlerde büyüyen eğitimli kadınlar arasında tercih edilen bir seçenek haline gelmiştir. Kırsal kesimde büyümüş ve eğitimsiz kadınlar için düşük doğurganlık davranışlarına geçiş devam etmektedir.

Anahtar kelimeler: doğurganlık, heterojen, Türkiye

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CHAPTER 1. INTRODUCTION

Understanding fertility patterns has been the primary focus of fertility studies for over half a century. Most fertility studies have attempted to explain observed fertility levels using behavioral models and proximate determinants (Bongaarts, 1978; Kohler et al. 2002; Goldstein et al. 2009), socioeconomic models (Becker 1960; Caldwell 1982; Van de Kaa 1987; McDonald 2000), institutional approaches (McNicoll 1980; Szreter 1993; Rindfuss et al. 2003). Especially in the fertility decline period in Europe, the influence of institutional transformations and the impact of these structural changes on fertility have been widely referenced. The relationship between women's socioeconomic characteristics, such as education, gender role, social mobility, and labor force participation, and proximate determinants, such as contraceptive usage, is often tested to understand fertility level variation. Sometimes, unexpected outcomes showing similar outlier properties for an intended result of a demographic theory lead to a to novel groupings of the population such as a stalled fertility transition (Bongaarts, 2006).

These studies have mainly focused on changes in the mean period and cohort fertility levels of the population, where mathematical modeling and fertility theories are widely used to analyze trends in the average fertility levels of women with similar characteristics. While examining the change in fertility from the perspective of demographic transition theory, it has not hesitated to use well-defined groupings to look for subpopulations in which the transformation is experienced (relatively early). It is not surprising that fertility is considered in aggregate, especially during periods when fertility is relatively high, and data are scarce. While the decision to limit fertility is easier to theorize individually when data refer to regions or subpopulations, rates, ratios, and proportions cover the individuals, and social and structural changes are used to understand the findings (Watkins 1986). However, changes in fertility are rarely uniform in a population. Women in the same cohort may have different fertility outcomes despite having similar characteristics, whereas women with dissimilar demographic backgrounds may display very similar fertility patterns. It is important to evaluate fertility in terms of differences in timing and size across reproductive ages, as it is important to interpret fertility over its determinants. As we gain more detailed data on women's fertility histories, considering fertility as a whole becomes unsatisfactory for understanding changing fertility patterns.

The decrease in the fertility level of the population causes the differences in fertility to be more visible. To better understand these differences, it would be useful to examine the experiences of individuals in more detail, rather than the average level of fertility of the population. Examining these differences among individuals will also help to reveal the heterogeneous structure of fertility, if any. Examining fertility through individuals, rather than general summary indicators, also requires analysis of women's fertility history. Tracing how a woman's actual fertility changes over time can help us understand the differences in fertility patterns. Heterogeneity in fertility can be defined as multiple traces of fertility – or fertility trajectories - observed in a cohort of women which are significantly different from each other. Such an approach is an effective means of understanding the composition of a population since childbearing is one of the most enduring demographic events, subject to the influence of individual decisions, and has important implications for a population in terms of structure and size. Employing fertility trajectories to understand the fertility structure of the population and its change over time is as functional and essential as fertility outcomes such as total fertility rates. Moreover, since fertility trajectories represent both the tempo and quantum components of fertility, it is possible to interpret the changes from two perspectives. The interpretation of these trajectories allows us to get closer to reality when the criteria for detecting differences in fertility behavior are based on women’s choices rather than a priori distinctions made by the researcher (Blau and Schwartz 1984).

While some traces of fertility behavior differences in the population can be found in the early literature (Bongaarts and Potter 1983; Knodel 1987), and population and mortality heterogeneity can be found even earlier (Keyfitz and Littman 1979; Land and Rogers 1982), little attention has been paid to assessing the variation and heterogeneity in fertility courses. The demographic transition approach, which is one of the theories that most systematically examines changes in fertility, often overlooks fertility heterogeneity and focuses more on changes in fertility size since intrinsic changes in fertility are of secondary importance. Indeed, there are several notable examples of shortcomings of the demographic transition framework, wherein the non-homogeneous nature of fertility decline is rarely discussed (Coale 1969; Cleland and Wilson 1987; Kohler et al. 2002; Kreager and Bochow 2017). On the other hand, when examining the periods in which fertility structure and levels change, fertility differentiations such as stopping behavior, postponing fertility, voluntary childlessness, and the prevalence of births out of wedlock are frequently mentioned factors. These factors show that the change is not only experienced in the level of fertility, but also in social, cultural, and daily life practices along with it or sometimes preceding it.

Differentiation of fertility types or heterogeneity of fertility behavior change is rarely mentioned during the decline in fertility from high to low levels. However, emphasis is placed on individualization and differentiation to understand the next step in populations that have already reached low fertility levels. With the second demographic transition (SDT) literature, which theorizes that cultural shifts and changes trigger individualization in demographic behavior, attention has been drawn to the diversification of fertility outcomes for the first time. Lesthaeghe (2010) mentioned that these changes can be observed heterogeneously in populations that reflect various cultural and historical paths. Though, the literature is not entirely arid, in terms of heterogeneity.

Lesthaeghe (2010) points out that the second demographic transition (SDT) results in non-stationary populations with a multitude of living arrangements, sometimes characterized by a “convergence to diversity”, and further claims that fertility cannot be studied without a framework that reflects changing lifestyle preferences. Indeed, it is possible to see a later surge in the literature on behavioral diversity among individuals. The rise of the life-course approach (Huinink and Kohli 2014), literature on social interaction effects on fertility (Rossier and

Bernardi 2009), and emphasis on the decision-making process of individuals (Hakim 2003) show how fertility can be examined from a more integrated perspective. The life-course approach made it possible to see the differences at the individual level and interpret fertility changes more holistically.

Contrary to what was experienced at the beginning of the first demographic transition, variations in the fertility structure are based on fragmented and more fluid behavioral changes. As suggested by the SDT, cultural shifts and changes trigger individualization in demographic behavior (Lesthaeghe 2010). Higher education is linked to a higher likelihood of accepting new family values and predicting new concepts and behaviors that emerge among young, educated, and less traditional people in urban regions (Vitali et al. 2015). Accordingly, interpersonal connections and networks have come to the forefront in examining these changes. While this perspective focuses on the emergence of new behaviors, it is also important to guide the approach when examining the diffusion of changes in fertility. Therefore, using the diffusion theory, understanding these changes and transitions can be possible.

Understanding the changes in fertility through women's fertility experiences requires consideration of the social interactions between individuals. As Blau and Schwartz (1984) pointed out, social relationships and networks depend on the social environment, that is, the composition of the community, as well as on the cultural and social factors that govern individual tendencies and preferences. Therefore, the course of change in fertility behavior over time becomes more important than the emergence of change, especially when focusing on the period in which fertility has already started to decline. The diffusion approach is one of the many approaches by which traces of these transitions can be studied. As defined by Rogers (1983), the "diffusion process" refers to innovations – a tool or an idea – spread from one locality, group, or individual to another through different communication networks (Casterline 2001). Fertility changes can be studied from a diffusion perspective according to this definition.

The diffusion of innovation theory has also been used to enlighten similarities in fertility behavior across regions and societies (Montgomery and Casterline 1996), as fertility control is thought to be a form of innovation and diffusion. Cleland and Wilson (1987) argue that processes of diffusion are important when interpreting both past and current fertility transitions. Knodel and van de Walle (1979) stated that the cultural environment had an independent impact on the origin and spread of the decline in fertility, regardless of socio-economic conditions. Kirk (1996) and Van de Kaa (1996) reviewed research on fertility and discussed diffusion arguments in a broader context. Mason (1997) also identified "social interaction and influence" as key mediating factors for fertility transition. Other various studies of European evidence have also concluded that diffusion processes can be used to understand the observed patterns of change (Reed et al. 1999). In recent studies, fertility variation and geographical properties have been linked to the understanding of fertility transitions (Walford and Kurek 2016; Dribe et al. 2017; Klüsener et al. 2019).

The diffusion of fertility is usually studied in terms of the diffusion of contraceptive methods or behaviors, ideas, or approaches related to limiting fertility. From any perspective, the importance of social interaction through channels of communication for diffusion is undeniable. As expected, these channels of communication are stronger among individuals with similar social and cultural characteristics, and ideas are communicated through these channels. The preference of individuals to communicate with others who share similar characteristics, called homophily, may result in the grouping of demographic behaviors within society. When we want to look at the change in fertility through individuals and focus on differences, it becomes important to determine whether people are similar. When the social structure is changing and fertility is declining rapidly in Turkey, the importance of interpersonal social interaction to look at the differentials and heterogeneity of fertility change emerges. Thus, I concentrated on fertility heterogeneity using both structural changes in Turkey and the elements of the diffusion of fertility.

In Turkey, fertility changes have occurred alongside rapid societal transformation. The total fertility rate in Turkey declined steadily in the second half of the 20th century, from a total fertility rate of five children in the 1970s to approximately the replacement level in the 2010s (HUIPS 2019). The most significant societal transformations in Turkey during the fertility decline period were urbanization and an increase in the education level of women. The urban population in Turkey has increased from 25% in 1950 to over 75% today (World Bank, 2021a). Parallel to urbanization, the education level of women increased significantly in the second half of the 20th century. The literacy rate of women aged 15 years and over increased from 17% in 1950 to 93% in 2017 (TurkStat 2010; World Bank 2021b). The increase in education level was not limited to literacy. In 1975, only 3% of the female population aged 25 and over had graduated from high school or higher, but this rate has increased to 39% by 2021 (TurkStat 2000; TurkStat 2022).

Declining fertility, rapid urbanization, and an increase in women's education levels in Turkey are simultaneous transformations that pave the way for an increase in interpersonal ties. The coexistence and interaction of these transformations are the focal points for interpreting fertility trajectories in Turkey. Interpersonal communication, especially among women, increases alongside observed declines in fertility in Turkey during periods when social changes are experienced more acutely and immediately at the personal level, and communication techniques multiply with the advancement of technology. Accordingly, the two main objectives of this thesis are to introduce the fertility heterogeneity notion and to examine the heterogeneous nature of fertility in Turkey in the second half of the 20th century, when both social structures and period-level fertility in Turkey underwent rapid transformation. The third objective is to examine how women who exhibit similar fertility trajectories share similar characteristics in their pre-fertility period. The fourth and last objective is to understand the relationship between the different fertility patterns and the pre-fertility characteristics of women, husbands, and marriages.

In accordance with the above objectives, the following hypotheses were constructed: (1) the current fertility in Turkey is heterogeneous, (2) the heterogeneity of fertility in Turkey increased for the analyzed cohorts, and (3) similar fertility outcomes indicate a similarity in women's background. To this end, the fertility courses of women cohorts between 1944 and 1978 were analyzed using the fertility history datasets of the six quinquennial Turkey Demographic and Health Surveys (TDHS) from 1993 to 2018. The TDHS is a national survey with a representative sample design in order to provide information about trends in fertility of women, infant mortality, reproductive health, and mother and child health (HUIPS 2019). This thesis reveals differences in fertility trajectories in Turkey to portray women with various fertility patterns and interpret these differences based on women's various characteristics. To investigate fertility heterogeneity in Turkey, sequence analysis was used to reveal the fertility trajectories of ever-married women aged 40-49. Clusters of fertility trajectories were formed to group tempo- and quantum-related fertility patterns.

Distance analysis was used to identify the pre-fertility similarities in women's social background characteristics, spouses, and marriage formations. To reflect men's share of fertility decisions, similarities between husbands for women with similar fertility trajectories were examined. In addition, the characteristics and the background of the establishment of marriage were examined to evaluate the cultural effects on fertility behaviors. In this context, this study considers similarities in the mother tongue of women and her husband, childhood place of residence for the woman and her husband, their education levels, and characteristics of the establishment of their marriage. In order to complement these descriptive findings, multinomial logistic regression analysis was used to link these background variables and determine the predictors of fertility clusters. Next, with the calculated predicted probabilities of cluster membership in terms of women's childhood place of residence and education level, constructed fertility clusters and the increases in women's education and overall urbanization in Turkey are linked.

This thesis is organized into six chapters including this introductory chapter. In Chapter 2, the fertility-related background is discussed with policy changes and demographic transformations in Turkey to establish a background. Chapter 3 discusses the fertility heterogeneity framework and diffusion theory related to fertility heterogeneity, with inferences from the literature. This chapter also discusses fertility studies in Turkey. In Chapter 4, data sources and variables are introduced and the methodology of the analysis is explained. Chapter 5 presents the results of sequence analysis, distance analysis, descriptive tables, and multivariate analyses to investigate the heterogeneity. The findings of the analysis are interpreted in Chapter 6. Appendices A, B, C, and D contain supportive material for the analysis. In Appendix E, the original article "Cohort fertility heterogeneity during the fertility decline period in Turkey" published in the *Journal of Biosocial Science* to fulfill the requirements of the Ph.D. program was presented.

CHAPTER 2. BACKGROUND

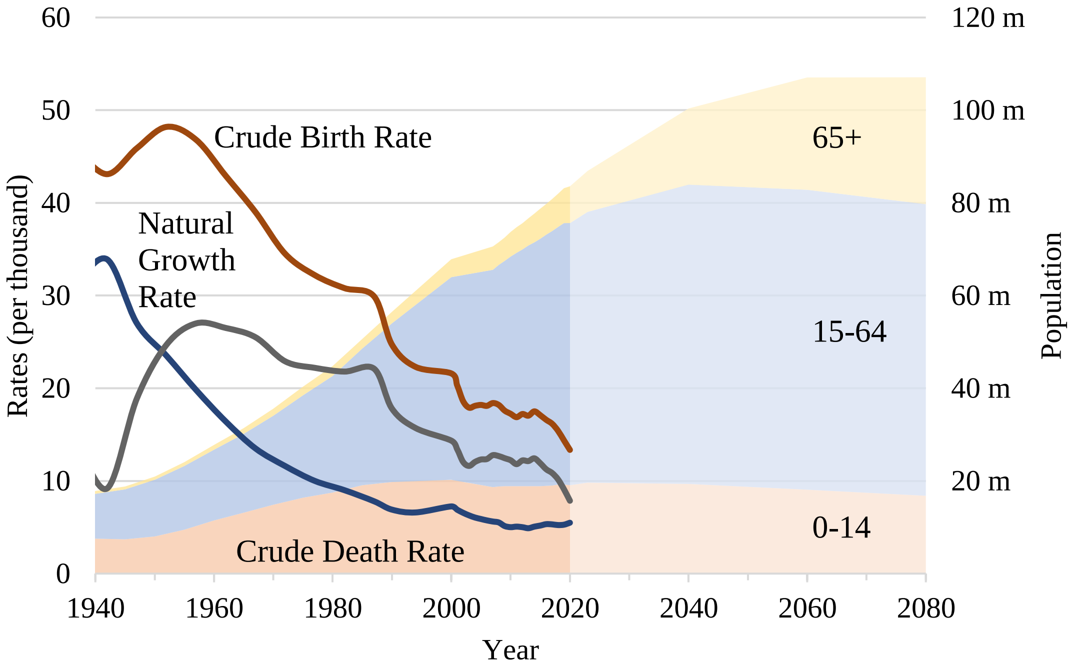
In the second half of the 20th century, when fertility declined rapidly in Turkey, it is necessary to address the socio-demographic changes in Turkey in order to examine this fertility changes in more detail and to correlate it with the socio-demographic structures in the country. The major demographic transformations in Turkey has occurred in a relatively short time compared to the European countries. They also influenced by the demographic transformations in the world in general and the geographical and economic structure of the country. These structural population changes in Turkey took place in accordance with the classical demographic transition theory, if the heterogeneous demographic structure of the country is overlooked. For this reason, we can briefly examine the change in the population of Turkey as a whole in the light of the theory of demographic transition, in order to put the structures, we are examining in context.

Demographic Transition Theory (DTT) is a theory that argues that based on the experience of Western countries, similar demographic changes can be experienced in other countries of the world, regarding birth and death rates of the population. It is a transition of a population with the industrialization and modernization process from a traditional structure to a modern society with a decrease in fertility and mortality rates. According to the classical theory developed by Notestein (1953), birth and death rates are relatively high in the beginning and the population change rate is at minimum levels. In the second stage, with the effect of industrialization and the advancements in health and living conditions, death rates start to decrease first, and the decrease in birth rates follows it with a lag, which causes a rapid population growth. In the third and final stage, birth and death rates are balanced at low levels, and the population growth rate returns to a low level.

It is possible to interpret the changes in Turkey's population in the light of this classical demographic transition theory. Many studies examining Turkey's demographic structure and change have interpreted DTT stages in Turkey considering the turning points of the major demographic changes (Koç et al. 2010, Eryurt et al

2013). The population in Turkey has moved from a period of high birth and death rates to times where both are low, and it is very close to completing its demographic transition (Figure 2.1). Crude birth and death rates were at high levels after the foundation of the Republic until 1950s. In this period, crude birth rates are over 45 per thousand and crude death rates are over 31 per thousand. While the crude birth rate reached its highest level with 48.3 per thousand in the 1950-55 period, deaths tended to decrease (23.5 per thousand) except for the Second World War years (Shorter and Macura, 1982). Crude birth rate, which decreased below 25 per thousand towards the end of the twentieth century, is around 13 per thousand in 2020, and the crude death rate is estimated to be 5 per thousand in 2019 (TurkStat 2020; TurkStat 2019). The population growth rate exceeded 2.5 percent between 1955 and 1975. This acceleration in the population growth rate has enabled the population of Turkey to increase numerically in a short time. With the decrease in crude birth rates, the natural growth rate declined to 1.5 percent in the 1990s, and this decrease continued in the 2000s, with the growth rate falling below 1 percent.

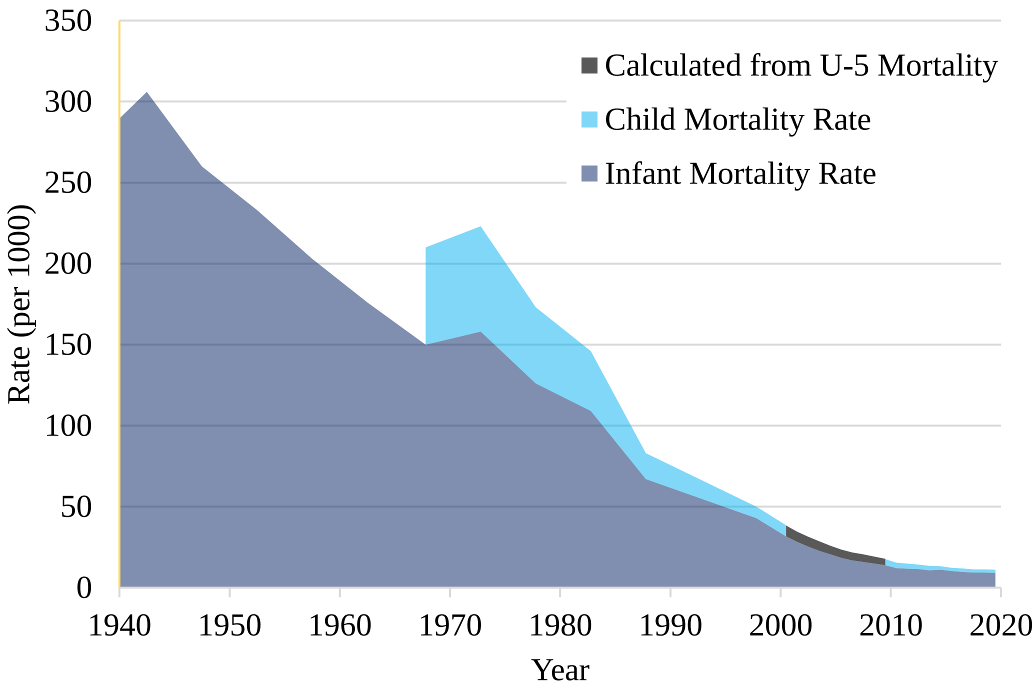
Figure 2.1. Population of Turkey



Source: Shorter and Macura 1982; TurkStat 1995,2019,2020; MoD 2015

In addition to the crude death rate that marks the beginning of the demographic transition, one can also look at the change in infant mortality and life expectancy at birth in Turkey for more detailed picture. Similar to crude death rates, infant mortality rate was also decreased dramatically in the second half of the 20st century (Figure 2.2). While the number of infant deaths per 1000 live births was around 300 in the 1940s, this number dropped below 50 in the late 1990s. A similar decrease can be seen in the child mortality rates. Looking at the current situation, the infant mortality rate has decreased below the level of 10 per 1000 live births. This is due to improvements in public health and medical care, as well as economic development. This improvement in infant mortality is also reflected in life expectancy at birth. Life expectancy at birth, which was about 40 years for men and 45 years for women in the 1950s, increased by more than 35 years between 1950 and 2020, reaching 75 for men and 80 for women (UN, 2022).

Figure 2.2. Infant and Child Mortality Rates



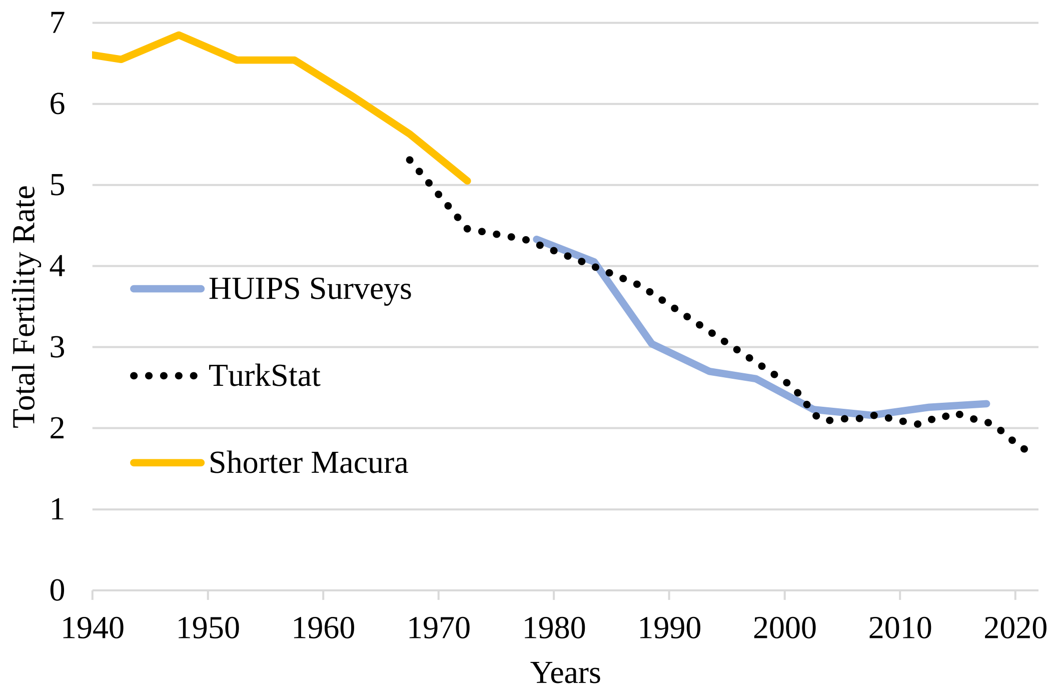
Source: Shorter and Macura 1983; TurkStat 1995, 2020

Crude birth and death rates and infant and child mortality rates in more detail show that the transformation started from the 1940s. Although we follow the demographic transformation of the population of Turkey throughout the history of the republic, the decline of fertility in Turkey started locally before the republican period. Before characteristic transformations of observed birth and death rates, some of the cities in Ottoman already experienced some parts of demographic transition. The Ottoman censuses of 1885 and 1907 shows that the total fertility rates of İstanbul (3.5 and 3.9 respectively) were already declined considerably (Duben and Behar, 2002). These levels show that the demographic transformation in metropolitan cities started earlier than in Turkey in general, although there is no exact information about deaths in this period. However, the population of Istanbul was only 6 percent of the entire population of Turkey according to 1927 census, and the demographic situation in Turkey was very different from Istanbul.

The period total fertility rate in Turkey ranged from 6 to 7 children between 1923 to late 1950s (Shorter and Macura 1982), showed a decreasing trend at the end of the 1950s and did not rise again (Figure 2.2). The total fertility rate in Turkey, which was on a marked decline in the second half of the 20th century, stagnated in the 21st century around the population renewal level of 2.1 children per women. This decline is largely due to improved educational and economic opportunities for women and the associated increased access to contraception. The most recent administrative registry results show that fertility has fallen below replacement level, with an average of two children per woman. Since the female population that I examine in this study consists of the cohorts between 1944 and 1978, the analyzed fertility schedules are approximately between 1959 and 2018.

When fertility and mortality rates are considered and Turkey is examined as a whole, the era up to the 1950s can be labeled as the first stage of the demographic transition theory. At the beginning of this period, it is seen that the fertility and mortality levels were high and therefore there were not very large changes in the size of the population. But its second half saw first the decline of mortality, and then the subsequent decline of fertility. From the 1950s to the 2000, there were significant decreases in both fertility and mortality rates. However, the decline in the overall fertility level was somewhat later than the decline in marital fertility due to the increase in women exposed to fertility in the late 1950s (Shorter and Macura 1982). Continuous decline in total fertility rate and decline in mortality levels in the following years shows that the second half of the twentieth century can be considered the second stage of the demographic transition. In the twenty-first century, low fertility and low mortality rates confirm that Turkey is in the last stage according to the classical stages of demographic transition theory.

Figure 2.3. Total Fertility Rate in Turkey



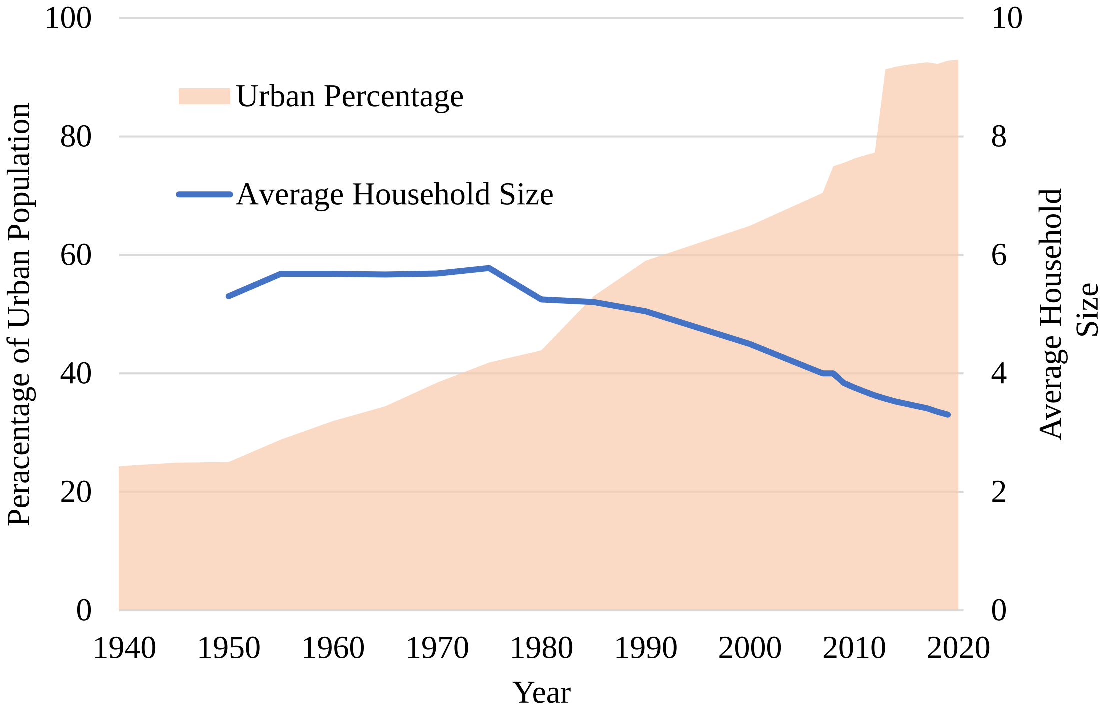
Source: Shorter and Macura 1982; TurkStat 1995,2018,2020; HUIPS 1979, 1984, 1989, 1994, 1999, 2004, 2009, 2014, 2019

As the demographic transition indicates, along with the declines in fertility levels significant changes were observed in the fertility related factors, also known as proximate determinants of fertility. The most prominent among these changes has been the rising age at first marriage. The age at first marriage, which had previously declined due to fertility-enhancing policies that encouraged marriage, started to rise with antinatalist policies. Singulate mean age at marriage (SMAM), which varied between

19 and 20 for women in the period until 1950, started to rise after the 1970s (Shorter and Macura 1982). Although the median age at first marriage increased from 19 in 1993 to 21.4 in 2018 for women in the 25-49 age group, the relatively early marriages and universality of marriage behavior among women means the pattern of having the first birth shortly after marriage in Turkey is retained, and the median age at first birth is calculated as 23.3 years (HUIPS 2019). In accordance with the age at first birth pattern, the currently childbearing group peaks with the 25-29-year-olds in Turkey, although that peak used to belong to the 20-24 age group. The change in the fertility of women aged 40-49, who have mostly passed their reproductive ages, has been in parallel to the overall decline of fertility. The mean number of children ever born to women aged 40-49 decreased from 4.8 children for the 1944-53 cohort to 2.7 children for 1969-78 cohort. (HUIPS 1994; 2019). Along with the increase in the age at first marriage, the widespread use of contraceptive methods has also been effective in the decrease in fertility in Turkey. The contraceptive prevalence has increased from 63% to 70% in 1993 to 2018 period (HUIPS 2019).

It would be restrictive to examine the demographic change in Turkey with only fertility and mortality rates to understand the decline of fertility and the changing related factors around it. It is important to take a look at the change in structural factors as in classical fertility change approaches. These structural changes are also important to understand the change in fertility through individuals and to examine this change from a diffusion perspective. Therefore, I will also focus on the structural changes during the period when fertility declines. The most significant societal transformations in Turkey during the fertility decline period are urbanization and the increase in the education level of women. Information about the proportion of the population living in cities in Turkey comes from the earliest censuses. According to the results of censuses, the share of the population living in provincial and district centers for the total population until the 1950s was below 25 percent (Figure 2.4).

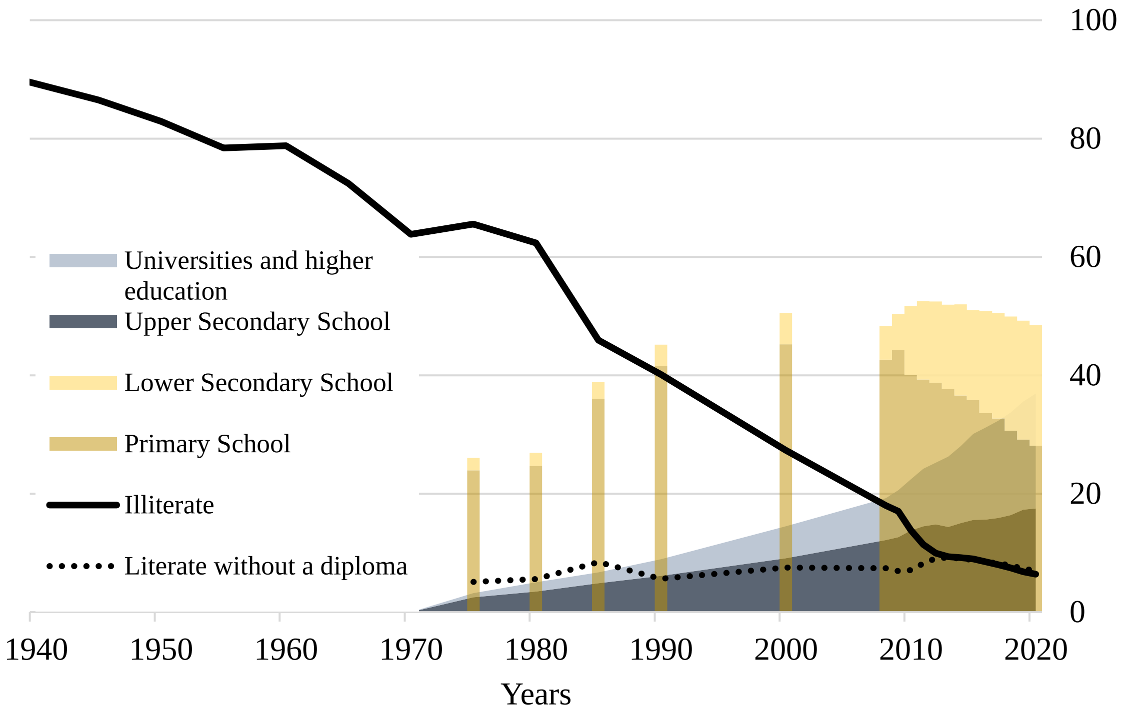
Figure 2.4. Urbanization Percentage and Average Household Size



Source: TurkStat 2000, 2022

While the urban population was around 40% in the 1970s, changing economic structures required more workers for the growing urban settlements. Beginning in the 1980s, the influx of migrants from rural to urban settlements has continued unabated and as a result, the urban population in Turkey went from 65% in 2000 to over 75% today (World Bank 2021a). The number of cities with more than 500,000 inhabitants has grown from four in 1935 to nine in 1950, and to thirty-five in 1985. In 2021, twenty-four cities of Turkey have more than 1 million inhabitants (TurkStat, 2022). However, the urban population is concentrated in a few large metropolitan areas, with Istanbul, Ankara, and İzmir accounting for about one-third of the urban population (TurkStat, 2022). The increase in the urban population following the acceleration of population growth in Turkey also affected the average household size. The average household size, which was between 5.5 and 6 until the 1970s, has declined since the end of the 1970s and has reached 3.3 today.

Figure 2.5. Educational Level of Women Aged 15 and Above



Source: TurkStat 2014, 2022

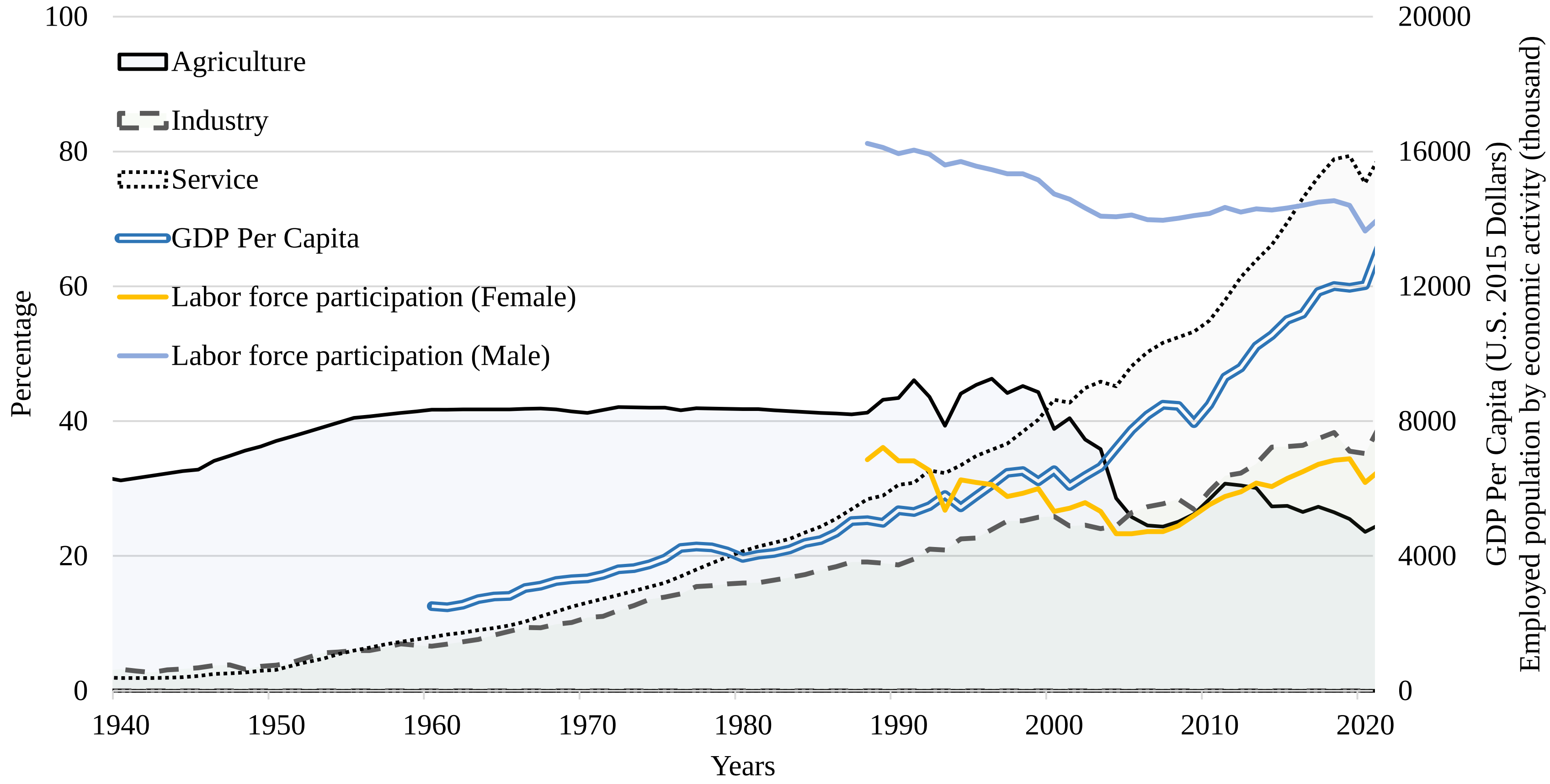
The increase in the population living in cities facilitated access to schools and led to an increase in the education level of the population. The increase in the education level of the female population has been more striking as a result of encouraging girls' participation in education in Turkey. Parallel to urbanization, the education level of women increased significantly in the second half of the 20th century. Figure 2.5 shows the educational level of women aged 15 and above. In 1940s, more than 80% of women were illiterate and this rate decreased to 50% only in the 1980s. Although these rates are high, this decrease shows that the education level of the female population has increased rapidly during these periods when total fertility rates drop. In 2000, when the decline in fertility slowed down, nearly half of the female population over the age of 15 were primary school or lower secondary school graduates. In 2000, one out of every 4 women over the age of 15 was still illiterate, but today this rate is below 10 percent. Similar change can be tracked trough the TDHS results also. The median years of education for women aged 15-49 increased from 5 in 1993 to 8 in 2018 (HUIPS

1994; HUIPS 2019). Despite these developments, the rate of women who have graduated from high school and above is still below 40 percent.

The increase in urbanization and education levels has been accompanied by a number of changes, including an increase in the number of people working in the service sector and a decrease in the number of people working in agriculture. Figure 2.6 summarizes the employed population by economic activity, GDP per capita in 2015 U.S. Dollars and labor force participation by sex. From the 1960s to the 2000s, the periods when the population growth rate of Turkey was the highest, the population employed in agriculture did not change much numerically, and after 2000 it started to decline. Although there has been a steady increase in the industrial sector over the years, the main growth has been seen in the service sector, which has grown rapidly since the 1960s.

Since 2000, the number of people working in the service sector has doubled and reached 16 million people. Accordingly, although there is no significant change in the percentage of women's labor force participation, the sector in which they work has also changed. Thus, the country has transformed from a largely agrarian economy to a more diversified one, with industry and services accounting for a larger share of GDP. Since the 1940s, the GDP of Turkey has grown significantly. In parallel with the rest of the world, neoliberal economic policies have been adopted and GDP per capita has more than doubled in the last 20 years (World Bank 2021c). When the labor force participation percentages are examined, the difference between women and men emerges. Male labor force participation percentages have hovered around 70 since 2000. On the other hand, the percentage of women's participation in the labor force declined from 35 percent in 1990 to 23 percent in 2005, and has increased to 33 percent today.

Figure 2.6. Population in Sectors, GDP and Labor Force Participation



Source: TurkStat 2021

Turkey has experienced rapid population changes in the 20th century. This was due in part to medical advances, improved standards of living and demographic changes mentioned above, but also to the population policies. At various points, the government has incentivized or encouraged families to have more children, with the goal of increasing the population and making the nation stronger. In the first years of the Republic, a pronatalist policy was followed to promote fertility. The fact that a census was made shortly after the establishment of the republic shows the importance given to the issue. In order to encourage having children, families with more children were exempted from some taxes, and families with 6 or more children were awarded a medal. Policies to increase the population in Turkey continued until the 1960s and were generally based on developmental reasons.

With a law enacted in 1930, the import, sale and distribution of all kinds of tools and devices that would prevent pregnancy or help abortion were prohibited. In the same period, abortion and other practices that would prevent having children were included in the scope of heavy punishment. In 1926, the official marriage age, which was determined in the Turkish Civil Code as 18 for men and 17 for women, was lowered to 17 for men and 15 for women in 1938. Turkey's population policies until 1960s focused on increasing the population and improving the quality of the population. The government believed that a larger population would lead to a stronger economy and more political power on the international stage. To increase the population, the government adopted a pronatalist policy which led to high fertility levels and the rapid increase in Turkey's population. To improve the quality of the population, the government invested mainly in education and health care.

In the 1950s, problems such as unplanned urbanization, unemployment and economic stagnation related to rapid population growth began to be expressed. The state planning organization was established in 1960, and the problems created by population growth were emphasized for the first time in the first five-year plan covering the period 1963-1967. It can be said that starting from the 1960s, the Turkish government has been concerned about population growth and its impact on the country's development. The First Five-Year Development Plan in 1963 (SPO 1963) has set some policies regarding population planning to develop and implement policies to encourage smaller families. The provisions of the law prohibiting the dissemination of contraceptive information and the import and sale of vehicles and drugs used to prevent pregnancy were abolished, it was decided to provide training on population planning to the personnel working in health services. Following the First Five-Year Development Plan in 1963 (SPO 1963), anti-natalist policies such as the authorization of family-planning methods and the easing of laws banning abortion were adapted under the new population law in 1965 (Population Planning Law No.557, 1965). With the Law No. 557 on Population Planning in 1965, Turkey officially switched to anti-natalist policies. With the law, abortion is allowed when it is known that pregnancy threatens the health of the mother or that the child will be born with a disability. The aim of the population policies in this period was to reduce fertility by spreading contraceptive methods, to reduce mortality by improving health services, and to alleviate unemployment pressure by encouraging immigration to abroad.

In the years following the military coup of 1980, in 1982, a new constitution was adopted and the family planning perspective was formally stated for the first time (Çağatay, 2013). In 1983, with the legalization of abortion, Turkey enacted a new population planning law and the family planning-oriented approach was continued (Population Planning Law No.2827, 1983). The law also included provisions for education about family planning and the prevention of unwanted pregnancies with provisions for increasing the availability of abortion services. The measures included making contraception more widely available and increasing public awareness about the benefits of smaller families. Sterilization has become legal for both women and men. The effects of this law were seen in the years following the law, and Turkey's natural growth rate fell below twenty per thousand in 1990. In the 1990s, Turkey's population policy focused on reducing the country's high infant and maternal mortality rate. These policies include increasing access to contraception and investing in girls' education. While Turkey's population policies have been evolving over time, they have always been ambitious and far-reaching, indicative of the importance that the government places on population size and growth.

Turkey's population policy has undergone a number of changes in recent years. The government has shifted its focus from decreasing the population to stabilizing it and even encourage families to have more children. The discourse of at least three children, voiced by the then prime minister Recep Tayyip Erdoğan in 2008, indicates that there has been a transition to de facto pronatalist policies. Afterwards, with the Protection of Family and Dynamic Population Structure Program, which was handled within the scope of Priority Transformation Programs Action Plans covering the years 2014-2018, fertility promoting regulations were also introduced. The government has implemented a number of measures to support this goal, including increasing financial incentives for families to have more children. Turkey's current population policy is to encourage higher fertility rates to sustain the replacement levels. The government also promotes marriage and childbearing, and discourages contraception and abortion. These policies are designed to increase the population of Turkey, which is currently around 85 million.

Despite the anti-natalist regulations, the population of Turkey, which was 40 million in 1975, doubled to 80 million in 2017 in 42 years. Accordingly, a similar increase was also seen in the analyzed female cohorts. While there were approximately 2.5 million women aged 40-49 in 1990 (TurkStat 2010), the number of women aged 40-49 is over 6 million according to the 2021 Address Based Population Registration System (ABPRS) results (TurkStat 2022).

CHAPTER 3. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

3.1. Context of Heterogeneity and Heterogeneity in the Concept of Fertility

The heterogeneous structure of the population in history is a concept that is considered together with the size of the population. One of the very first examples can be found in Aristotle's Politics[1] where the size of the population and the relationship between the members of the population were discussed. Although the way the population is handled has changed a lot in about 2400 years, the desire to understand the different structures in the population has not changed. With the establishment of cities, the increase in the population living in the city and the growth of cities, the population living together started to increase numerically. Rapid urbanization, especially in western Europe and the USA, has included population density along with population size into the discussion and often, concept of heterogeneity has been associated with urbanization.

With the rapid population growth in the world, the population in cities has increased more than ever before. This makes population differences and urban population dynamics worth studying. Wirth (1938) in his famous article describes the differentiation of the population living in the city and argued that the population size increases social heterogeneity. Social heterogeneity, which can be simply defined as the proportion of socially dissimilar people in a population, is also important for understanding the interrelationships of individuals. For example, Wilson (1986) have found that the size of the population, independent of several demographic variables indicating population differences, increases the heterogeneity of these characteristics. Fischer's subcultural theory also argues that large population size increases the subculture diversity which causes an increase in social heterogeneity. He defines the

[1] "But if the citizens of a state are to judge and to distribute offices according to merit, then they must know each other's characters; where they do not possess this knowledge, both the election to offices and the decision of lawsuits will go wrong. When the population is very large they are manifestly settled at haphazard, which clearly ought not to be."

subculture as "a set of modal beliefs, values, norms and customs associated with a relatively distinct social subsystem (a set of interpersonal networks and institutions) existing with a larger social system or culture" (Fischer, 1975). Although this seems like a static definition, when considered together with norms and custom, it is possible to expand this definition for behaviors.

Considering the constantly evolving behaviors of individuals within the population and their redefinitions within this structure, interpersonal ties gain importance. Fischer (1975) argues that concentration of large and heterogeneous populations, as suggested by Wirth (1938), ultimately leads to weakening interpersonal relations. While these weakened interpersonal ties lead to differentiations within the population, they also give meaning to interpersonal communication. Wirth (1938) suggests that the increased mobility of the individuals brings them into the reach of many different individuals and exposes them to fluctuations in their status in different social groups that make up the social fabric of the city. It can be easily accepted that these social groups differ not only culturally but also behaviorally. Similarly, Wilson (1986) argues that large population sizes not only preserve heterogeneity, but also give rise to new or hybrid subcultures. He also adds that these new subcultural forms can be the outcome of diffusion or can be evolved from the interactions among existing subcultures. Therefore, the heterogeneous structure of the population is not only related to people living together and in increasingly densely structures, but also is effective in the emergence of social differences because it increases the possibilities of interpersonal communication.

On the other hand, the city is frequently defined with the differentiation and characteristics of its population recursively. Wirth (1938) defines the city as "a relatively large, dense, and permanent settlement of socially heterogeneous individuals". The increasing and diversifying population, which gives birth to the urban phenomenon, is in a sense becoming the definition of the city. For example, Karp et al. (2015) mentions that the city is characterized by the heterogeneity of its population and Berry (1973) notes that the population size, density, and heterogeneity of the city are the focal points of the approaches on the effects of cities on social relationships. Considering the heterogeneous structure being so central and revealing the communication between individuals, the perception of social and demographic changes in cities also gains meaning. Since urbanization reveals, makes visible and nourishes the heterogeneous structure, the impact of these heterogeneous structures on demographic changes gains importance in the period when urbanization accelerates.

In relation to social heterogeneity, differences in demographic behavior of individuals can also be examined within the heterogeneous structure frame. From a demographic point of view, heterogeneity can be simply defined as demographic variations in the population studied. These variations can be observed inevitably in age and sex, which are the fundamental elements of the population, as well as in marriage or fertility behaviors, which need more complex mechanisms to make sense of. For example, demographic differentiation by age groups or gender can be used to reveal and understand heterogeneous structures within the population. Heterogeneous structure can be interpreted not only on the basis of the static characteristics of the population, but also on the dynamic characteristics such as their migration histories or fertility behaviors. It is possible to see the traces of heterogeneity discussions on differences of population and mortality in early works (Keyfitz, 1979; Land and Rogers, 1982). Although fertility heterogeneity is not treated as a separate issue most of the time, the traces of literature on differences of fertility in population also can be found early. Bongaarts and Potter (1983) discusses the fecundity of heterogenous population and mark that women with the highest fecundability conceive quickest. Knodel (1987) asserts that heterogeneity within the population with respect to biological and behavioral characteristics would lead women to be distributed among a range of different final family sizes.

Heterogeneity, which is an internal framework for understanding the population, has not been considered in the foreground when examining the change of populations. The most famous of these, the theory of demographic transition, states that the decline in fertility and mortality levels will be similar across all populations. Although demographic transition theory is concerned with being valid for all populations, there are several notable examples address the shortcomings of the transition framework wherein the non-homogeneous nature of fertility change is rarely discussed and refer to the variations of fertility change. For example, Coale (1969) notes that the pre-decline fertility in Europe was in a wide range and cannot be explained through the breastfeeding or health differences. In addition, anticipating that the decline in fertility may be volatile, he mentions that it is difficult to set a certain economic and social threshold for the decline. Similarly, Cleland and Wilson (1987) state the predominant natural fertility prior to the transition does not mean that child bearing levels in all populations were similar. There are also opposite examples in the same sense; there were highly different economic areas in England prior to the transition where homogeneous fertility regions can be observed (Cleland and Wilson 1987).

With second demographic transition (SDT) literature, systematic attention has been drawn for the first time to the diversification of fertility. Especially in populations close to completing the demographic transition, where fertility has decreased significantly, some differences have started to come to the fore. Lesthaeghe (2014) points out that since 1960 age at first marriage increased in Europe, cohabitation before marriage and long-term cohabitations replaced marriage, and childbearing before marriage became much more frequent. He adds that with contraceptive, sexual and gender revolution, postponing childbearing and the share of childless women are coming to the fore, and higher parity births are becoming rare. Lesthaeghe (2010) further claim that the second demographic transition (SDT) results in non-stationary populations with a multitude of living arrangements, sometimes characterized by a "convergence to diversity", and further claims that fertility cannot be studied without a framework that reflects changing lifestyle preferences.

When we consider populations on the road of SDT on the one hand, and populations with still high fertility levels on the other hand, a differentiation emerges again. Pesando (2019) refers to this heterogeneity as "persistent diversity with development". Indeed, it is possible to see a later upsurge in the literature on behavioral diversities among individuals. The rise of the life-course approach (Huinink and Kohli 2014), the literature on social interaction effects on fertility (Rossier and Bernardi

2009) and an emphasis on the decision-making process of individuals (Hakim 2003) show how fertility can be examined from a more integrated perspective. The life-course approach made it possible to see the differences at an individual level and interpret fertility changes more holistically. Kreager and Bochow (2017) take the heterogeneity perspective more directly and think that similar fertility trends and levels can be achieved through different means and purposes. They argued that the problem with studying reproduction as a dimension of population heterogeneity is that there is no consensus on the best subpopulation units for comparison of populations.

Several empirical and theoretical studies of populations provided evidence of variations in fertility. Lesthaeghe (2010) claims that the defining pattern of fertility associated with the SDT is its noticeable degree of postponement, the significant heterogeneity apparent in recovery of fertility levels at later ages and the considerable degree of heterogeneity in cohort fertility. He also adds that the current status of heterogeneity in Europe is mainly due to timing differences in the onset of fertility postponement and cohort fertility heterogeneity is substantial and cannot be evaluated as the outcome of ethnic variations (Lesthaeghe 2010).

The heterogeneity Lesthaeghe emphasized in the European context was also investigated by other researchers. Catherine Hakim's preference theory (2003) argues that women's lifestyle preferences are heterogeneous and at the heart of advanced society's choices of fertility and labor markets. Hakim assumes that there are three main lifestyles across the life course; career-oriented, family-oriented and adaptive women who stands in the middle. She argues that women's heterogeneity is the main reason for their varied response to social policies and fertility. Hakim’s point of view supports and strengthens the individualization and behavioral centralization stance of Second Demographic Transition. The recent empirical works and theoretical conceptualization of handling women as self-determining individuals shows that the research of fertility indeed searches heterogenetic patterns in populations.

Sobotka et al. (2008) refer to a growing diversity in the timing and sequencing of family-related transitions which can be linked to increasing differences between social groups in the Czech Republic. Parallel results are derived by Potančoková et al. (2008) for Slovakia, where they assert they argue that a more heterogeneous pattern of childbearing age is becoming apparent, and that continued delay in family formation and childbearing will introduce more heterogeneity in the parity distribution. Kohler et al. (2002) draw attention to the aftermath of the demographic transition and point out the heterogeneity in the determinants of low fertility and postponement behavior within former Soviet republics and Eastern European countries. Similar findings were also found for Britain (Tavares 2016), Spain (Baizán et al. 2003), Italy (Caltabiano 2016), and Germany (Raab and Struffolino 2019).

The study by Chandola et al. (2002) on characteristic features of age-specific fertility rate models in the English-speaking world shows an increasing heterogeneity of fertility behavior through the increase of early age fertility since the 1970s. The authors also discuss these results with participation of the English-speaking countries to SDT and conclude that the English-speaking uniqueness is likely to change over time (Chandola et al. 2002). Additionally, for baby-boom generations in both European and non-European countries, more homogeneous structures were found than in other generational groups (Bean 1983; Requena and Salazar 2014; Sandström 2014; Van Bavel 2014; Reher and Requena 2015). The work by Van Bavel et al. (2018) showed that over the 1901-1945 cohorts, the proportion of parents with exactly two children has increased, resulting in homogeneity of family sizes. This also gives some clues about a shift from more heterogeneous fertility behaviors especially in Europe.

Variations in fertility are also studied with respect to age-specific and parity perspectives. Peristera and Kostaki (2007) claim that recent data from the United Kingdom, Ireland and the US show distortions in fertility rates of younger women which cause a deviation from classical age-specific fertility patterns. Also, the pattern of first births displays an intense upward distortion in younger ages, stronger than that of the total fertility pattern. They claim that this heterogeneity can be related to educational level, differences in social and economic conditions, marital status, religion and ethnic diversities. They introduce a new flexible fertility model for describing both the old and the new patterns of fertility and they fit this new model to empirical data.

An empirical study of Lima et al. (2018) uncovers a bimodal fertility profile in Latin America. They analyzed the emerging pattern of fertility polarization in Latin American low-fertility countries and conclude that "the first birth rates in the low-fertility countries in Latin America show a bimodal age pattern more pronounced than the bimodality identified earlier in some European countries and the United States." (Lime et al., 2018). Another study on Uruguay by Nathan et al. (2016) on the duality of high teenage fertility and women delaying motherhood, are among the studies highlighting the increasing heterogeneity of reproductive behavior.

The differences in fertility differentials also covered by researches in Asia. Mu and Xie's (2016) work mention that the one-child policy for married couples in China ignored the heterogeneities in fertility intentions and behaviors especially in the urban and rural differences, where in rural areas where patriarchy and male child preference are more intense. Zhao (2018) investigated the heterogeneous relationship between the economic activities and incomes of Chinese urban women and the ages of their children. This study concluded that women's economic activities are consistent with their family's needs, and they differ at different stages of motherhood, which showed that heterogeneity in fertility may constitute another heterogeneous process. Sohn and Lee (2019) analyzed the heterogeneous effect of having a college degree on fertility in Korea and results showed that having a college degree reduces the likelihood of childbirth. Mohanty et al. (2016) asserts that there is a remarkable heterogeneity in fertility decline in Indian districts between 1991 and 2011.

Gayavan et al. (2010) presented a flexible parametric model that can capture the differentiating patterns of the age-specific fertility curves of African countries. Grace and Sweeney's (2016) work showed that in Guatemala instead of a straightforward decrease in fertility, some parities and ethnic groups have reduced fertility, some have stalled fertility, and others have begun to transition. Kreager's article (2017) dwells on Adam Smith and population heterogeneity and contends that explaining the mechanisms of continuous heterogeneity are probably the main challenges facing demographers in recent years. Kreager (2017) also insisted that Smith's analysis framework is a reminder that "heterogeneity is a potentially fruitful explanation in creative population thinking".

Pesando (2019) examines the persistent diversity of global family change, noting that divergent demographic trajectories of fertility have begun to characterize high-income societies, and Rindfuss et al. (2016) complete Pesando's thought, asserting that two distinct fertility regimes have emerged in economically advanced countries; in one group, the period total fertility rates are around 1.9, while in the other they are at the level of 1.3. All these recent works focus on the fact that fertility has no monolithic and homogeneous structure, especially in populations where changes in fertility size and structure continue. In light of these studies, it is necessary to understand constituent and more homogeneous fertility trajectories and their transition, in order to correctly understand structural change in fertility.

Studies on fertility of Turkey's population mainly refer to various rates and phases of the fertility transition in spatially distant population groups (Duben and Behar 2002). Therefore, studies on differences in fertility predominately focus on mean period fertility level and are usually related to predefined observed characteristics. These approaches evaluated fertility by linking it to diversification of the demographic structure and did not go beyond this; however, the increase in the mean age at first birth in postponed marriages, together with the slowdown in fertility decline, gives clues that the change in Turkey may not be uniform.

Fertility in Turkey has been largely studied as an extension of global fertility research trends and is mainly focused on language groups and regional differences that are strong proxies of ethnicity in that country. Fişek and Shorter's work (1968), which is one of the earliest studies on fertility in Turkey, states that fertility has already started to decline in Turkey and that there are differences between rural and urban areas as well as regional differences, and these differences overlap with educational and socioeconomic dissimilarities. The comparison of rural-urban and regional fertility levels comes to the fore in fertility studies, which are also shaped by the limiting effect of the data sources of the period (Goldberg and Adlakha 1969, Özbay et al. 1979, Shorter and Macura 1982, Cerit 1989, Hancıoğlu 1997).

Fertility has more recently been studied in more detail in the breakdown of ethnicity and regional differences, thanks to the detailed structure of the TDHS data. The study by Koç, Hancıoğlu and Çavlin (2008) shows the demographic differentials and integrational aspects of Turkish and Kurdish populations in Turkey. Their results indicate that strong demographic disparities exist between Turkish and Kurdish populations and the latter's fertility level recalls that of Turkey in the early 1980s. There were also similar differences between Kurds and Turks in terms of contraception, reproductive health and marriage and according to their findings the convergence of the two groups was not apparent. Yavuz (2006) also investigated the fertility decline in Turkey according to main language groups. His findings suggest that the intensity of parity progression for Turkish-speaking mothers is lower than that of Kurdish-speaking mothers, indicating that the decline in fertility for the latter group began much later and the risk of third birth is lower for people with higher socio-economic status. He found that the populations that are more integrated into Turkey's modernization process also change their fertility behavior the fastest.

Yüceşahin and Özgür (2008), in their study examining the variation of fertility between regions in Turkey together with the fertility in the provinces, stated that ethnicity and cultural factors are associated with high fertility, especially in the southeast Anatolia region. In Turkey, where urban fertility levels are always lower than rural areas (HUIPS 2019), the findings of Kavas and Thorton (2019) confirmed that most of the urban population recognizes the relationship between development and low fertility and the decline in marriage and fertility will contribute to socio-economic growth in the country. Regional differentiation of fertility outcomes is also apparent in other research in Turkey (Işık and Pınarcıoğlu 2006, Caarls and de Valk 2018, Aydın et al. 2018, Selim and Bilgin 2020).

In addition to examining fertility in relation to geographical region and ethnicity, associating it with education of women is an approach frequently encountered in the Turkish fertility literature. In almost all studies with appropriate data, it has been revealed that the education level of women in Turkey and their fertility level are inversely proportional (Berksan 1969, Özbay 1979 , Ergöçmen 2012, Kırdar et al. 2018, Özbay Daş 2020). This is not surprising given that regional differences in fertility are actually due to intertwined ethnic, demographic and cultural differences. In recent studies, this relationship is examined in more detail. Gore and Carlson (2010) stated in their study that besides ethnicity, education also influences marriage patterns and therefore fertility patterns. The results of their study showed that although low-educated Kurdish women married earlier than Turkish women, the difference was reversed among educated women. Heterogeneous effects of female education on fertility has also investigated in fertility literature. Güneş's (2016) study on female education and teenage fertility found heterogeneous effects in Turkey which indicates that women's education reduces adolescent fertility more in provinces with low population density and high agricultural activity. Her findings showed that female education reduces the fertility of adolescents. In addition, the study of Greulich et al. (2016) concludes that differences in female education are the driving force behind the regional heterogeneity of fertility in Turkey and educated women in the formal labor market are most likely not to have a third child. Baykara-Krumme and Milewski's (2017) work on first-, 1.5, second-generation and return Turkish migrant women and non-immigrant Turkish women from the similar regions of origin found that due to differences in education, the transition rate of first-births of the second generation of immigrants is lower than that of non-immigrant Turkish women.

There are also studies examining the relationship between education and fertility through differentiations in various populations. A study about educational differentials during the fertility transition in South Korea argues the degree of homogeneity in society influence the fertility differences (Yoo, 2014). According to Yoo's findings, trends in parity progression ratios show that fertility declines diffuse from the most educated to the least educated groups in the fertility transition period. He also concludes that the norm of a two-child family became established across all social sections in Korea. Another study from Brazil accounts for the fertility differentials by education and asserts the heterogeneity change in lower education groups (Rios-Neto et al. 2018).

Frye and Lopus's (2018) article on sub-Saharan Africa examined how the significant heterogeneity of sub-Saharan African educational expansion is linked to the differences in the timing of marriage between women with different educational levels. Uchikoshi's paper (2018) investigated the effects of educational assortative mating on having first and second childbirth in Japan. He claims a heterogeneity of highly educated women according to their labor force participation depending on whether their spouse is also highly educated or not and the heterogeneity of women's education could be identified through focusing on their partner's status.

Fertility and employment of women relationship is another topic of interest for heterogeneous effects. Cáceres-Delpiano's study (2012), using DHS data for 40 developing countries, showed that size of the family has a negative impact on female employment and the effect of an unexpected change in fertility is stronger for women with higher education and women residing in urban areas. Another study in Germany (Haan and Wrohclich, 2011) developed a structural model of female employment and fertility and their hypothetical policy reform showed that an increase of child care promotion leads positive employment and fertility on highly educated women and women who will give birth for the first time.

For OECD countries, Engelhardt and Prskawetz (2004) built homogeneous groups with respect to the development of their female labor participation rates (low, medium, high) and investigated the fertility changes through these groups. A study on Turkey by Abbasoğlu-Özgören et al. (2018) analyzed the two-way relationship between employment and fertility in Turkey and found that women's employment is negatively associated with the size of the family, with women who are not employed having a higher risk of a first birth than women who are employed. Their results suggest a shift from insignificant to being strongly negative in fertility–employment relationship and show that fertility reduces the risk of unemployment among inactive women.

3.2. Diffusion Theory and Diffusion/Change of Fertility Behavior

When demographers tried to make sense of the declines in fertility levels seen all over the world, the developmental perspective came to the fore with structural and economic improvements due to the weight of the demographic transition theory in the field. However, with the results of the European Fertility Study, it has been accepted that theories based on individual decision making in response to structural change have not fully explained the fertility transition observed in many regions of the world and diffusion theory has become more attractive for demographers to explain fertility declines. (Reed, 1999). As theorized by Rogers in 1962, the "diffusion process" refers to innovations spread from one group or individual to another through different communication networks among members of a social system (Rogers, 1983). Based on the definition, it is possible to interpret the diffusion process by its four components; innovation, communication, time, and social system. Innovation can be a new technology, device, or a toll as well as a new idea. If a certain idea is new to the individual or to the population, it can be taken as an innovation.

The characteristics of the innovation as categorized by Rogers (1983) can be useful to understand the diffusion of the new idea or tool. According to this categorization, a successful innovation, which is not complex, can be tested and observable, should have a relative advantage over current behaviors, but must be compatible with other existing values. The collective mutual understanding slowly changes the structure of the society with relation to the adopted idea. This social change often takes time to complete, depending on what is diffused. At early stages, interpersonal communication among select individuals that are early adopters of new behavior are the pioneers (Rogers, 1983). Later, according to the success of diffusion, wider sections of the society adopt the behavior. In sum, the diffusion can be treated as a social change where adjustments occur in the structure and function of the social system (Rogers 1983).

In order for a person or group to meet an innovation, the precondition is that they must have access to another group or idea. Thus, the adaptation of the new idea or tool happens through processes of communication. Rogers (1983) defines the communication in diffusion is the process of creating and sharing information with others to achieve mutual understanding. The information creating and sharing that takes place during diffusion is generally examined under two headings as mass media channels and interpersonal channels (Valente and Rogers, 1995). Although the mass media occupies a large place in terms of communication and increased its presence in everyday life through time, the impact of subjective ideas and interpersonal networks in forming people's behavior cannot be denied. Despite the developing technology, the place social media occupies in daily life and the ease of access to global information, it is possible to say that interpersonal communication is still more organic. On the other hand, behavioral innovations do not happen randomly but instead spread among groups with established social networks and kinships (Casterline 2001, Vitali, Aassve and Lappegård 2015). As expected, these networks are stronger among individuals with similar characteristics.

When we highlight the importance of interpersonal communication while tracing the diffusion of information or a demographic behavior, it is necessary to examine which actors make this communication easier. In this case, we come across the term homophily. Homophily in the diffusion process can be defined as people favoring others who share similar characteristics when establishing social relationships. These similarities can often be identified through their demographic profile and social status properties. Communication is assumed to be stronger between individuals who share similar values, cultures and social status because people who are closer in any given social system are more likely to interact with each other and this communication in turn provides a favorable environment for the spread of ideas (Centola 2015). Therefore, particular emphasis is placed on the effect of homophily on the diffusion process, especially among similar individuals (Rogers 1983; Blau and Schwartz 1984; Centola 2015).

No matter how much homophily facilitates communication, a certain degree of heterogeneity is needed for ideas to spread. In a heterogeneous population, interactions of new ideas, behaviors and beliefs can occur more frequently. Granovetter's (1973) notion of "the strength of weak ties" suggests that individuals learn new attitudes and behaviors when they are involved in heterogeneous networks with weak ties to others, as opposed to homogeneous networks of similar people (Bras 2014). Madhavan et. al (2003) assert that social learning most likely happens in heterogeneous networks, where ideas and behaviors about fertility may differ from those to which women are routinely exposed. New ideas and behaviors are often adopted earlier or more quickly among higher-status groups. The heterophile links become critical for diffusion since they can provide a route for information to travel from higher-status groups to lower-status groups (Montgomery and Casterline 1993). Ideally, for an idea to diffuse quickly and effectively, a spark of heterophile connections is needed initially. But later, the new idea quickly spreads in the social groups through homophilic connections. Therefore, it is useful to consider these heterophile and homophile networks when following the diffusion of a behavior or idea.

Hints of the importance of the diffusion perspective in fertility studies appear even in the very early literature. Carlsson (1966) stated that the diffusion pattern, with its putative delays and gradients, is at the center of the literature on fertility and its variations. Diffusion theory has intrigued demographers as the evidence abounds that theories on individual decisions over economic changes cannot explain the fertility transitions observed in the various regions completely (Reed et al. 1999). Indeed, Pollak and Watkins (1993) noted that with standard economic models it would be difficult to understand the diffusion of the thinkability of fertility control as Coale (1973) called it. Cleland and Wilson (1987) also presented the importance of ideational change over the structural change in the decline in fertility since the fact that culture and education, which is likely to determine the acceptability of new ideas, are stronger than the links between fertility and economic structure.

Through the decades of fertility study, various attempts have been made to combine economic and sociological approaches. As Cleland and Wilson (1987) stated, the most well-known approach is Caldwell's intergenerational flow of wealth theory, which combines the economic demand for children through cultural transmission of ideas and values, which weakens this demand. In addition, they also pointed that third world studies show that parents have great aspirations for their children which can spread rapidly in a society and provide a strong reason for family size reduction, consistent with Caldwell's theory (Cleland and Wilson 1987). However, the Princeton European Fertility Project found that the fertility declines of the 19th century resulted from the diffusion of new attitudes such as value of children and behaviors such as availability of birth control across Europe where similar cultural characteristics are shared (Bongaarts and Watkins 1996; Vitali et al. 2015; Coale 2017). According to the findings of the study, socioeconomic conditions are weak in predicting fertility declines. Furthermore, the study showed that transitions begin at a wide range of development levels, when the fertility levels in a region begins to decline, neighboring regions with the same language or culture, even if they are less developed, followed it after short delays (Bongaarts and Watkins 1996). Indeed, as Watkins (1986) stated, the decline in fertility in Europe was mainly due to changes in marital fertility, not marriage, and continued to decline without stalling until very low levels. Knodel and van de Walle (1979) also stated that there was an important innovation-diffuse dimension in the reproductive revolution that radically changed Europe's population structure.

In order to interpret fertility in terms of diffusion, it may be necessary to define the diffusion of fertility. Karen Mason and Steven Sinding (Reed et al. 1999) defined diffusion of fertility change as follows:

> “the spread or adoption of new information, ideas, beliefs, or social norms capable of influencing reproduction decisions and behavior that occurs through social interaction and influence, either at the interpersonal level or through impersonal channels such as the mass media.”

Although both diffusion theory and this definition emphasize newness in the diffusion of an idea, it may also be sufficient for the idea to be relatively new. As Carlsson (1996) states, the change in the proportion of parents controlling their fertility can be seen not as the diffusion of a new invention, but rather as a shift in the balance between old and new ideals and the consequent shift in the fertility outcome. Therefore, there may not necessarily be a need to look for a new idea or tool in the diffusion of fertility. The fact that relatively new ideas find more supporters in the society can also be considered as the spread of new fertility ideals. Later, when this balance is sufficiently disturbed by understanding the controllability of reproduction, it can lead to a decrease in the overall fertility level. Therefore, the increase in fertility limitation and the continued decline in fertility are revealing the process of diffusion (Knodel, and van de Walle 1979).

When thinking about the diffusion of fertility, it is also necessary to think about the underlying idea, behavior or tool that is diffusing. Pollak and Watkins (1993) talks about two different diffusion approach in the context of the fertility transition. The first one is the diffusion of information about fertility regulation and the second one is the diffusion of preferences regarding accepted family size and fertility regulation. In the first group, it is possible to examine fertility policies and contraceptive methods that regulate fertility by analyzing the use of contraceptive methods or the interventions that support or prevent fertility. In the second group, the change in the preferences of individuals to reduce or increase fertility can be examined within the framework of the characteristics of individuals. As Watkins (1986) pointed out, the spread of termination of childbearing in marriage where not all of the couple's reproductive years utilized, played a very important role in the decline of fertility in Europe. Pollak and Watkins (1993) noted that this could be labeled as an innovation, as the introduction of fertility control within marriage by stopping childbearing seems not to be gradual but abrupt. Afterwards, as Watkins (1986) stated, in addition to the spread of stopping behavior, spacing behavior also gained importance in the change of fertility.

Although diffusion of tools and preferences seem to be separate, it has been observed that these two conditions almost always act together in the decline of fertility.

The diffusion of knowledge towards contraception and the contraceptive techniques and practices themselves can initiate or accelerate the fertility decline (Knodel, and van de Walle 1979). Therefore, although there is criticism that it is only an accelerating catalyst for diffusion, Bongaarts and Watkins (1996) advocate addressing the diffusion of fertility not by the diffusion of contraception, or even by the diffusion of ideas about these techniques, but by expanding it to more general ideational change. Furthermore, diffusion of fertility ideas is more than a yes-or-no process as it can lead to the emergence of a new behavioral trajectories and because the interpretation or the behavior associated with a new idea is different, it can change what is being diffused (Bernardi 2003). For example, the preference for smaller families with the effect of social interaction mechanisms has been used to examine the starting time and pace of the demographic transition (Watkins 1986, Cleland and Wilson 1987, Bernardi 2003). Therefore, it is necessary to consider social interaction when examining diffusion of fertility behavior which sometimes regarded as a neglected process (Bongaarts and Watkins 1996, Casterline 2001).

Cleland (2001) states that there is strong indirect evidence that changes in reproductive behavior are a social transformation that is greatly influenced by perceptions of how others behave. This perception is directly related to culture. For example, when we look at the decline in fertility in Europe, it can be seen that the cultural effect is more prominent than the socioeconomic effect. It is even stated that the timing of transitions is influenced by cultural borders and is linked to indicators of social development such as literacy rather than economic indicators (Cleland and Wilson 1987). Regions with similar socioeconomic conditions but different cultures enter the transition period at different times, while regions with different socioeconomic levels but with similar cultures enter the transition period at similar times (Knodel, and van de Walle 1979). More broadly, the transition occurring at about the same time in overseas English-speaking western culture suggests that some diffusion of knowledge about contraception has taken place within the Western cultural sphere, alongside some communication of normative beliefs (Knodel, and van de Walle 1979). These findings show that common life styles are effective in the spread of new fertility behaviors. For example, provinces or regions typically share similar cultural characteristics, such as a common language or common traditions. This means that social interaction is more effective in these smaller groups. However, the importance of physical proximity vanishes in regions where two different cultures meet (Knodel, and van de Walle 1979). Therefore, some behaviors cannot diffuse despite the physical proximity of populations.

It becomes important in which situations or in which compositions the behavioral and ideational changes in fertility diffuse more easily. As Casterline (2001) points out, social interaction, unlike the focus of what is diffused by ideational or behavioral point of view, is more concerned with how diffusion occurs in population. This leads us to examine the diffusion over the homogeneity of the population. For example, Cleland and Wilson (1987) note that in the culturally homogeneous population, contraception and the resulting decrease in marital fertility spread over the entire population in relatively short time. According to them, this implies that change mainly operates at the societal level. Therefore, facilitating diffusion of homogeneous structure also means faster spread of ideas and behaviors that change fertility. Indeed, Strang and Meyer (1993) argue that the fact that the individuals are in the common social category means that the diffusion must be rapid, and they add that the rapid diffusions within the world is related to the homogeneous cultural structures of contemporary nation-states. On the other hand, a more heterogeneous population structure may also be associated with greater diffusion of knowledge, as Granovetter (1973) has shown. As discussed above, the probabilistic increase in interaction with people with different fertility behaviors may affect people's ideas about fertility. As Bott (1971) has shown, in a heterogeneous community there may be more options for innovative behavior within the family.

The social interaction argument also gains importance as interpersonal interactions begin to change more rapidly, especially when the population is mobile. Movements within the population may lead to the deterioration of homogeneous populations, as well as triggering more intense interaction between people. However, Carlsson (1966), when examining fertility changes, showed that metropolitans and urban regions are advantageous only in terms of the rate of spread, although it is accepted that diffusion emerged especially under the leadership of the middle class in metropolitan areas and then spread to more rural areas. However, Livi-Bacci (1986) mentioned that the urban population begins the demographic transition earlier, and Sharlin (1986) also mentions that the fertility decline in the urban population starts earlier if there is a temporal difference. It is also possible to examine these differences on a regional basis. For example, Watkins (1986) mentioned that populations that are culturally and spatially close to each other also act together in demographic changes, fertility within regions was relatively homogeneous and that variations are generally observed between different regions. However, what is emphasized here is that populations' similar fertility behavior depends not only on spatial proximity, but also on the cultural and social proximity that this spatial proximity creates.

When evaluated in terms of diffusion, as a result of these population movements, and even in the digital age without the need for physical population movements, especially dissimilar people start to communicate more, which can cause attitudes and ideas about fertility behavior to become widespread. It is possible to encounter population movements that lead to these interactions, especially in regions where migration is intense. Rural to urban migrations, which increases the interaction of rural and urban populations with different lifestyles and socio-cultural backgrounds, has a great impact on the spread of ideas and behaviors. For example, Watkins (1986) mentions that the similarities in the timing of transformation in rural and urban areas may be the consequence of the spread of ideas or birth control techniques and while socioeconomic conditions in rural areas have not yet changed in the ways predicted by the theory of demographic transition, rural residents who visited the city may have transported back adopted new ideas or techniques. Watkins (1986) also emphasizes that the impact of modernization should not be limited to urban and educated individuals. It emphasizes that education facilitates the diffusion of new attitudes and techniques even to the less educated population. He argues that the sectoral growth in industry and service in an urban area does not only affect the workers in this sector, but also those who work in traditional occupations.

In this context, it is possible to interpret the fertility change in Turkey with the diffusion process. Rapidly increasing urbanization and women's participation in education, especially in the period of fertility decline, show that the relationship between these two developments is worth examining. When these two social developments are inspected in terms of diffusion, developments that increase interpersonal communication and enable the interaction of different people to come to the fore. With the rapid migration from rural to urban areas in Turkey, populations who grew up in rural areas started to live in the cities and met the values of the urban population. It cannot be thought that intellectual exchange, which can be observed in all kinds of social interactions, does not affect fertility. This interaction was even more decisive in the sense of fertility for the urban populations who have completed the fertility transition to a large extent and the rural population with relatively higher fertility behaviors.

When the increase in women's participation in education, which has a remarkable place in fertility behavior, is added to the migration from rural to urban areas, the possibilities of interactions that may lead to intellectual changes have increased. Although the interaction of immigrants with the urban population may be limited during periods of intense migration from rural to urban areas, participation in education has become a means of communication for rural and urban populations. For this reason, it is not possible for people with different behavioral backgrounds to remain unaffected by each other despite these increased ways of communication, especially for fertility behaviors. Although the prevalence of contraceptive methods and the effect of antinatalist policies were in question in this period, the response to these developments in the public base is only related to an intellectual transformation, or in other words, mental readiness.

CHAPTER 4. DATA & METHODOLOGY

4.1. Data Source

The data source of this dissertation is the Turkey Demographic and Health Surveys (TDHS), which are part of the global Demographic and Health Survey (DHS) series. Turkey Demographic and Health Surveys are household-based nationally representative sample surveys designed to provide information on fertility, infant and child mortality, maternal and child health, family planning, and nutrition. The surveys are carried out by the Hacettepe University Institute of Population Studies (HUIPS) in collaboration with various national and international institutions. The results of the surveys are presented for urban and rural regions and five regions of Turkey for most of the survey topics as well at the national level in all six surveys. Starting from 2003 TDHS, the results are presented for the 12 geographical regions (NUTS1) for selected survey topics also. Women aged 15-49 years, who are usually living in the household or who were present in the household on the night before the interview, were eligible for the survey. Table 4.1 contains some basic information of the surveys and the dataset.

This study is based on six quinquennial TDHS datasets, 1993, 1998, 2003, 2008, 2013 and 2018. The similar methodology (weighted, multistage, stratified cluster samples) used in the design of the surveys and comparable structures of the data allowed interoperability. Since the surveys carried in 1993, 2003 and 2008 were conducted only on ever-married women, the datasets were rearranged accordingly; never-married women filtered out from datasets of 1998, 2013 and 2018 surveys. Therefore, ever-married women were used as the baseline dataset for all of the analyses. Since these survey data were analyzed separately, no data pooling method was applied. In addition, DHS datasets were not combined, as case weights calculated for different surveys may lead to misleading results. Especially since we used 40-49 age women and further clustered them in the analysis, the weighted calculations can be deceptive. Therefore, case weights for the corresponding observations used separately for each data set. However, after pooling DHS data, applying a correction factor considering sample sizes is also a preferred method in the literature (Koç and Eryurt, 2017). Since this study aims to analyze fertility histories through a trajectory, this method was not applied.

Table 4.1. Basic Information on Turkey Demographic and Health Surveys

Survey	Field Date	Questionnaire Types	HH Sample	Women Sample Size
1993 TDHS	August 1993 October 1993	* Household * Ever-married 15-49 Women	8619	6519
1998 TDHS	August 1998 November 1998	* Household * Ever-married 15-49 Women * Never-married 15-49 Women * Husband	8059	8576
2003 TDHS	November 2003 May 2004	* Household * Ever-married 15-49 Women	10836	8075
2008 TDHS	June 2008 December 2008	* Household * Ever-married 15-49 Women	10525	7405
2013 TDHS	September 2013 January 2014	* Household * 15-49 Women	11794	9746
2018 TDHS	October 2018 February 2019	* Household * 15-49 Women	13982	7345

For the analysis in this dissertation, the complete birth information of women and some selected variables from the women dataset are used. Complete birth information is collected directly from women with the Birth History Module. The Birth History Module is located under the ‘Reproduction’ section in 1993, 1998 and 2003 surveys and the ‘Pregnancy and Fertility’ section in 2008, 2013 and 2018 surveys. In the Birth History Module, women were asked about all live births, either alive at the time of the survey or previously deceased. The information about all live births of the woman was collected directly from the mother with the questions in this module. The date of birth of the child is one of the mandatory questions asked for all of the births. The completed age of the mother for each live birth is calculated from the information from this question.

The analysis carried on age group 40-49 bearing in mind that the cohorts of women in successive surveys will overlap partially. Table 4.2 shows the unweighted number of observations for women aged 40-49. The women dataset of the TDHS contains the complete birth histories of women aged 15-49. In order to properly analyze fertility trajectories of women cohorts, complete fertility histories are needed. Ideally, birth history of women at the end of their reproductive period who completed their fertility should be used to construct the trajectories. However, the TDHS data contain birth histories of women during the reproductive ages, which is until the age of 49. In addition, since the purpose of this thesis is to study similar patterns of fertility by clustering the fertility trajectories of women, a decent amount of observations was needed. Therefore, for the purpose of the dissertation, in order to analyze the almost complete fertility histories, the focus of the study was limited to women aged 40-49. Since the age-specific fertility rates of women 40-49 are low for Turkey (Table 4.2), the women aged 40-49 assumed to represent women who have completed their fertility. For this reason, in each dataset women aged 40-49 were selected and new sub datasets were formed by filtering out younger cohorts for each survey year.

Table 4.2. Number of Unweighted Observations of Ever-married Women and the Age Specific Fertility Rates in 40-44 and 45-49 Age Groups

Surveys	Cohorts	Age Groups			Age Specific Fertility Rates (per 1,000 women)	
		40-44	45-49	40-49	40-44	45-49
1993 TDHS	1944-1953	888	675	1563	12	0
1998 TDHS	1949-1958	874	698	1572	13	1
2003 TDHS	1954-1963	1297	1026	2323	12	2
2008 TDHS	1959-1968	1170	1038	2208	10	1
2013 TDHS	1964-1973	1240	1048	2288	7	2
2018 TDHS	1969-1978	1023	935	1958	10	1

The vast majority of births in Turkey take place within marriage. Children ever born is zero for all of the never married women in all TDHS datasets. Therefore, exclusion of never-married women is negligible from the fertility outcome point of view when analyzing trajectories. It can be safely assumed that fertility of the never-married women has near to no effect on the fertility behaviors. However, since women who have never been married can be assumed childless, the overall childless women may have been underestimated for all-women. All ever-married women (currently married, divorced, widowed or women not living with their spouse) were analyzed for their fertility structure with the sequence analysis. However, the remarried women were excluded from distance analysis and multinomial regression analysis since there was more than one group of variables related to the husbands and marriage characteristics. Table 4.3 shows the percent distribution of women with relation to their marital status.

Table 4.3. Marital Status of Women Aged 40-49

Survey Years	Cohorts	Never Married	Married Once				Married More Than Once	Total
			Currently Married	Widowed	Divorced	Not Living Together		
1993	1944-1953	1.6	86.3	5.6	1.6	0.5	4.5	100
1998	1949-1958	1.8	84.3	6.4	1.6	0.5	5.3	100
2003	1954-1963	2.3	87.0	4.3	1.5	0.7	4.2	100
2008	1959-1968	0.9	85.8	5	2.9	1.0	4.3	100
2013	1964-1973	2.5	85.7	3.5	3.7	1.0	3.6	100
2018	1969-1978	4.1	83.4	2.7	4.5	0.8	4.5	100

4.2. Variable Construction for Analysis

After the preparation of ever married women data, the datasets were prepared for sequence analysis with the construction of variables. The completed ages of mother at each of their child's birth was calculated through the age of mother and date of birth of their children for each observation. With the information on completed age of women at birth, children ever born states for the women ages between 12 and 40 can be formed. Sequence analysis didn't require any other variable construction from the datasets.

In the second part, the purpose of the distance analysis and the calculated heterogeneity index is to investigate the similarities in the background of women, of their husbands and of their marriages. In order to capture the change of the similarities in time and for the reproducibility of the heterogeneity index through 6 datasets, several background characteristic variables were selected to understand the similarities among women. Since the fertility literature of Turkey points out to the importance of regional, educational and cultural differentiation, in order to capture the pre-fertility features and control these in multinomial regression analysis, and on the axis of urbanization and increase in educational levels, the background characteristics of women consist of the place of residence where they spent their childhood, their educational status and their mother tongue (Table 4.4). This selection made possible to examine the urbanization and the increase in women's participation in education and the diffusion effects which is the focus of the study.

Information on both three variables (the place of residence where they spent their childhood, their educational status and their mother tongue) were collected directly from the respondents in surveys. Although it lags behind in fertility studies, the characteristics of men are also important for understanding actual fertility. Therefore, the same variables were utilized for the husbands also. Different than the variables of women, information on husbands were collected from the women. In addition to these, since it contains cultural codes and shed light on the cultural background of fertility, the marriage characteristics dimension was created from the variables of age at first marriage of women, kinship with her husband, arrangement of marriage and marriage ceremony. The categories of 10 variables in 3 dimensions were standardized among surveys, so that analyzes using different datasets were comparable.

The background characteristics used in this study to understand heterogeneity are the features that women and men acquire mainly in the pre-fertility period. Therefore, background characteristics are not only related to the heterogeneity of fertility trajectories, but also constitute the foundation of this heterogeneity. Even though other aspects such as religiosity and occupation of women contain valuable insights to the fertility, the available data are insufficient to provide these variables to make retrospective comparable analyses. The selected variables were used with binary categories in distance analysis to give equal weights to each variable in their dimension and so as to preserve the difference in the categories of the variable for all 6 cohorts in distance analysis.

Table 4.4. Variables and Categories Used in Distance Analysis

Variables	Categories for distance analysis
Background Characteristics of Women	
Mother tongue	1 Turkish
	0 Other
Education	1 Complete primary or higher
	0 No education or primary incomplete
Childhood Place of Residence	1 Urban
	0 Rural
Background Characteristics of Husbands	
Mother tongue	1 Turkish
	0 Other
Education	1 Complete secondary or higher
	0 Less than secondary
Childhood Place of Residence	1 Urban
	0 Rural
Background Characteristics of Marriages	
Women's age at first marriage	1 18 and above
	0 Before 18
Relationship to husband	1 No relation
	0 Relative
Marriage arrangement	1 Themselves
	0 Families/Escaped/Abducted/Other
Type of marriage ceremony	1 Only civil or civil first
	0 Only religious, religious first or no ceremony

Since binary categories were needed in order to calculate the distances of observations through variables, the categories of these variables were reduced to two. The mother tongue variable distinguishes between Turkish, Kurdish, and other languages in the data, and it is combined into two groups as Turkish and other, considering the percentage distribution. The variable showing the educational status of women was grouped to distinguish between educated and uneducated women roughly. Keeping in mind the birth dates of the analyzed cohorts, women who had no education or did not complete primary school were considered uneducated, and women who at least graduated primary school were considered educated. Finally, the childhood place of residence variable was recoded into two categories. In order to fully capture the urbanization effect, only province centers were recoded as urban settlements. District centers, subdistricts and villages are coded as rural settlements. Each of the six datasets has these three variables for women.

The same variables are used for husbands also. The mother tongue and childhood place of residence variable was recoded same as women. Information on mother tongue of the husbands was collected from the women respondents. Each of the six datasets has mother tongue of husband variable but 1993, 1998 and 2003 TDHS datasets didn't contain childhood place of residence variable for husbands. Since it will allow an approximate estimation, place of birth variable was used instead of childhood place of residence variable for 1998 and 2003 observations. The categories of the place of birth variable in 1998 and 2003 surveys were provinces. In order to approximate urban and rural settings, the threshold of population was used to assign urban or rural labels to provinces. Since the reason of analyzing childhood place of residence for husbands was interpreting their social interactions, number of people in the province is a relatively safe approximation. Therefore, provinces with 1,000,000 or more around the date of survey was labeled as urban. Since neither childhood place of residence nor place of birth variable was available for the husbands in 1993 TDHS dataset, the distance of husbands for 1993-TDHS was calculated using the remaining two variables. For the educational level of husband, the threshold was determined with the secondary school completion; husbands who completed secondary school or higher was grouped together. The information on the educational level of the husband was also collected from women.

The variables about the establishment of marriage is consistent through the survey years. Age at first marriage of women was recoded binary as below and above 18 to identify the early marriage. For the consanguinity, relationship of the women to their husband in their first marriages was recoded as a dichotomous variable; related to her husband or not. Created in binary form according to who decides on the marriage, themselves or other (which includes families or other forms of marriage arrangements such as abduction or escaping) the marriage arrangement was also recoded. For the marriage ceremony, having only civil marriage or having civil ceremony before the religious ceremony recoded together and other forms of marriage ceremony patterns, such as having only religious marriage, having religious ceremony before the civil ceremony and living together without the ceremony, recoded together. Except from the marriage ceremony variable, all 3 variables were available in each of the six datasets. The marriage ceremony variable is excluded from 1993 TDHS dataset because the related questions and the categories are not comparable the remaining datasets.

In the last part, the fertility trajectories of cohorts were further analyzed using multinomial logistic regression using the same variables for the distance and regression analysis but using more detailed categories when available (Table 4.5). Mother tongue variable have two categories in multinomial logistic regression; Turkish, and Other. The childhood place of residence has same categories; Urban and Rural. For educational level of women, more detailed variable, education in single years was preferred and used as a continuous variable in regression. Educational level of husbands was detailed in three categories; No education or primary education incomplete, Primary complete and Complete secondary or higher. Women’s age at first marriage (before 18 or 18 and above) and consanguinity categories (no relation or relative) remained same. In marriage arrangement variable, escaped, abducted and other categories are grouped together and separated from the family category. For the marriage ceremony, all of the categories remained separate.

Table 4.5. Variables and Categories Used in Multinomial Analysis

Variables	**Categories for Multinomial Analysis**
Background Characteristics of Women	
Mother tongue	Turkish
	Other
Education	Education in single years
Childhood Place of Residence	Urban
	Rural
Background Characteristics of Husbands	
Mother tongue	Turkish
	Other
Education	Complete secondary or higher
	Primary complete
	No education or primary education incomplete
Childhood Place of Residence	Urban
	Rural
Background Characteristics of Marriages	
Women's age at first marriage	18 and above
	Before 18
Relationship to husband	No relation
	Relative
Marriage arrangement	Themselves
	Families
	Escaped/Abducted/Other
Marriage ceremony	Only civil
	Both, civil first
	Both, religious first
	Only religious
	No ceremony

4.3. Methodology

In this dissertation, a series of analyzes were conducted to investigate the heterogeneous nature of fertility, to group women with similar fertility behaviors in terms of tempo and quantum, to understand the pre-fertility characteristics of these women, and finally to make sense of these grouped fertility behaviors with their pre-fertility characteristics. The analysis in this dissertation was carried out in three main steps. For the first part, the sequence analysis approach originally proposed by Abbott (1995) were used for ever-married women 40-49 separately in each dataset. Fertility trajectories were created to interpret the tempo and quantum effect of women's fertility behaviors together. Instead of the children ever born numbers summarizing only the completed fertility levels, or the total fertility rate, which represents the quantum part of fertility, fertility trajectories that consider together the timing and number of births of women from age 12 to age 40 are used. Later, women are clustered together according to their fertility trajectories. With this clustering, women with similar tempo and quantum characteristics were brought together.

It was necessary to measure the similarities between women in the same group to determine whether pre-fertile traits were similar or not according to grouped fertility trajectories, or in other words, in women with similar fertility behavior. Therefore, in the second part, the similarity of women in each cluster was measured to calculate the heterogeneity of background characteristics in the constructed clusters. In order to measure similarities, the heterogeneity scores $\phi(P)$ were calculated using Hamming distances between observations, for six clusters of six surveys, each cluster having three dimensions: the background characteristics of women, their husbands and their marriages.

While the grouping of women according to their fertility trajectories revealed the structure of fertility behavior, measuring the similarities of women according to pre-fertility characteristics shed light on the demographic differences of women with similar fertility behaviors. However, understanding whether these demographic differences lead to differences in fertility behavior and measuring the distribution of fertility behaviors by controlling for these demographic differences will help to understand the reasons for the heterogeneity in fertility. Therefore, in the last part, the fertility trajectories of cohorts were further analyzed using multinomial logistic regression using the same variables for the distance and regression analysis but using binary categories for the former and more detailed categories for the latter. In addition to the odds ratios, the predicted cluster membership probabilities of “ideal types”, where other independent variables were kept in their group means, are calculated with the help of two variables: women’s education and childhood place of residence.

Sequence analysis and the following clustering of the sequences are completed with the R (version 3.6.3) software environment for statistical computing. TraMineR (version 2.0-14) and WeightedCluster (version 1.4) packages available in R was employed to construct sequences and clusters in each dataset (Gabadinho et al. 2011). Distance measures are also calculated using R through functions written in accordance with the method specified in the methodology. Regression analyses were done in Stata 13 and marginal effects were calculated with SPost13 package in Stata (Long and Freese 2014).

4.3.1. Sequence Analysis

Sequence analysis in social sciences can be defined as a collection of techniques tailored to explain consecutive categorical states of individuals (Abbott 1995). Originally used for analyzing DNA and RNA sequences in biostatistics, sequence analysis in social sciences is used to analyzed series of social events. Especially in life course analysis where life determining events and their relation and order is a focus of interest, sequence analysis becomes a useful tool. Since the time, order and the magnitude of events is analyzed, the sequence analysis method can be used to describe the quantum and tempo of interrelated events and their sequencing (their order of happening) (Di Giulio et al. 2019). This strategy emphasizes the holistic nature of trajectories, and rather than handling the observations as a single point in time, treats every individual as a life-course trajectory. By focusing on the analysis of all trajectories rather than looking at individual events, sequence analysis also considers the interrelation between multiple events (Barban and Sironi 2019).

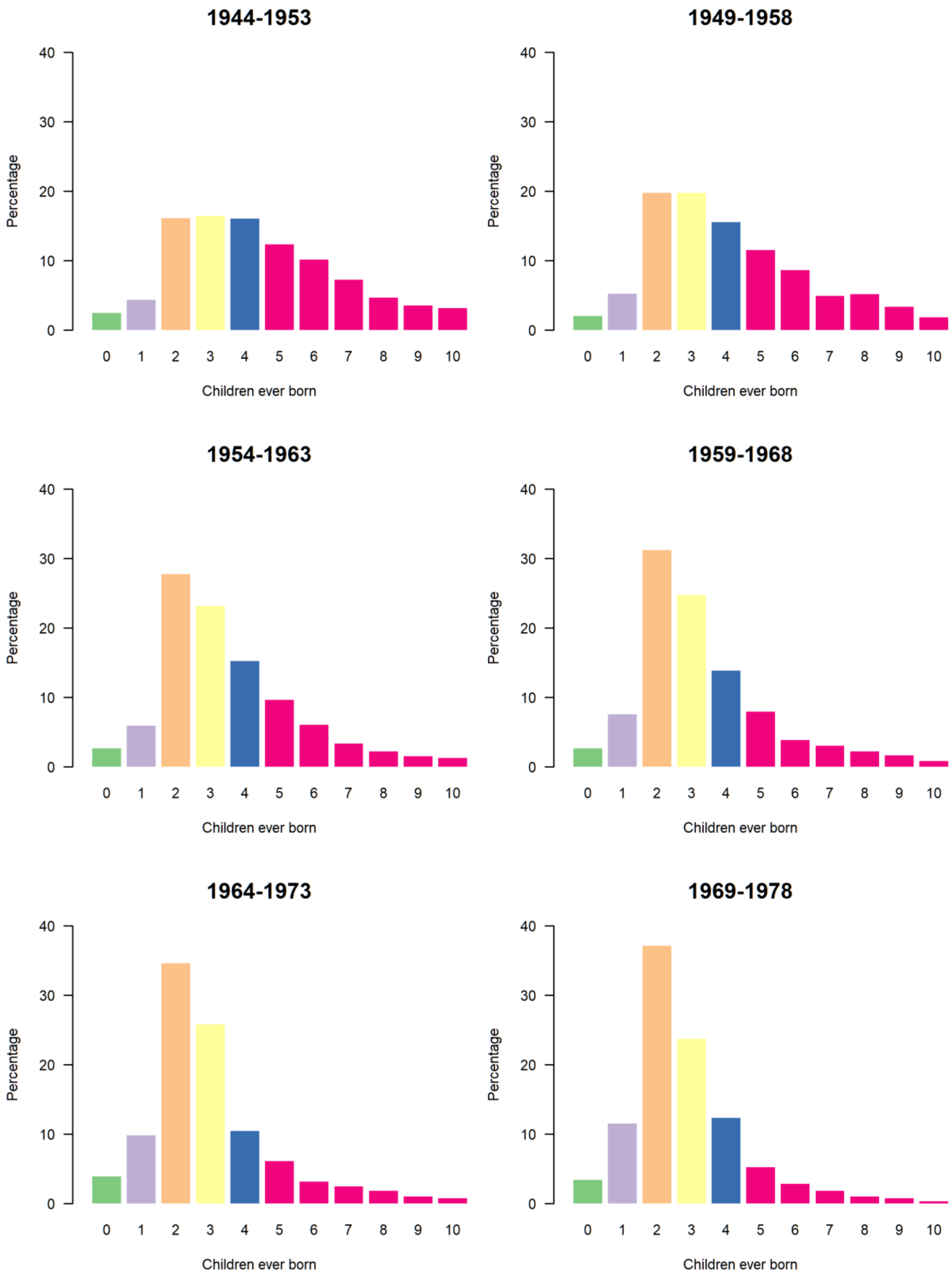
4.3.1.1. Creating Sequences

Since methods of sequence analysis concentrate on trajectories of states, the first step of the analysis is constructing the state-space. The state-space is defined as the finite set of all possible states an individual can take values on each discrete period. The state-space can also be named as the alphabet of the trajectories. For the sequence analysis used in this dissertation, the discrete period is defined as one completed age year of a women. After state-space is defined, trajectories can be represented as strings or sequences of the alphabet, where each character denotes one particular state. For each individual, a variable s_{it} indicates the state of the individual i at time t. Since s_{it} can take finite number of values from state-space defined, trajectory of an individual can be represented as categorical time-series.

In order to apply sequence analysis methods, first the state-space is constructed with fertility levels. Since the objective of sequences in this case is to purely represent the fertility experience of women, the state-space is formed from the number of children ever born. Starting with zero children in the beginning of the reproductive ages, it is possible to track the fertility of women through the number of children as their ages increase. For example, a woman with two children at the end of her reproductive ages, can spend some of the time with zero child, some with one child and the remaining time with two children. In that case, this sequence will need three states; zero, one and two. In order to specify the highest birth state, children ever born to 40-49 women should be investigated. Figure 4.1 shows the percentage distribution of number of children ever born for the ever-married women aged 40-49 in six datasets.

The distribution of the children ever born shows that especially starting with 1954 cohorts, the percentage of women aged 40-49 with five and more children ever born has sharply decreased. In addition, since the mean number of children ever born to women aged 40-49 in the cohort with the highest fertility was 4.8 (HUIPS 2019), the cut-off level for the highest children ever born was decided as five. Therefore, the alphabet constructed for the sequence analysis contained six mutually exclusive states according to children ever born, namely; “no birth”, “one birth”, “two births”, “three births”, “four births” and “five or more births”. In the first attempt, all ever-married women were included in the analysis. However, the clustering analysis was influenced from the observations of childless women. The primary focus of the sequence analysis in this case was investigating tempo and quantum of fertility. Therefore, the childless ever-married women until the age of 40 was excluded from the sequence and clustering analysis.

Figure 4.1. Children Ever Born Levels of 40-49 Women by Birth Cohorts



After separating the childless 40-49 ever-married women from the data, the age at nth birth of woman was calculated for every birth and a set of 29 variables namely "age_x" where x is between 12 and 40 were constructed. For every age in scope, the children ever born of the woman at that age was checked and the corresponding state was assigned. In the end, in each dataset, 21 new variables denoting the children ever born states of the observations from age 12 to 40 was created. In other words, the childbearing trajectories of women are constructed as sequences of 29 states from ages 12 to 40, where each age between 12 and 40 represents children ever born related state. Women in each age can be represented with a state according to their number of children ever born in the corresponding age. After that, the TraMineR package available in R was employed to construct sequences in each dataset.

Sequence analysis did not require a regulation regarding missing values, as there was no missing value in the TDHS birth history data. All of the sequences of ever married women age 40-49 was complete. In addition, since six survey data was handled separately, no data pooling method was implemented. Therefore, case weights for the corresponding observations used separately in each data set for sequence analysis.

After state sequences are created for each dataset, the following descriptive visualizations are generated:

- Sequence frequencies: Using *seqtab()* function of TraMineR, weighted frequencies of each sequence are calculated. Using *seqfplot()* function, 10 most common sequences are visualized.
- Mean time spent in each state: Using *seqmeant()* function of TraMineR, mean time spent in each state was calculated. Using *seqmtplot()* function, mean time spent in each state is visualized.
- State distributions: Using *seqstatd()* function, 5x21 state distribution table is calculated. Using *seqdplot()* function, state distributions are visualized. Different from the full sequence plots, this doesn't show individual experiences, but summarize the overall state transitions.

- Modal state sequences: Using *seqmodst()* function, modal state sequences are calculated. Using *seqmsplot()* function, modal state sequences are visualized.
- Entropy of state distributions: The *seqstatd()* function also provides the Shannon entropy of the state distribution. The entropy is,

$$h(p_1, p_2, \dots, p_a) = -\sum_{i=1}^{a} p_i \log(p_i)$$

where p_i denote the proportion of cases in state i and a is the length of the alphabet. The entropy value can be considered as the diversity of the states for each time point. The entropy index takes a value between 0 and 1. If all observations are in the same state, the index takes the value of 0, if the same proportion of cases are observed in each state, the index takes the value of 1.

4.3.1.2. Sequence Dissimilarities

After creating sequences, in order to measure the dissimilarities between sequences, the distances between these sequences needed to be calculated. The calculation of distances and choosing the right method is critical since the clustering process will use the pairwise dissimilarities. There are several ways to measure dissimilarity between sequences. The simple Hamming distance (Hamming, 1950), the longest common prefix, suffix or subsequence are methods based on the count of common states between pair of sequences. On the other hand, distances calculated based on editing such as generalized Hamming distance, dynamic Hamming distance or Optimal Matching (OM) distance based their calculation on the minimal editing costs needed to transform one sequence to the other. The OM distance, promoted in the social sciences by Abbott (Abbott and Forrest 1986), is widely used in social sciences. Therefore, OM was selected as a method for the dissimilarity calculation.

The OM algorithm measures the distance between two sequences in terms of the minimal count of edit operations required such that, after editing, the two sequences become identical (Barban and Sironi, 2019). Three basic edit operations on sequences are used in this process; insertion (one state is inserted in a sequence), deletion (one state is deleted from the sequence) and substitution (one state is replaced with another state in a sequence). For every operation described above, a specific cost is assigned with a cost function. Then the total transformation cost of one sequence to another can be calculated by the sum of the basic operation costs. The distance between two sequences is defined as the minimum cost of transforming one sequence into the other one. This calculation, in summary gives us a number for each sequence pair according to their similarity (it is zero if both sequences are exactly same).

It is possible to specify insertion-deletion (indel) and substitution costs for the OM algorithm. There are several methods exist when selecting the substitution cost such as a constant value for all substitution, cost derived from the observed transition rates or Gower distance between states (Gabadinho et al. 2011). However, a common practice is to use constant indel costs and use substitution costs based on the data where costs are inversely proportional to transition rates (Piccarreta and Billari, 2007). The transition rate $p(s_j|s_i)$ is defined as the probability to change from state s_i to state s_j, which is calculated with,

$$p(s_j|s_i) = \frac{\sum_{t=1}^{L-1} n_{t,t+1}(s_i, s_j)}{\sum_{t=1}^{L-1} n_t(s_i)}$$

where $n_t(s_i)$ is the number of sequences that do not end in t with state s_i at position t and $n_{t,t+1}(s_i, s_j)$ is the number of sequences with state s_i at position t and state s_j at position $t + 1$ (Gabadinho et al. 2011). Then, the substitution cost $SC(s_i, s_j)$ is calculated as,

$$SC(s_i, s_j) = cval - p(s_i|s_j) - p(s_j|s_i)$$

where $cval$ is the constant value and $p(s_i|s_j)$ and $p(s_j|s_i)$ are the transition rates respectively. For the analysis, the optimal matching (OM) algorithm with insertion/deletion cost as 1, and the transition rates between states observed in the sequence data as substitution costs (with default $cval$ value 2) are used to calculate distances between sequences and form the dissimilarity matrix for each dataset.

4.3.1.3. Cluster Analysis on Sequences

When distance of each sequence to the remaining sequences is calculated, the result is an NxN dissimilarity matrix with 0 as diagonal for the total of N sequences. The next step is using cluster analysis on sequences with the help of this dissimilarity matrix. Cluster analysis is an unsupervised method in which we place observations (fertility trajectories or sequences in our case) in groups (or clusters) that are relatively different from each other. The main reason for the use of cluster analysis is to reduce the total heterogeneity of the observations by creating more homogeneous groups. Doing so, each observation (i.e. individual birth history experience) is assigned to a "typology" based on its distance to all the other fertility trajectories. When grouping observations in a dataset, the goal is to divide them into different groups such that the observations within each group are relatively similar to each other and the observations in different groups are relatively different from each other.

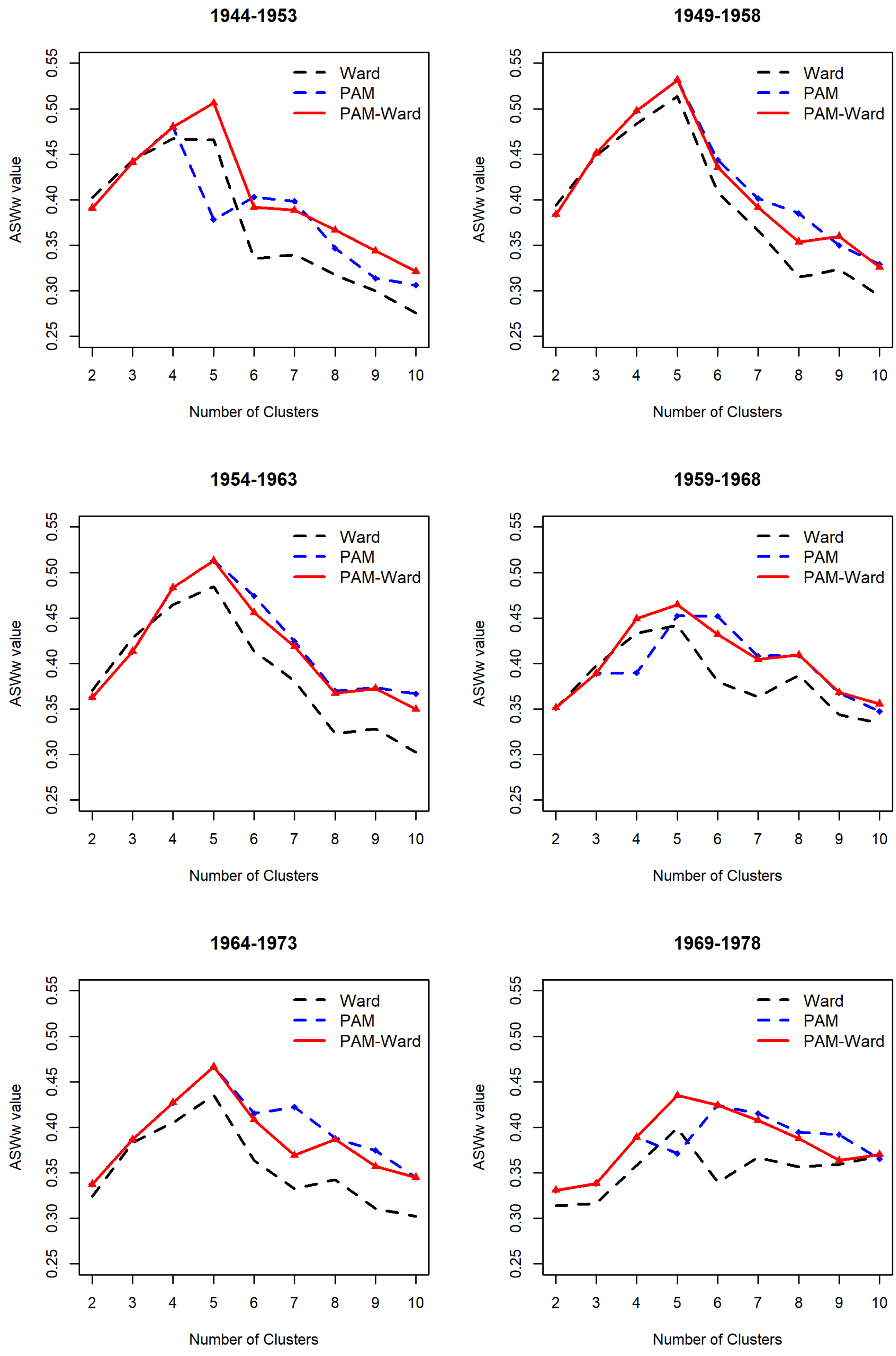
There are several cluster analysis methods based on different calculation methods of distances and clusters in the social science literature and they are commonly grouped by how the number of clusters is chosen. While partitioning methods rely on pre-defined cluster numbers, hierarchical methods and based on iterations of divisive or agglomerative approaches. There also exist several algorithms for both methods. Ward's method is a common choice in hierarchical clustering and k-means clustering is a widely used algorithm in partitioning methods. It is also possible to combine the partitioning and hierarchical algorithms and benefit from the advantages of them both. The results of hierarchical clustering (calculated with Ward algorithm) can be used as initial medoids in a PAM (partitioning around medoid) algorithm. In order to choose the method for clustering, using measures of quality of the partition is a common practice. Hubert's Gamma, Hubert's C, Average Silhouette Width, Calinski-Harabasz index and Pseudo R^2 are some of the measures of the quality of a partition (Hennig and Liao 2010, Studer 2013). In the clustering process of TDHS data, weighted Average Silhouette Width (ASWw) measure proposed by Kaufman and Rousseeuw (1990) was used as a decisive measure.

The ASWw value is a measure of coherence of assignments. It is based on comparing an observation's average weighted distance from other members of its group with its average weighted distance from the nearest group in order to assess the coherence of the assignment of an observation to a certain group (Struder, 2013). Each observation yields a value, but the average silhouette receives greater focus. High coherence indicates high between-group distances and strong within-group homogeneity. For this reason, the fact that a woman is in a particular cluster according to her fertility trajectory indicates that her fertility is more similar to the fertility behavior of this cluster than the others.

Two women falling into the same cluster regardless of their last parity results from having similar fertility behaviors for ages 12-40 in terms of tempo and quantum. In other words, clustering by fertility trajectories allows us to consider the amount of the reproductive period spent at each parity. Although women in a certain final parity come to the fore in the resulting clusters, women in different final parities can coexist in the same clusters. Therefore, we interpreted clusters considering similar fertility behaviors rather than same final parities. While it seems to contradict orthodox categorization practices, this illustrates the importance of considering the timing of fertility.

Ward algorithm, PAM algorithm and their combination was applied for cluster analysis and ASWw was used for the method decision. Figure 4.2 shows the weighted average silhouette width of Ward algorithm, PAM algorithm and PAM-Ward combination. According to the results of partition qualities, PAM-Ward method was applied in the clustering process and the optimal number of clusters were selected for each dataset. The clustering analysis resulted in five clusters in each data set and after combining the previously separated childless women, there were six clusters in total.

Figure 4.2. Weighted Average Silhouette Width Values of Ward, PAM and PAM-Ward Methods



After the application of cluster analysis on the datasets, in the last part, the representative sequence plots of the clusters were generated. These figures show representative sequences as horizontal bars with their width proportional to the number of sequences assigned to them and descending by their representative scores from bottom-up. The representative set plots are generated with default values with the neighborhood radius of 10% (pradius value), and at least 25% coverage of the sequences in cluster (Gabadinho et al., 2011). The neighborhood radius is set as the percentage of the D_{max}, the maximal theoretical distance of two sequences. Therefore, representative set doesn't contain sequences that the distance is smaller than this threshold value.

The coverage of a representative sequence is the percentage of adjacent sequences. In other words, it is calculated by the number of sequences whose distance to the representative is less than a selected threshold divided by the total number of sequences. Therefore, the coverage of the representative set in total corresponds to the percentage of original sequences with a representative in their neighborhood (Gabadinho et al., 2011). Two parallel series of symbols associated with each representative is displayed horizontally on a scale ranging from 0 to D_{max}. The symbol related with the representative r_i on axis A shows the variance (V_i) within the sequence subset assigned to r_i and on the axis B shows the mean distance MD_i to that representative (Gabadinho et al., 2011).

4.3.2. Distance Analysis

In the second part, the similarity of women in each cluster was measured to calculate the heterogeneity of background characteristics in the constructed clusters. In order to measure dissimilarities, we calculated the heterogeneity scores $\phi(P)$ using Hamming distances between observations, for six clusters of six surveys.

The Hamming distance $d_H(x_1, x_2)$ is defined as the number of variables at which the two observations x_1 and x_2 are different. The variables are recoded with binary categories and the Hamming distance between two observation according to these variables is hypothesized as the theoretical distance between women in that dimension. Since the Hamming distance between two observations can be measured, it is also possible to calculate the pairwise distance of a group of observations. The pairwise Hamming distance H between n observation would then be,

$$H = \sum_{k=1}^{k=n-1} \sum_{k'=k+1}^{k'=n} d_H(x_k, x_{k'})$$

The sum of all possible pairwise distances gives the pairwise distance of observations. When the pairwise distance is divided to number of distances, the average pairwise distance in a group of observation is calculated. The average pairwise distance is,

$$H_{avg} = \frac{2 * H}{n * (n-1)}$$

In order to calculate average Hamming distances, the algorithm introduced by Morrison (2004) were used. His algorithm first calculates the centroid (moment of inertia) of the observations. The i-th coordinate of the centroid of equally weighted points is,

$$c_i = \frac{\sum_{j=1}^{j=n} x_{ij}}{n}$$

where x_{ij} are the values of observations (in this case x_{25} indicates the 5^{th} observation in second variable). Then, total pairwise Hamming distance becomes the sum of the moments of inertia about their centroid (Morrison, 2004),

$$H = n * \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} (x_{ij} - c_i)^2$$

where m is the number of variables and n is the number of observations. However, this calculation of the distance does not take case weights into consideration. When the case weights are introduced to the above equations, the weighted total pairwise Hamming distance becomes,

$$H^w = \sum_{j=1}^{n} w_j * \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} w_j * (x_{ij} - c_i)^2$$

where w_j is the case weight of observation j. Since the weights are introduced, the weighted total pairwise Hamming distance can be divided by the sum of pairwise products of weights to calculate the average of the total distance. The average weighted pairwise Hamming distance becomes,

$$H_{avg}^w = \frac{H^w}{\sum_{i=1}^{i=n-1} \sum_{j=i+1}^{j=n} (w_i * w_j)}$$

H_{avg}^w takes values between 0 (minimum heterogeneity) and $\frac{m}{2}$ (maximum heterogeneity) where m is the number of variables and n is sufficiently large. For example, for the TDHS, if all observations have the same value at every background characteristic of women, which means the population is extremely homogenous, the indicator will take a value of 0. On the other hand, for a sufficiently large n, if the observations are distributed evenly to all possible categories, which means the population is at maximum heterogeneity, the indicator will take a value of 3/2 (since m=3 for the background of women). In order to normalize the indicator and generate heterogeneity scores ϕ,

$$\phi(P) = \left(\frac{H_{avg}^w(P)}{H_{max}(P)} \right) * 100$$

is used where H_{max} is the maximum heterogeneous distribution of the population P. For these scores, higher values indicate a more heterogeneous distribution of women. The relative heterogeneity scores were also calculated as $\Delta\phi_c = \phi_c(P) - \phi_t(P)$, the difference between the heterogeneity score of a cluster and the score of the whole cohort. Relative heterogeneity scores are used to understand the similarities of background characteristics of the clusters with the overall cohort. Positive values represent more a heterogeneous nature of the cluster related to the cohort overall and negative values show less heterogeneity. Distance measures are calculated with R, the functions for the calculations can be found at Appendix A.

4.3.3. Multivariate Analysis

In the last part, the clusters of fertility trajectories were further analyzed using multinomial logistic regression with the same variables as the distance analysis as independent variables with more detailed categories as mentioned in the data section. The two objectives of the multivariate analysis were determining the predictors of fertility clusters and calculating the probabilities of cluster membership. Considering the complex sample structure of TDHS, multinomial logistic regression analysis was carried on STATA where the survey design for the dataset was declared. Sampling units, clusters and weights were declared through the *svyset* command.

Utilizing the single categorical dependent variable, the cluster membership, as the outcome measure, the relationship of pre-fertility period characteristics with the cluster membership is analyzed. The cluster membership was treated as a categorical variable with 6 categories and the reference category was identified for each cohort as the *two children norm,* since the most recent cohorts have greater share in this specific cluster. For the first objective, significance of an independent variable's effect on a woman's belonging to a particular cluster was determined by the p-values, and the log-odds (logits) by transforming them to the relative risk ratios was used to understand how likely a woman is in a specific cluster compared to the *two children norm* cluster, for a unit change in the independent variable, controlling for the remaining variables.

However, the main interpretation of the multinomial logistic regression model will concentrate more on the marginal effects and the predicted probabilities than the odds ratios since the interpretations from the odd ratios contain less information about the intrinsic size of the change in the probabilities (Long and Freese 2014). Furthermore, predicted cluster membership probabilities of the fertility trajectories is better suited for the purpose of understanding fertility changes. For this purpose, for the second objective, the postestimation interpretation of regression models was carried on with the SPost13 package in Stata.

The marginal effect is defined as the probabilistic change that occurs by changing an independent variable when all other variables are held at a certain value. For the postestimation interpretation, marginal effects at the mean (MEM) values were calculated to investigate the effect of a change in independent variables, when all other variables are at their mean values. In other words, the marginal change in an independent variable was calculated for someone who is average on all remaining characteristics. Later, the predicted cluster membership probabilities of "ideal types", where other independent variables were kept in their group means, are calculated with the help of two variables: women's education and childhood place of residence.

Ideal type in postestimation analysis can be defined as the hypothetical observation of a subgroup of sample, where the subgroup is selected through the help of independent variables. Therefore, different than the marginal effects, where the hypothetical average fertility behavior of all women was interpreted to understand the effects of independent variables, average fertility behavior of four ideal types were analyzed. For this purpose, four probability distributions were calculated for four ideal types; average educated women who grew up in rural, average uneducated women who grew up in rural, average educated women who grew up in urban, and average uneducated women who grew up in urban. For each of the four type, the remaining independent variables are kept at their group means. With the ideal types, the changes of the predicted probabilities through cohorts can be observed. This not only helps to understand past experiences, but also contains clues about future changes.

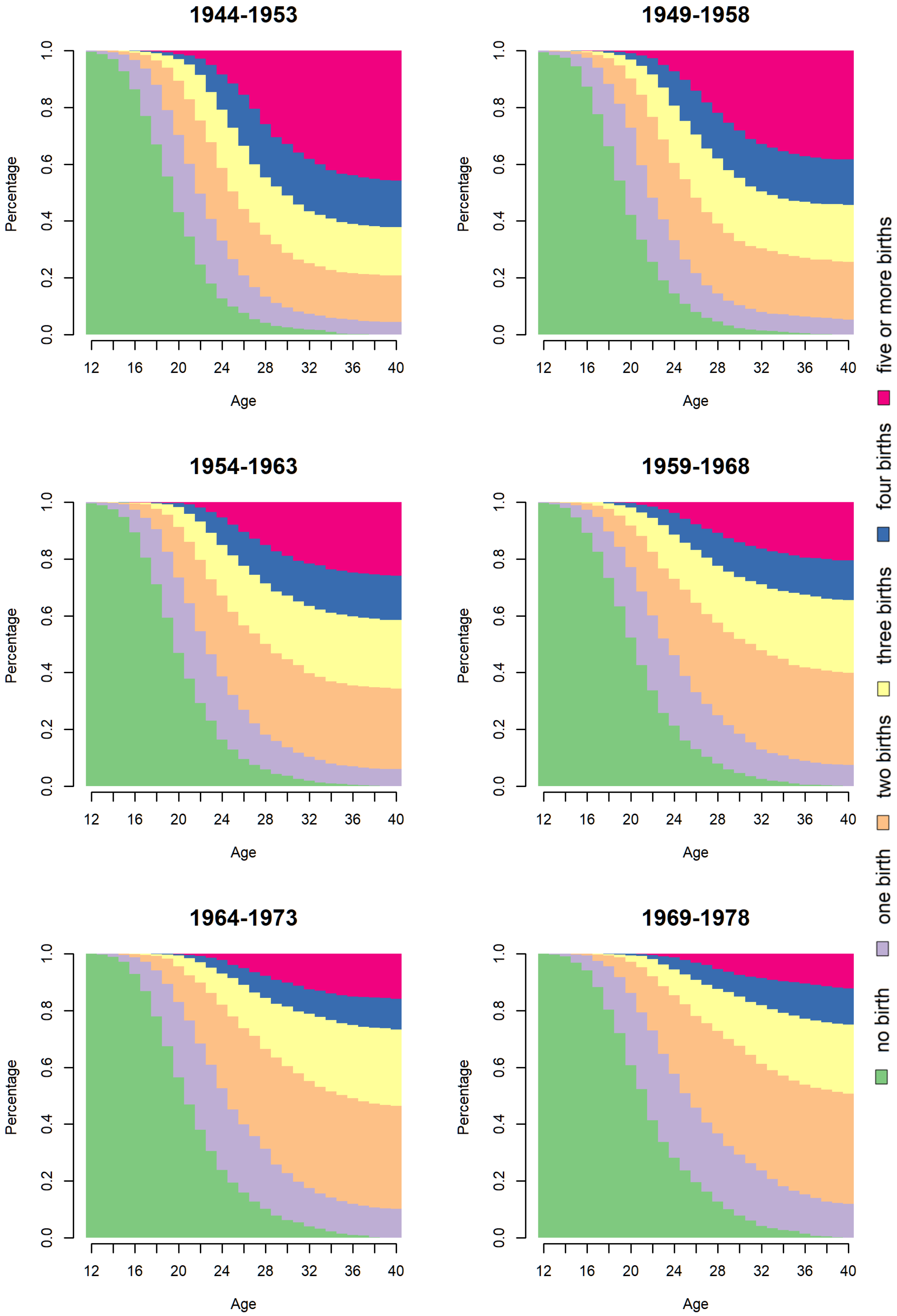
CHAPTER 5. RESULTS

This chapter introduces the results of the sequence analysis, cluster analysis, distance analysis and the multinomial logistic regression analysis. The subchapter 5.1 presents the sequence analysis and cluster analysis results where sequences of fertility trajectories are calculated to understand the fertility behavior and the clusters are formed to investigate the patterns. In the subchapter 5.2 distance analysis results are given with heterogeneity scores and relative heterogeneity where background characteristics of women, husbands and marriage are inspected for their similarities. In subchapter 5.3 descriptive statistics are presented for the created clusters in order to show the differences in percentage distributions. In the last part, results of the multinomial regression analysis with odds ratios and post estimation analysis are shared were the causal links between the fertility behavior and background characteristics are examined.

5.1. Fertility Behaviors of Cohorts

In order to understand fertility behaviors, fertility trajectories were created using women's birth histories. The fertility trajectories revealed the tempo and quantum effect on women's fertility structures. It also revealed how fertility behavior changed across cohorts. Then, these trajectories were clustered to reveal similar patterns of fertility behavior and the variation of these patterns. Homogeneous fertility patterns were determined through cluster analysis. Finally, analyzes were carried on the clusters with the help of representatives. Examining the representatives helped understanding the clusters in detail and to get an idea about the future heterogeneous structures with the possible transitions between the clusters.

Figure 5.1. Cumulative State Distribution by Cohorts



5.1.1. State Sequences of Fertility Trajectories

After state sequence calculations, as mentioned in the methodology chapter, visualizations of the sequences are used as descriptive guides. In this sub-section, some of these visualizations are presented in-text, and some visualizations are attached in the Appendix B for a compact presentation. Since the sequence analysis and the clustering steps were applied to women with at least one live birth, all the sequence analysis results in this sub-section excludes the childless women.

The first two sets of graphs (Appendix Figure B.1 and Appendix Figure B.2) show the calculated full sequence representations of the fertility experiences of women (full sequence index plots) and the 10 most frequent sequences for each cohort. While the first provides general information about the cohorts, the second shows the most common fertility behavior trajectories. Full sequence index plots show the sequence representation of each women in six consecutive cohorts[2]. Each state is represented with different color and every line represents a weighted observation.

Figure 5.1 display the cumulative state distribution, which is an aggregated summary of state transitions. These graphs show the state spaces (children ever born) of ever-married women aged 40-49 years who have had at least one birth between the ages 12 and 40. Cumulative state distribution graph reorders the full sequence index plots for a cleaner look and easy interpretation.

When the green areas in cumulative state distribution plots are compared between cohorts, it is evident that the number of years spent without children is increasing among frequent sequences of younger cohorts. Younger women cohorts show an increasing frequency of having only one child at the end of their reproductive ages. The results of the sequence analysis also revealed that the total time spent with 5 or more children decreased significantly in younger cohorts. In addition, the time

[2] The six consecutive cohorts are acquired from the six consecutive TDHS; 1944-1953 cohort from 1993 TDHS, 1949-1958 cohort from 1998 TDHS, 1954-1963 cohort from 2003 TDHS, 1959-1968 cohort from 2008 TDHS, 1964-1973 cohort from 2013 TDHS and 1969-1978 cohort from 2018 TDHS.

spent childless in the reproductive zone is extended and spacing has increased, especially between second and third births.

Figure 5.2 shows the mean time spent in each state. For each children-ever-born state, the bar graph shows the average year spent by the mother in that state between the ages 12 and 40. Compatible with the previous results, the mean time spent in lower parity states have increased and the mean time spent in higher parity levels have decreased. For example, while in 1944-1953 cohorts, women spent less than 9 years in childless state, for the youngest cohort 1969-1978, this number increased to nearly 11 years. Since these numbers are summable, adding the mean number of years spent in childless state to 12, the starting age of the sequence analysis, give us the mean age at first birth or ever married 40-49 women for the corresponding cohorts (excluding childless women). Similar calculations can be done for the following states.

Appendix Figure B.3 displays the sequence made of the most frequent state at each age. Similar to above results, these plots also support the changes of childbearing experience in cohorts. The last set of plots show the transversal entropies of states in each cohort (Figure 5.3.). These values show the total entropy of the cohorts before clustering. A lower entropy value means a homogeneity of states in the cohort. For example, values close to zero near the ages of 12 shows us nearly all women were childless at the beginning of their reproductive years, thus showing a very homogenous distribution of states. On the other hand, highest entropy values around their mid-20s, shows that children ever born states were distributed almost evenly among the women. Again, a decrease of the entropy values shows the final parity diversity among women. The results show that entropy continues to remain high in younger cohorts, which implies that women who have completed their fertility may have differing fertility behaviors.

Figure 5.2. Mean Time Spent in Each State by Cohorts

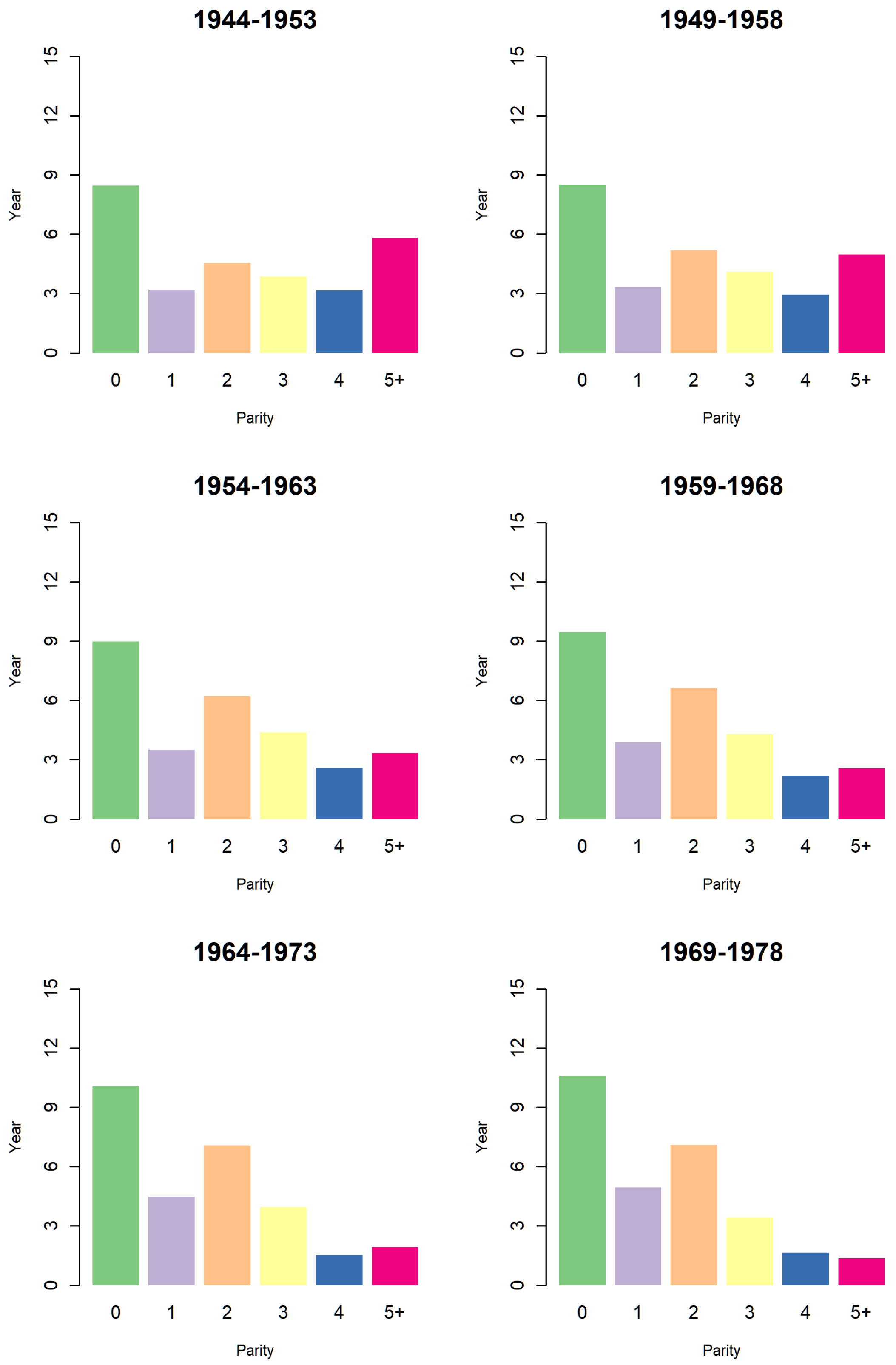
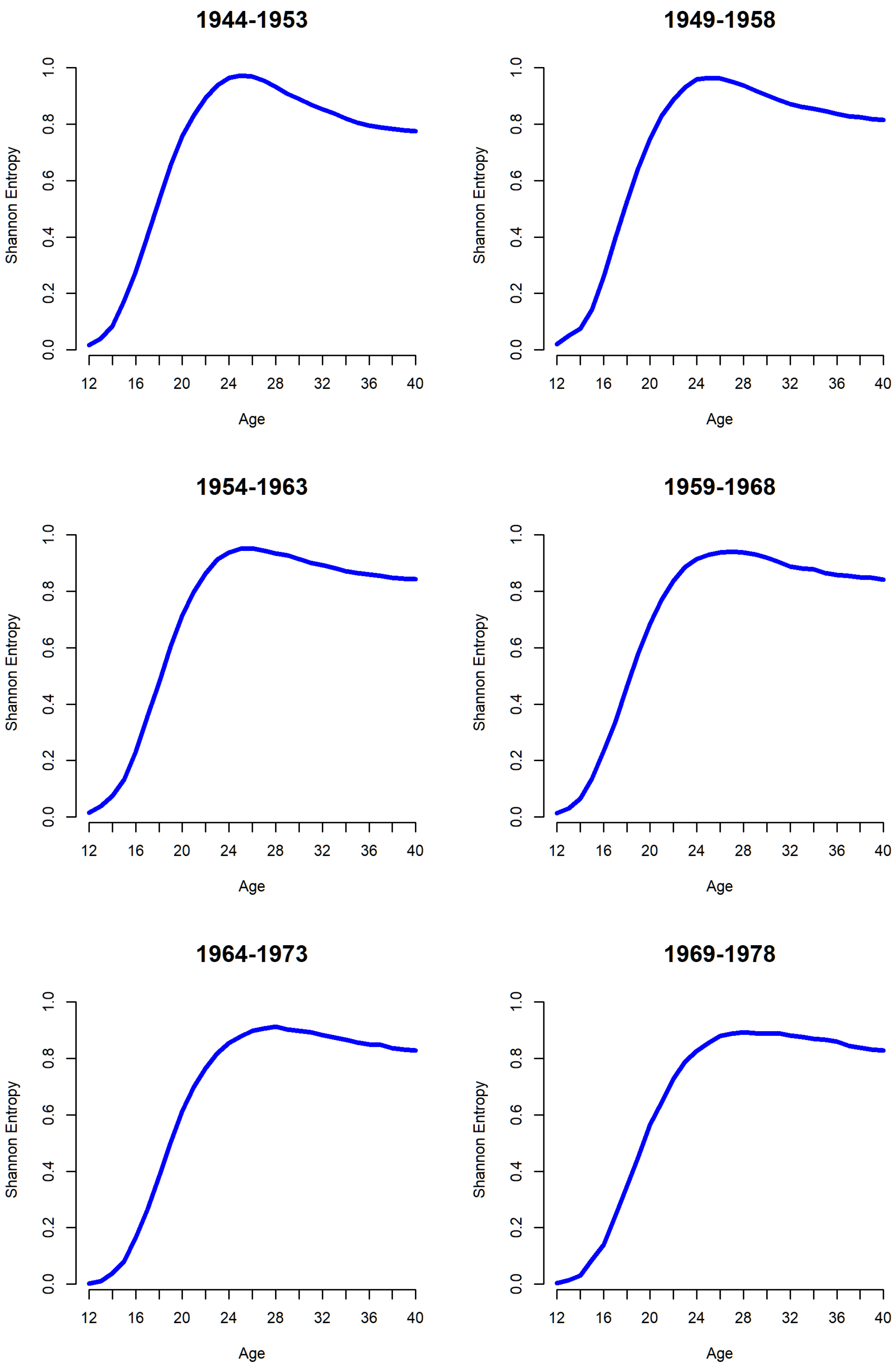


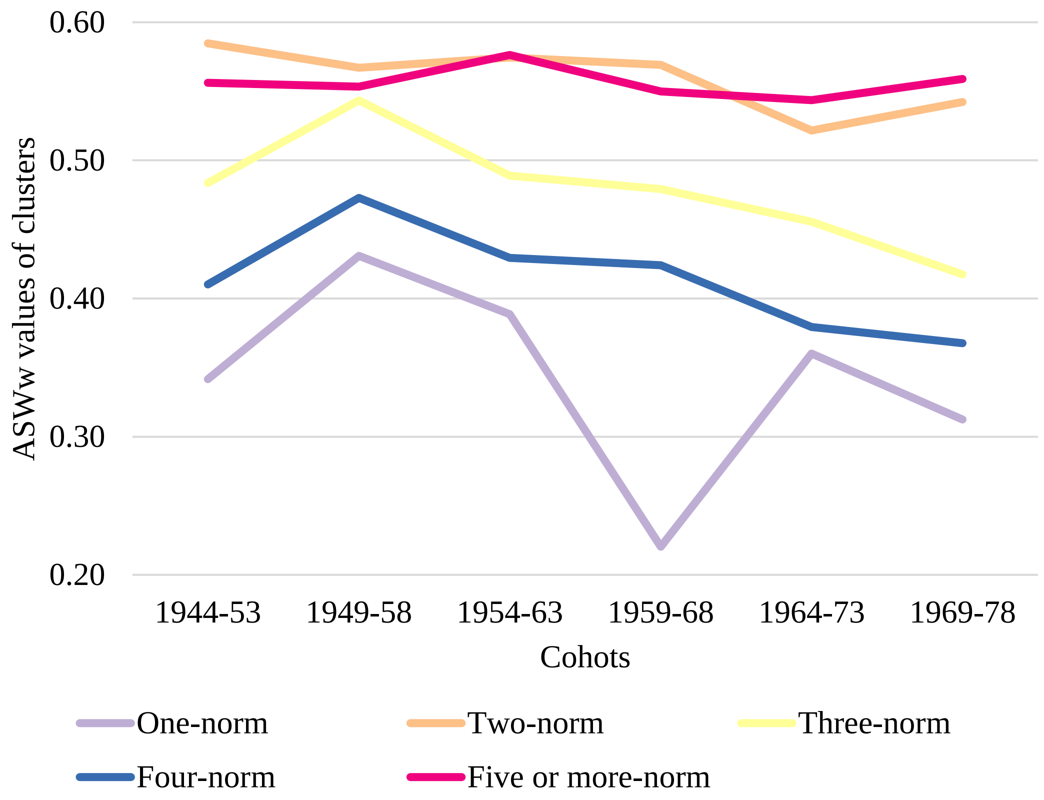
Figure 5.3. Entropy Indexes by Cohorts



5.1.2. Sequence Dissimilarities and Clustering

Following the calculation of pairwise sequence distances, clusters are formed according to the parameters discussed in the methodology chapter. Cluster analysis revealed that the fertility trajectories of ever-married women aged 40-49 with at least one live birth can be grouped into 5 clusters according to the weighted average silhouette width (ASWw) values of number of clusters. For each year, the same parity-related categories emerged from the cluster analysis. Appendix Figures B4 through B9 present these five cluster state sequences for each cohort. Although women with different final parities may co-exist in the clusters, the clusters are named as follows: "one child-norm", "two children-norm", "three children-norm", "four children-norm" and "five or more children-norm" based on the fact that a certain parity stands out as the norm.

Figure 5.4. Change of ASWw Values in Clusters by Cohorts

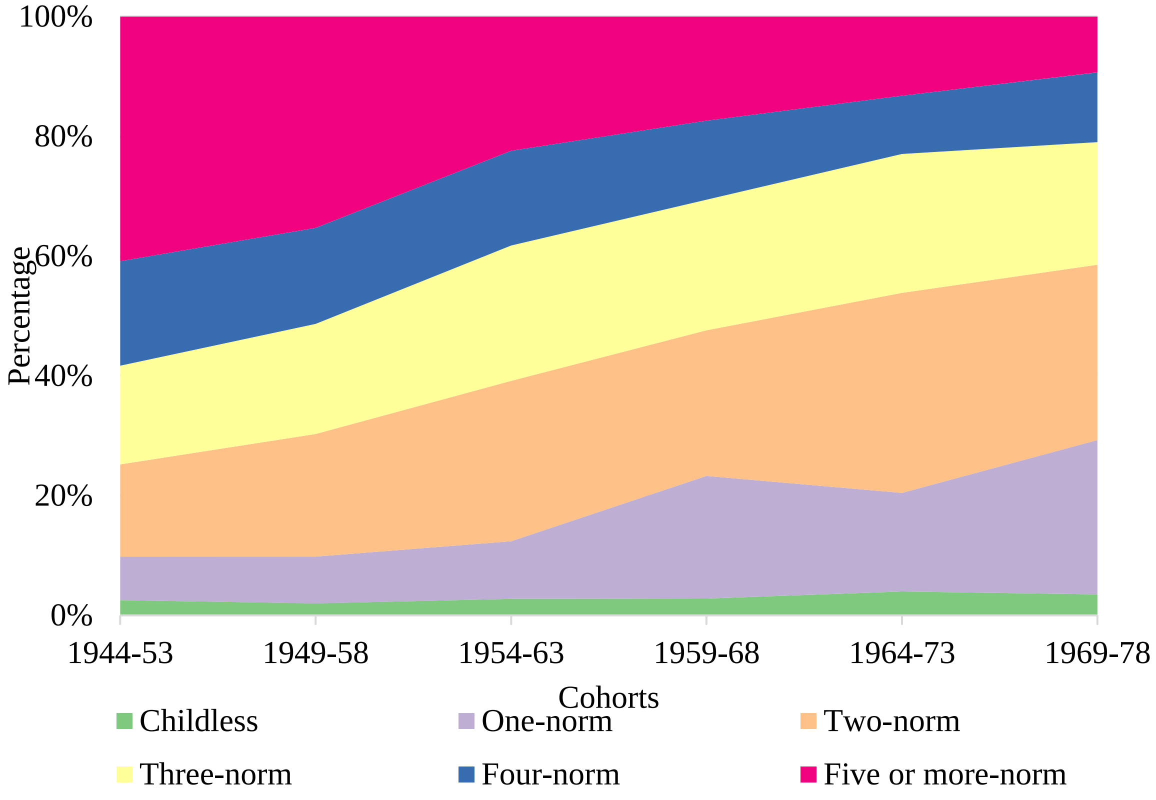


After determining the clusters, the quality of the clusters is calculated according to the weighted average silhouette width (ASWw) values. Figure 5.4 shows the changes in ASWw values through cohorts (See Appendix Table B1 for the values). For two children-norm and five or more children-norm clusters, it is clearly visible that the ASWw values are almost stable through the cohorts. High ASWw values are strong indications of homogeneity since this value is a measure of how homogenous a cluster is, on average, compared to other clusters.

It is possible to say that two children-norm and five or more children-norm clusters have preserved their homogeneous structure for the period of inspected cohorts, which is an indication of a steady tempo structure of these fertility behaviors. On the other hand, for three children-norm and four children-norm clusters, the decrease in ASWw values is apparent. Although it follows a more volatile course, the ASWw value of one child-norm cluster also tends to decrease. Decreased values in these clusters in which high fertility behaviors are observed indicate an increasing heterogeneity of fertility behavior among women in these clusters. Especially, the low values of one child-norm and four children-norm clusters indicates that these behaviors are in an evolutionary process or that groups that transitional groups in their fertility are in these clusters.

The results of cluster analysis showed that the types of clusters remained same over the years, but the size of these clusters has changed. After reuniting the previously separated childless women, Figure 5.5 summarizes the change of cluster sizes with the percentage distribution of the clusters among women cohorts.

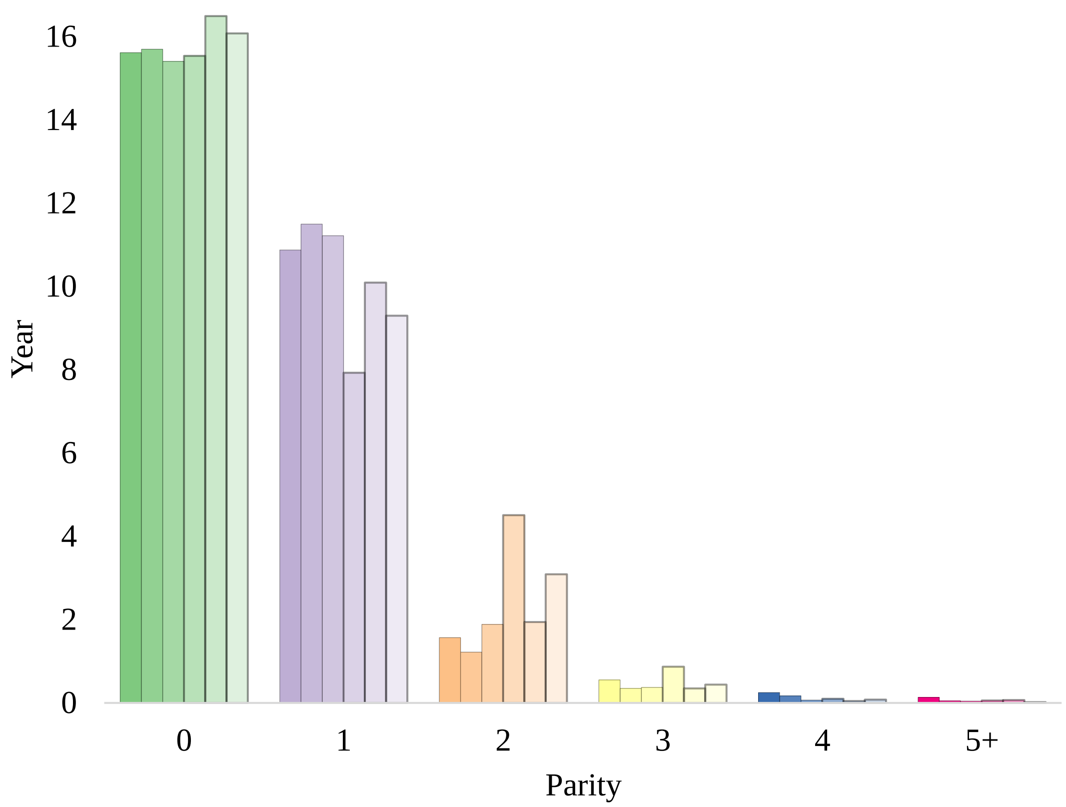
Figure 5.5. Cluster Size Variation by Cohorts



The changes in cluster sizes show those associated with higher fertility have declined over time. Most notably, the share of five or more children-norm cluster decreased from 41% to 9% over 25 years, while the size of lower parity clusters increased. This is, of course, an expected change for a population with declining fertility. The four children-norm cluster was also declined almost 6 percent point and there was a slow increase in the share of the three children-norm cluster with 4 percent point. On the other hand, the percentage of women in the two children-norm cluster almost doubled in 25 years, from 15% to 30%, causing this cluster to stand out among other fertility behaviors. However, the most outstanding increase was observed in the one child-norm category. The share of women in the one child-norm cluster almost quadrupled, increasing from 7% to 26%. The share of women in the childless cluster remained relatively stable in size.

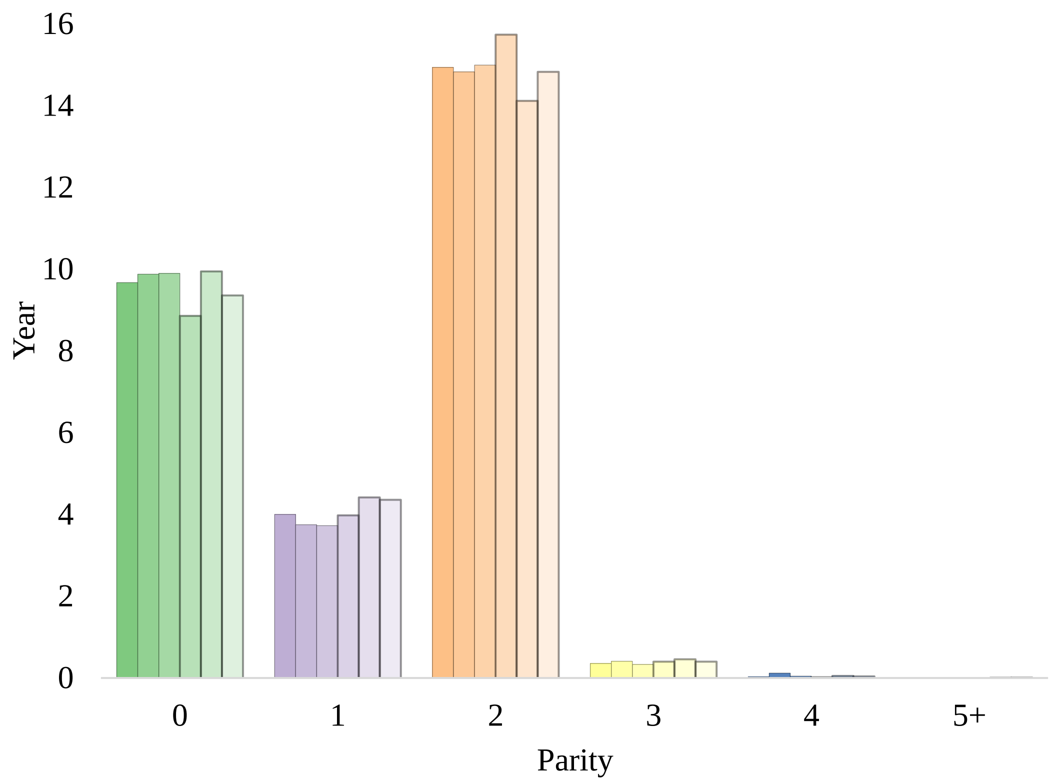
The cohort trend of mean years spent in each parity state was also examined for clusters with sequence analysis to provide more insight into the tempo structure. Similar to the calculation of mean time spent in each state, in the following figures, the mean years spent in each parity state is presented (Figure 5.6 to Figure 5.10). For each fertility-behavior cluster, the consecutive cohorts are grouped together to illustrate the change. The same colors from darker to lighter show the consecutive cohorts in the same parity state. Since the childless women spent all of their years between 12 and 40 in the zero-parity state, they are not included in these figures.

Figure 5.6. One Child-norm Cluster Mean Time Spent in States by Cohorts



For one child-norm cluster, the time spent in parity zero increased slightly through the years (Figure 5.6). While women in this cluster spent approximately 15 years (ages from 12 to 27) childless, in the recent years this value increased by one to 16 years. Furthermore, a decrease in time spent in parity one was also observed. Women in the recent cohorts spent one less year in the one parity compared to the older cohorts. It is possible to see an increase that can be matched with this decrease in the parity of two. If the leap in the 1959-1968 generation is ignored, time spent in the parity two was doubled from 1.5 to 3 years in 25-year period. Time spent in the following parities were insignificantly low. The decrease in the time spent with one child and the increase in the time spent with two children indicate a structural change in this group.

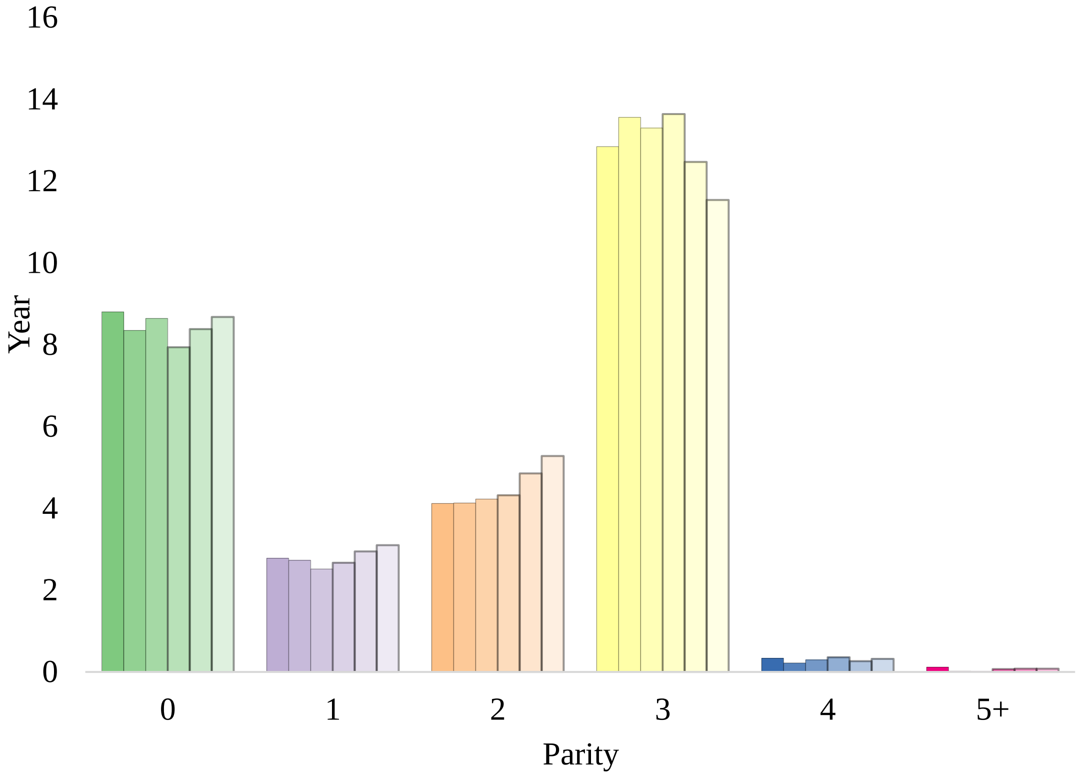
Figure 5.7. Two Children-norm Cluster Mean Time Spent in States by Cohorts



The two-norm cluster remained rather steady through the years (Figure 5.7). Time spent childless remained stable with 9.5 years between cohorts (12-21.5) but slight increase observed in the mean time spent in parity one (4 years for the oldest cohort to 4.4 years for the youngest one). Other than that, the two-norm cluster remained fairly unchanged through the years in terms of time spent in parities. The unchanged tempo structure of the two-norm cluster indicates that the timing of first and second births remained similar, where the space between the first and second birth is just above four years, and the fertility behavior is ossified. Considering this cluster's

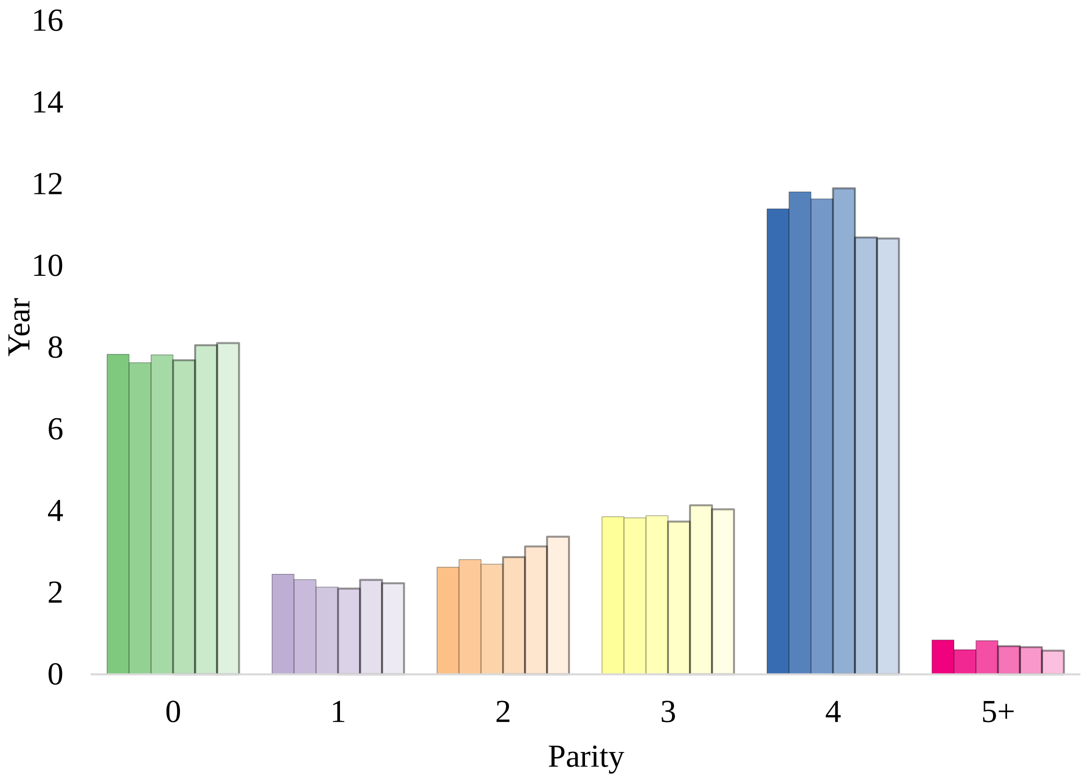
ASWw values, it is an expected result to see this tempo related homogeneous fertility behavior structure.

Figure 5.8. Three Children-norm Cluster Mean Time Spent in States by Cohorts



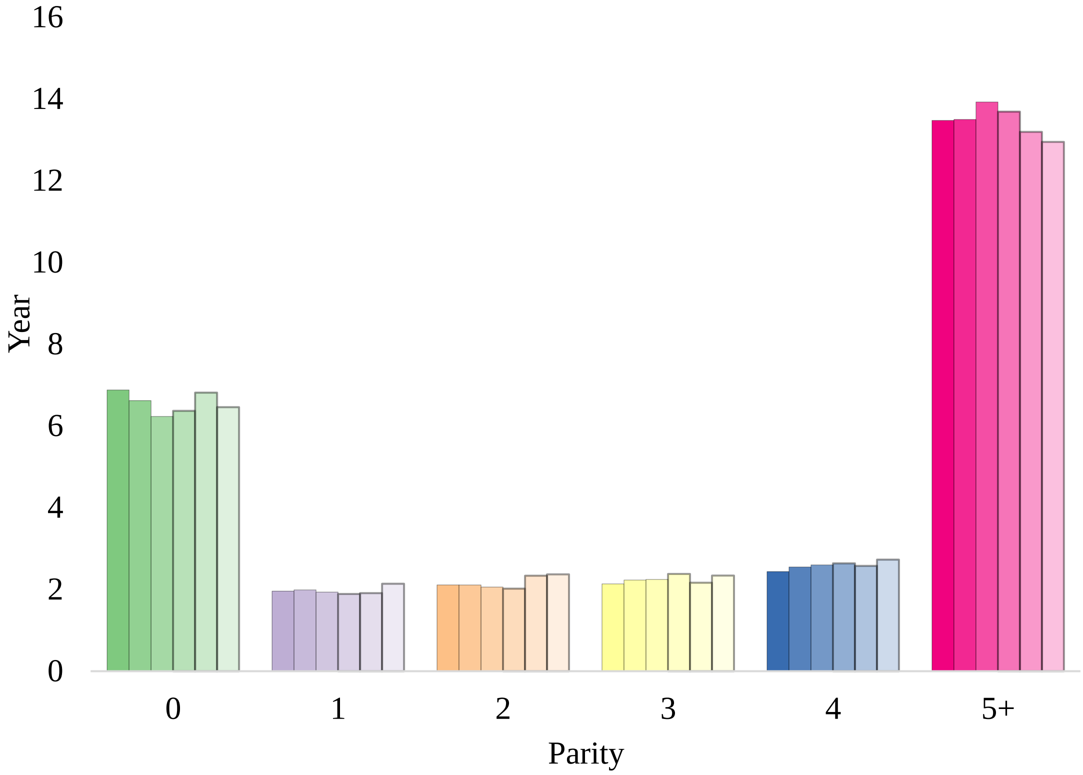
For the three children-norm cluster (Figure 5.8), time spent childless fluctuated around 8.5 years (12 to 20.5). However, a substantial change was observed for the mean time spent in parity one and parity two. Mean time spent in parity one was increased from 2.7 years to 3.1 years. Similarly, mean time spent in parity two was increased from 4.1 years to 5.3 years. The combination of these two intervals indicates an increase of 1.6 years in spacing. In relation to this change, there has been a significant decrease in the time spent with three children. The consistent increase in the elapsed time between births indicates the transformation in the fertility behavior of this group. These changes, which coincide with the increase in maternal age when calculated at the parity level, are also important for the decrease in the period total fertility rates.

Figure 5.9. Four Children-norm Cluster Mean Time Spent in States by Cohorts



Changes in the four children-norm cluster has similarities to the three-norm cluster (Figure 5.9). A slight increase was observed in the mean time spent in the childless zone (8 years). Different than the three children-norm cluster, a decrease rather than an increase was observed in the time spent in first parity. This situation, which somewhat offsets the increase in the number of years without children, shows that the increased mean age at first birth in general leads to reduced first birth interval in women aiming for higher fertility. On the contrary, mean time spent with two parity has increased from 2.6 years to 3.4 years. A slight rise is also observed in the mean times spent with three parity. These birth interval increases, which are expected to be observed in the period of decline in fertility, caused a decrease in the time spent with parity four.

Figure 5.10. Five or More Children-norm Cluster Mean Time Spent in States by Cohorts



The changes in mean times spent in five or more children-norm cluster were small but happened mostly in the recent cohorts (Figure 5.10). The time spent childless after the age of 12 was around 6.5 years. After the first child, the interval between the consecutive births were around 2 years. The space after the first, second, third and fourth births were only increased in small quantities. These little increments decreased the mean time spent in five or more parity less than one year before the age of 40. The untransformed nature of this high fertility cluster indicates a strong underlying fertility preference.

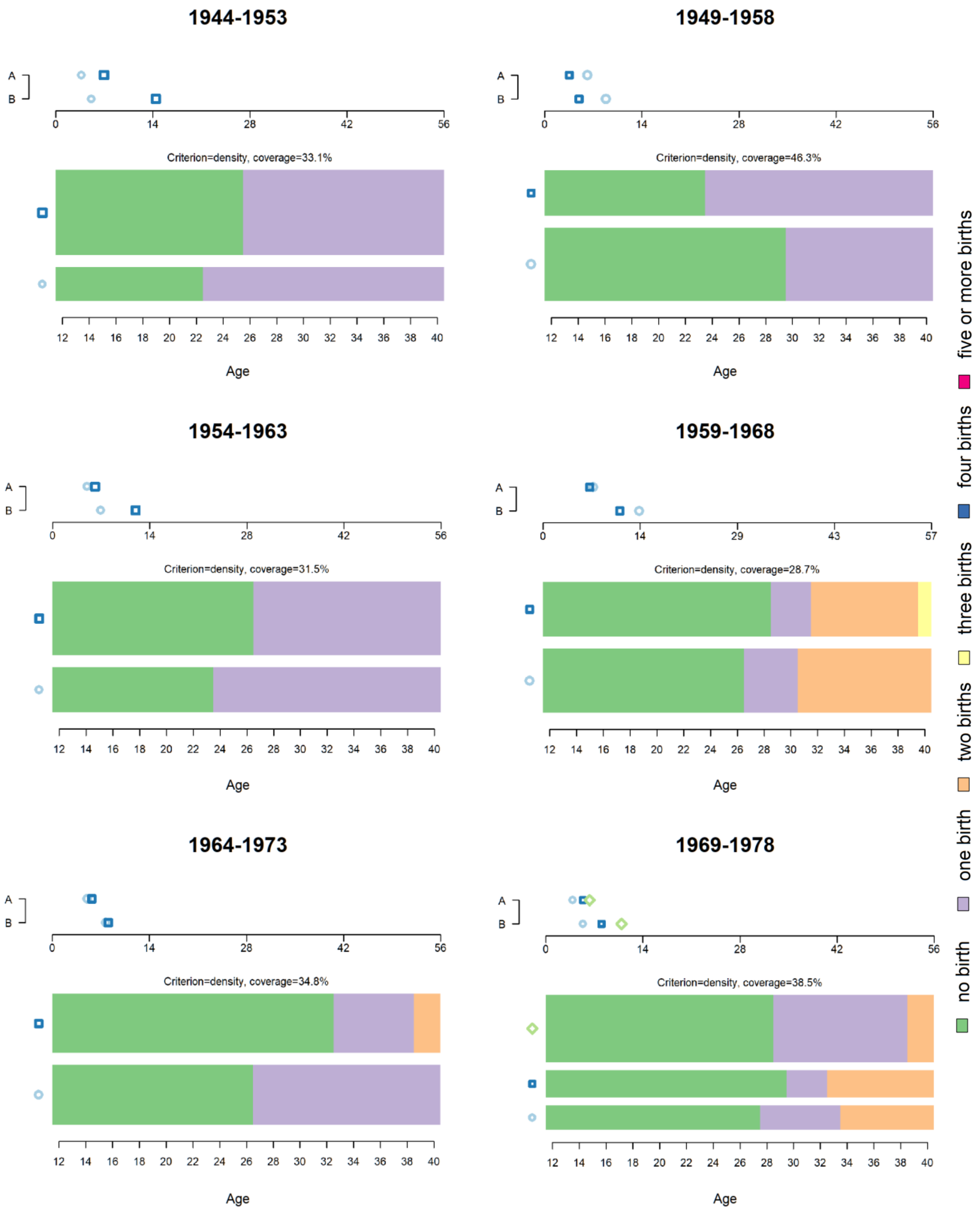
These clusters can also be interpreted together to understand the mean time spent in each parity. Time spent childless dramatically drops (nearly 7 years) between one child-norm and two child-norm clusters. However, it shows similar patterns in three and four children-norm clusters with nearly 1 year less than the two-children norm. Time spent childless again drops nearly 1.5 years in five or more children-norm cluster. Similarly, the time spent in the following parities decreases as one moves towards to the clusters with relatively higher fertility behavior. This can be interpreted that there exist a predetermined fertility target and it is seen that the interval between births is shortened in order to reach this goal within the reproductive ages. On the other hand, when women are followed in cohorts, for every fertility behavior cluster, the main trend can be specified as the increased spacing of births. Especially the time spent in second parity increased for three-norm, four-norm and five or more-norm clusters.

5.1.3. Representatives of Clusters

The last results of the sequence and cluster analysis is the representative sequences of the clusters in cohorts. The Figures 5.11 to 5.15 show representative sequences as horizontal bars with their width proportional to the number of sequences assigned to them. Although these figures do not show the behavior of the whole cluster, they summarize the most dominant (which is defined by density criteria) fertility behaviors in that cluster. These results, which contains very important visual clues about the tempo of fertility, are important in terms of understanding intra-cluster evolutions and inter-cluster transitions.

The most interesting variations and changes can be observed in the one norm cluster representatives (Figure 5.11). When the relatively older cohorts are examined, having exactly one child among this group is dominant. Two subgroups stand out within the one-norm cluster between 1944 and 1963 cohorts where the mean age at first births are differentiating between 3 to 6 years. On the other hand, the remaining relatively younger cohorts show another pattern for the one-norm cluster. In these cohorts, representatives who had the first birth at a later age and reached the end of the reproductive period with an only child emerged. It is also possible to see representatives where a second birth occurs immediately after a late first birth, and representatives where the gap between two births is very large.

Figure 5.11. One Child-norm Cluster Representatives by Cohorts

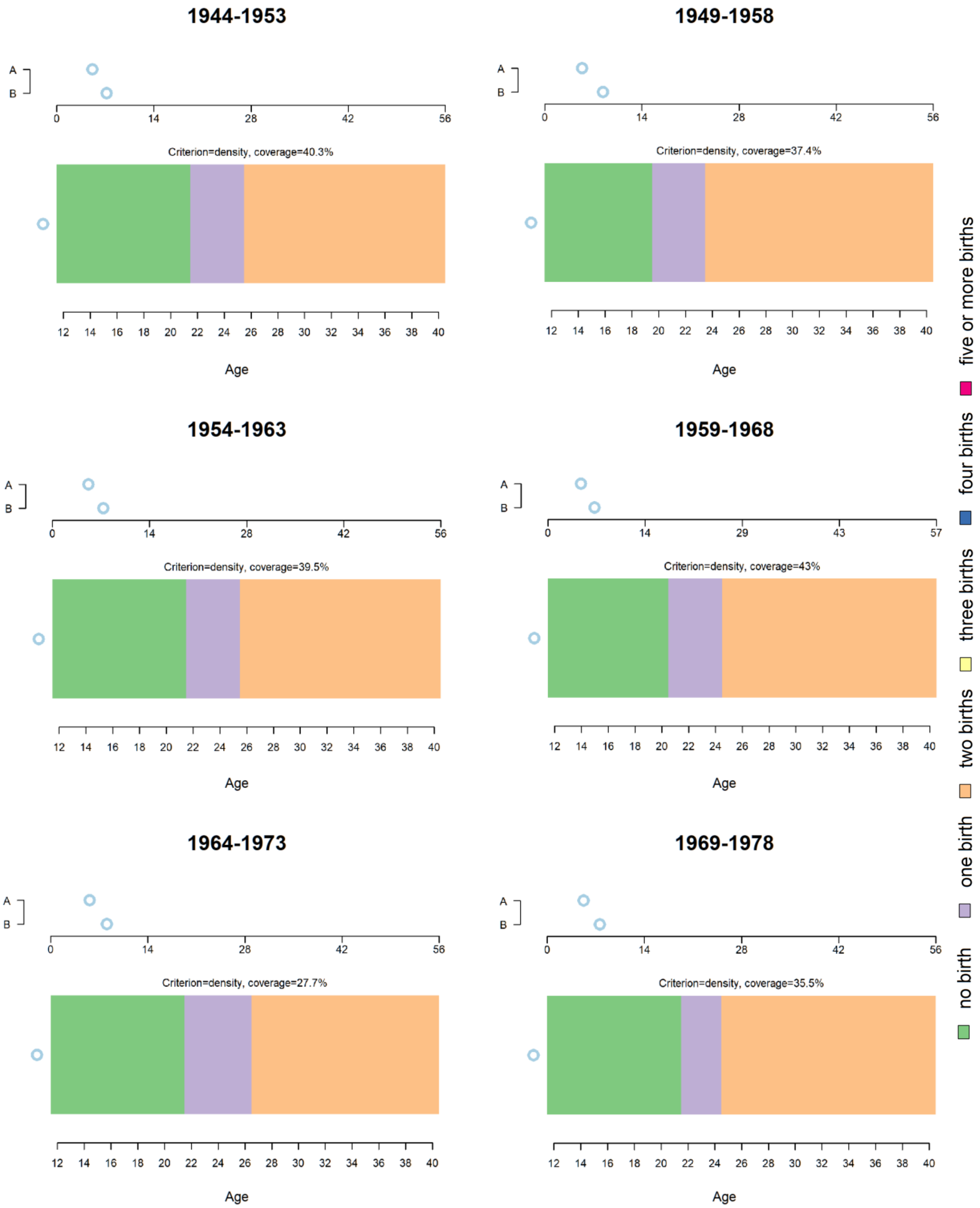


While a single prominent structure was observed in the past, representatives with slightly different fertility timings have come to the fore in recent cohorts. These representative related changes in the one child norm cluster can be interpreted as a deterioration in the ideal of two children during the decline of fertility. This cluster, which could previously be labeled as having exactly one child, is beginning to take shape by the behavior of having a second child in younger cohorts. Differentiating from the two children-norm, women who gave birth at a later age and took a longer break after their first birth were also included in this cluster.

Considering the increasing heterogeneity observed in this cluster and the decline in the average time spent with one child, together with the changing internal structures, it can be said that, postponing fertility to later ages indirectly evolves into having one child at the end of the reproductive age. In addition, the compression of two births into the last stages of fertility for a group has started to become more evident in the fertility behaviors of this cluster.

Looking at the two children-norm cluster, it is seen that the representatives have a very clear and stable structure that is also high in coverage (Figure 5.12). In this cluster, a first birth occurring in the early 20s with a second birth occurring approximately 2-3 years later appear to be the dominant behavior. Although the intervals between births did not change much, an increase in the age at first birth can be observed. This uniform and dominant fertility structure, which is observed as a result of the high homogeneous fertility structure in this cluster, shows that the two-child norm is realized very firmly. The increase in the share of two-child norm among all fertility behavior also gives the impression that this behavior is adopted by more women.

Figure 5.12. Two children-norm Cluster Representatives by Cohorts



As the number of births in the clusters increases, the differentiation of representatives also tends to increase. While there was no major structural change in the three children-norm cluster, variation in age at first birth in the oldest cohort, then variation in the time spent with second child, and then variation in the time spent with first child underlie the differences between representatives (Figure 5.13). The varying timings of births can be observed in the youngest cohort suggest that the three-children goal are achieved in different ways. The increasing heterogeneous fertility structure observed in this cluster also supports this idea. Although the time spent in the second parity is increasing on average, the presence of a relatively short time spent with two parity among the dominant behaviors indicates that the three-children goal remains as a valid target.

It is possible to see that there are more diverse timings in the four children-norm cluster, which is shaped by higher quantum (Figure 5.14). In the earlier cohorts, the timing of the first birth and the time spent with the third parity was decisive, but with time, the timing of the first birth becomes the only separator. In the two youngest cohorts, fertility behaviors seem to be more diversified. The diversity of the time spent in parities in these relatively young cohorts was decisive in this differentiation. The increasing heterogeneous fertility structure observed in this cluster gains meaning with these various sub-breakdowns. This diversified structure indicates a transitional fertility behavior rather than a target fertility structure of four children-norm.

Figure 5.13. Three Children-norm Cluster Representatives by Cohorts

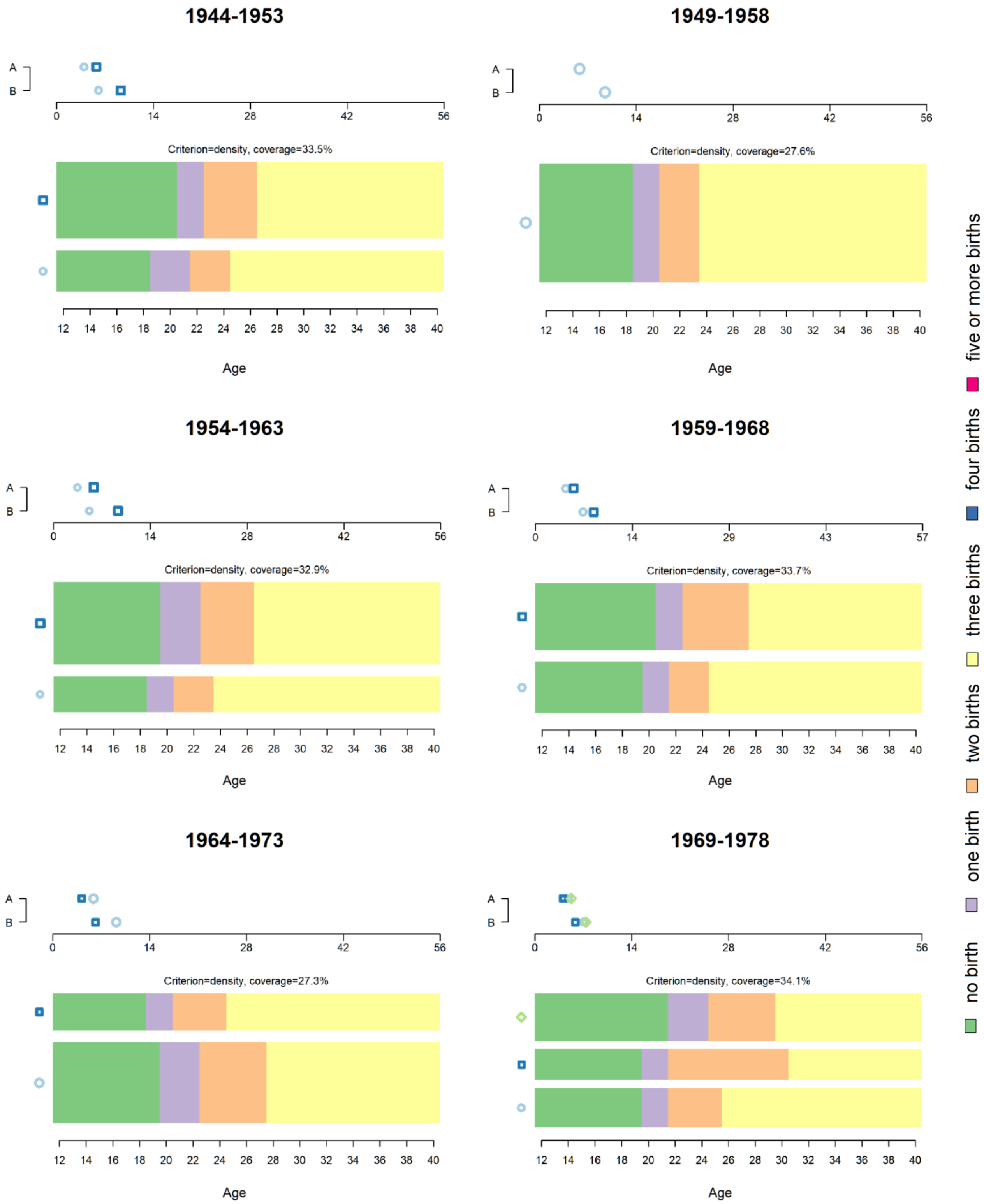
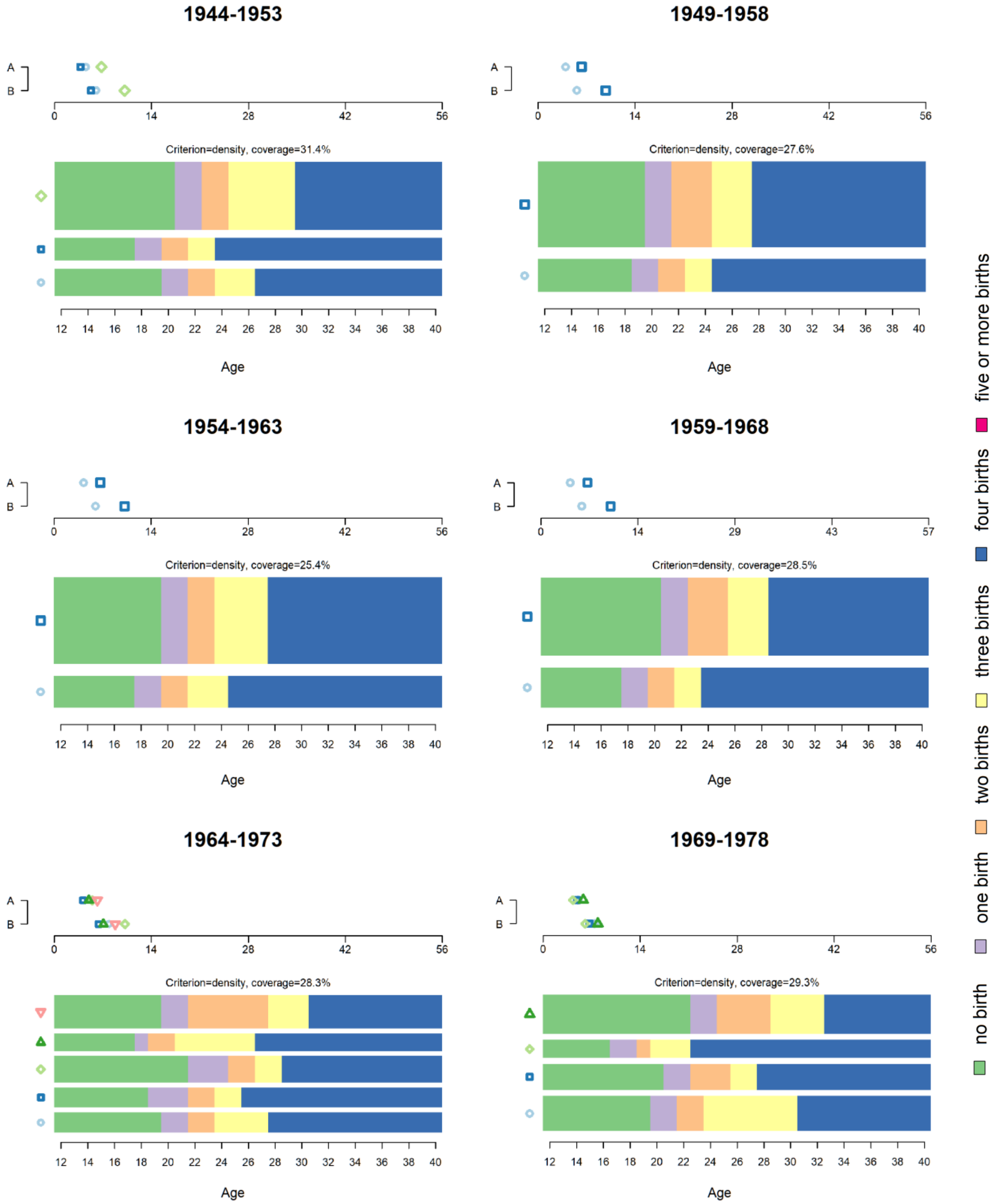


Figure 5.14. Four Children-norm Cluster Representatives by Cohorts

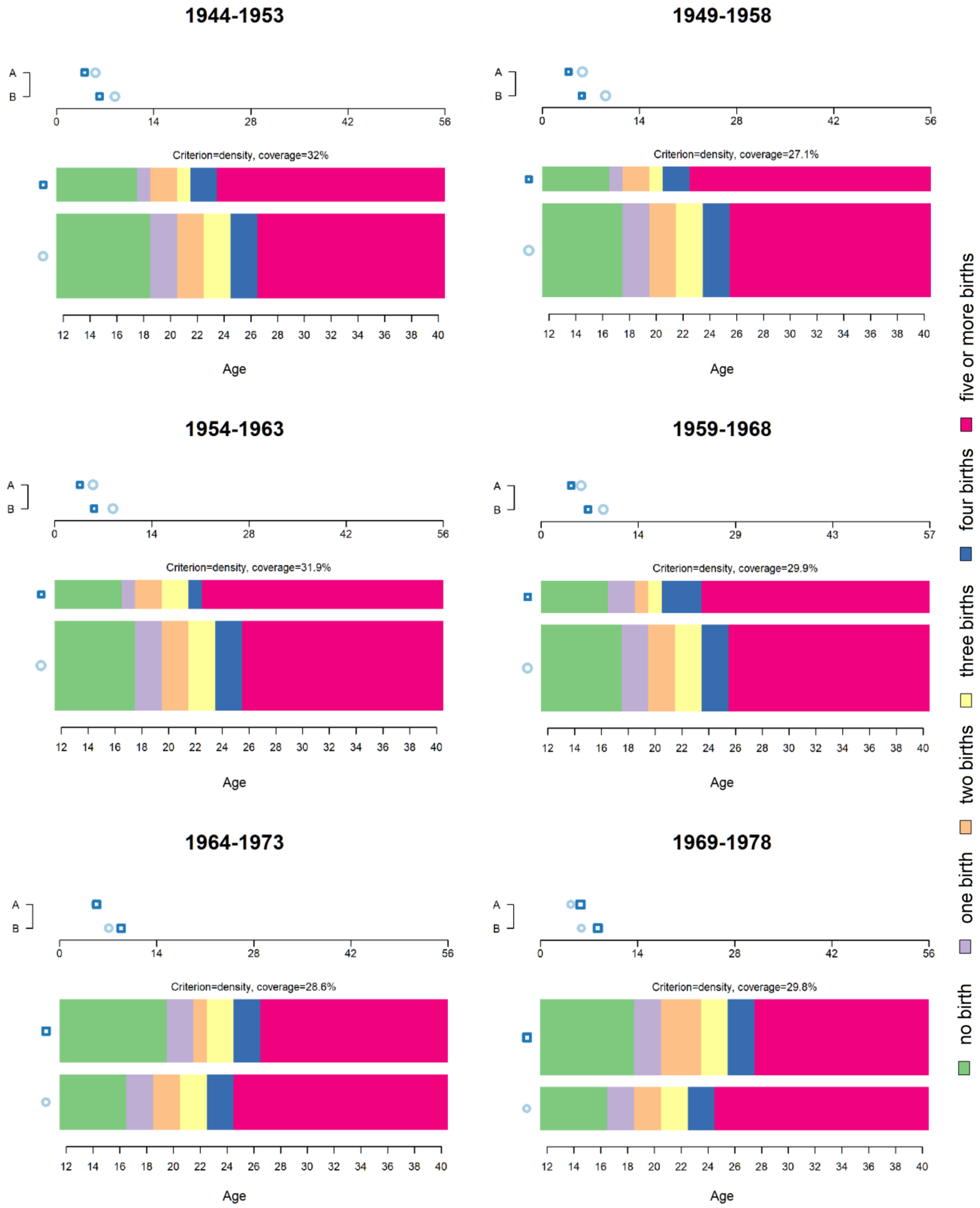


For the five or more children-norm cluster where the highest fertility behaviors are observed, it is possible to say that a dual structure is decisive for this cluster (Figure 5.15). It is the differentiation in the age of first birth that can be seen as the decisive factor in this dual structure. It is noteworthy that in this group, the first births under the age of 18 are visible in a subgroup. While the group giving birth at the age of 18 or later is more dominant in the early cohorts, the first births under the age of 18 come to the fore in the youngest two cohorts. This appears to be a percentage redistribution in dominant behavior rather than an evolutionary change. When considered together with the highly homogeneous structure within the cluster, there is a clear distinction in the fertility behaviors with other clusters. In addition, due to the grouping of births of five and above, possible differences in these higher parities may be overshadowed.

Examining the dominant tempo behaviors within the clusters gives an idea about the inside dynamics and therefore the fertility structures. The representatives also contain important results in terms of the relationship of different clusters. As the change in fertility behaviors is examined in the process of fertility decline, it is possible to observe the signs of transition to lower clusters. For the one child-norm cluster, since the behavior of having only one child at a very late stage in the reproductive period is not observed in the younger cohorts as a representative can indicate an absence of a transition to childlessness from this cluster. Similarly, the stable structure in the two children-norm cluster specifies that this fertility behavior will continue to remain unchanged in the near future.

For three children-norm cluster, the fact that a subgroup that spent a longer time with two children is among the representatives in the recent period can be an indication of an evolvement of this fertility behavior into two children-norm. For the four child-norm cluster, two transitions can be observed from the representative sets. First is the surfacing of a subgroup with an early first birth pattern which can be observed in the five or more children-norm. This may be due to the transition from higher fertility behaviors. The second one is similar to the three-norm subgroup, where an increased time spent in the third parity may evolve into three-norm behavior.

Figure 5.15. Five or more Children-norm Cluster Representatives by Cohorts



5.2. Similarities of Background Characteristics in Fertility Behaviors

The sequence analysis results showed the heterogeneous structure of the fertility behaviors of women. However, it is also important to analyze the background of these fertility behaviors. In order to analyze this background, characteristics of the women and their spouses were analyzed. Since fertility takes place within marriage in Turkey, and the establishment of the marriage contains valuable cultural codes, marital characteristics were also examined as a third dimension. The distance analysis was carried on the axis of heterogeneity, in order to form a link between the homogenous fertility behaviors and the similar characteristics of individuals and marriages.

Following the sequence analysis, the heterogeneity scores, $\phi(P)$, were calculated for six clusters in each cohort according to three dimensions of background properties, namely women's, husband's and marriage background characteristics. Appendix Table C.1 presents the calculated heterogeneity scores for each cluster in each cohort, and the total heterogeneity score of the cohorts. The following figures (Figure 5.16, 5.17, and 5.18) show the change in heterogeneity scores in three dimensions. Unlike the previous analysis, the distance analysis presented here also provides results for the childless women. The findings regarding the background similarities of childless women and their spouses and the marriages of childless women contain important information to distinguish this cluster from other groups.

Higher heterogeneity scores indicate a more heterogeneous structure among women in the related dimension. Increased heterogeneity of a cluster in a particular dimension means that they are less similar to each other according to the traits in that dimension. Similarly, the decrease in heterogeneity indicates that they are more similar to each other. Since clusters are formed by fertility behaviors, the relational link should be constructed backwards. In other words, the increase in heterogeneity in the dimension related to the background of the woman, for example, means that women who are less alike over time display similar fertility behaviors.

Figure 5.16. Women Background Heterogeneity Score Changes

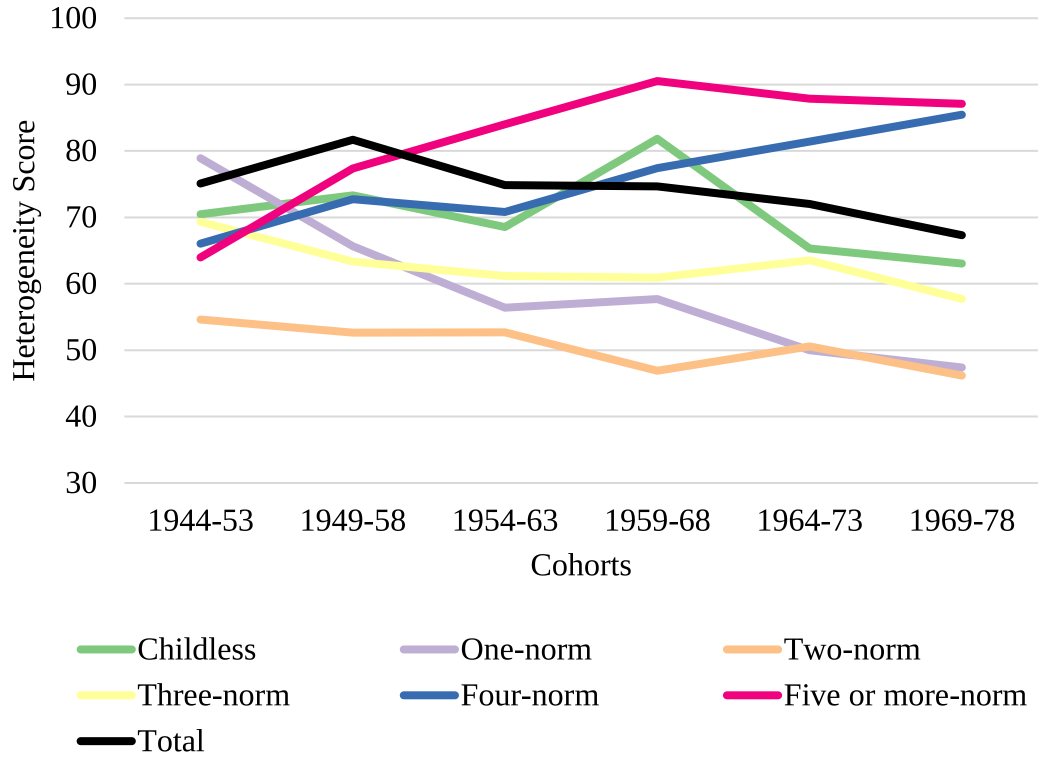
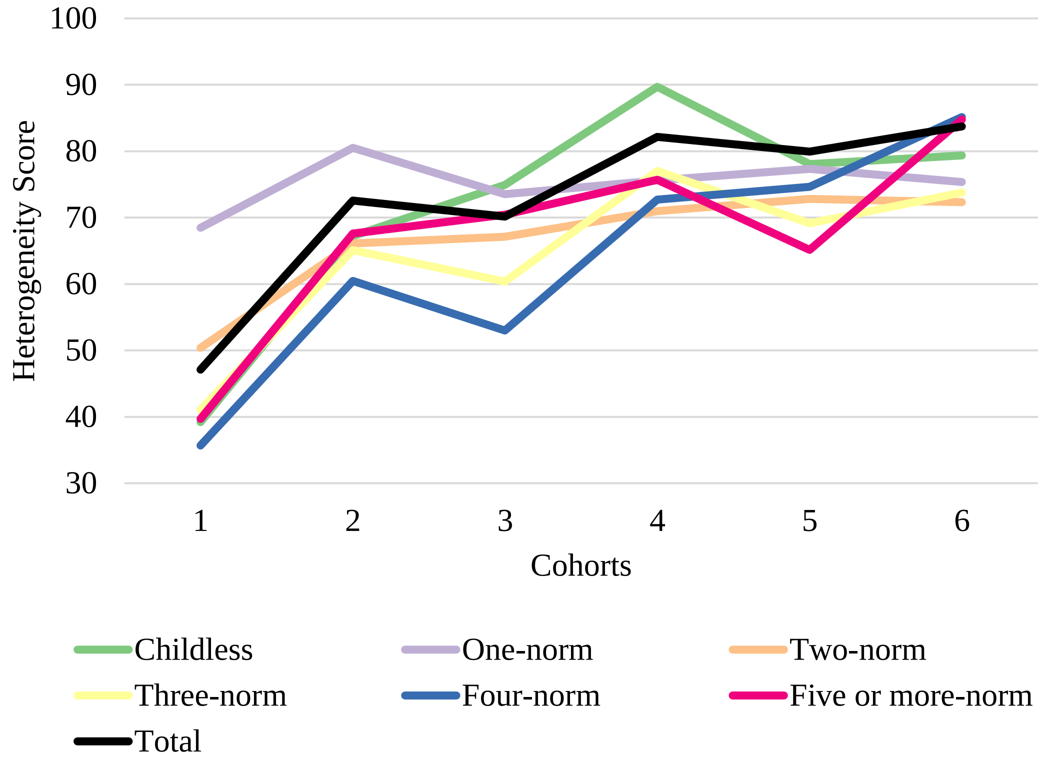


Figure 5.17. Husband Background Heterogeneity Score Changes



When women's characteristics are examined, results show an increase of heterogeneity in the four children-norm and five or more children-norm clusters (Figure 5.16). This increase indicates that women with high fertility behavior begin to resemble each other less when their background characteristics are considered. On the other hand, a notable decrease can be observed in two children-norm and one child-norm clusters. And a minor but steady decline can be detected in the three children-norm cluster. For childless women, heterogeneity scores were observed to be slightly less than for the total population except 1959-68 generation. When cohorts are considered in total, women are becoming more similar to each other with time, in terms of bivariate mother tongue, education and childhood place of residence categories.

By contrast, when changes in the husbands' backgrounds are investigated, an increase of heterogeneity can be observed for almost every cluster with an exception of the one child-norm (Figure 5.17). Especially the husbands of women with relatively higher fertility behavior are gradually different from each other. The change in two child-norm seems to be slower than the relatively higher fertility behavior clusters. The change in the total also indicates an increase in heterogeneity. Compared to the women's and husband's categories, heterogeneity was relatively stable for the marriage background category (Figure 5.18). On the other hand, it seems that only marriages of childless women begin to resemble each other.

When these three dimensions are considered together, it can be deduced that childless women and their husbands were stable in the means of diversity but their marriage characteristics became more similar. Considering the one child-norm cluster, while women and their marriage characteristics have preserved their homogeneous structure over the years, husbands have also followed this trend and become more homogeneous. For the two children-norm cluster, the homogeneous structure has become permanent in all three categories, especially for the background characteristics of women. The homogeneity of husbands of women in the three children-norm cluster is similar to the two children-norm but there is an increase of heterogeneity in their marriages and for the women themselves. For relatively higher fertility behavior clusters, the most striking result is that of an increasing diversity in background characteristics of women.

Figure 5.18. Marriage Background Heterogeneity Score Changes

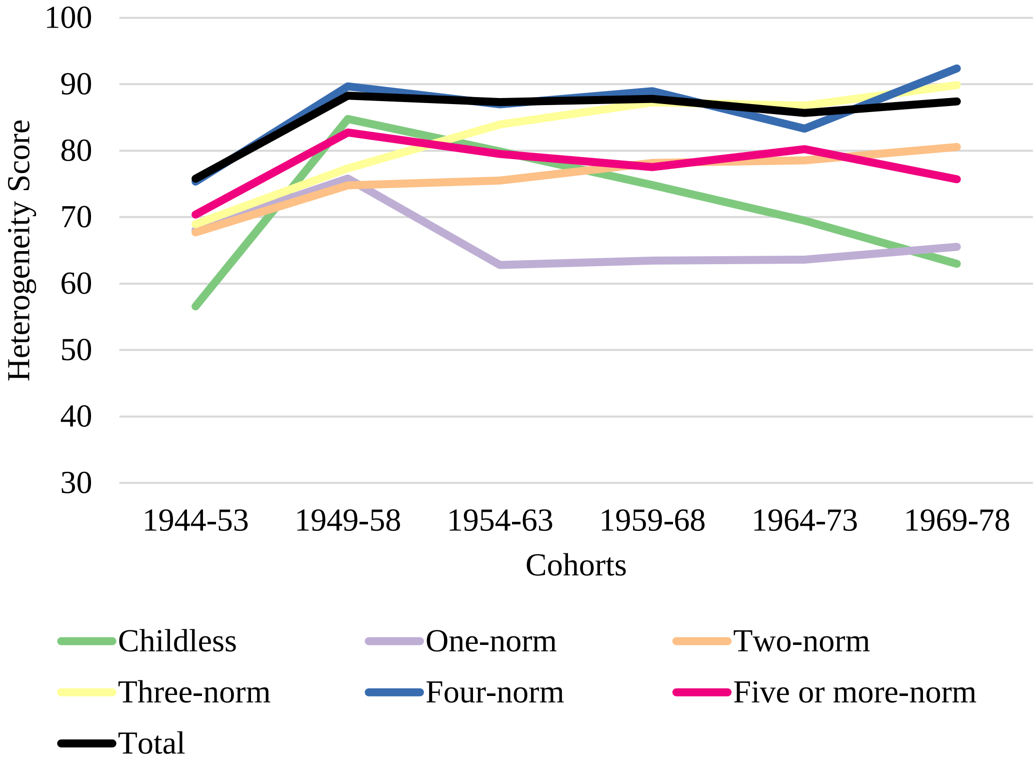


Figure 5.19, 5.20, and 5.21 shows the relative heterogeneity scores $\Delta\phi_c$, the difference between heterogeneity score of a cluster and the score of the whole cohort for each year by background dimensions. Again, positive values indicate more heterogeneous structure relative to the cohort average. The relative heterogeneity scores are important because they also consider the changing trends in cohorts. The increase of overall educational level may have an impact on heterogeneity scores and on the nominal results, since these scores consider a binary distribution, but the relative scores capture the real change according to the cohort average.

According to results, the fertility trajectory clusters are strongly related to the heterogeneity of the background of women (Figure 5.19). In the first part, the most striking finding is that women in the two children-norm cluster are much more homogeneous according to their background characteristics compared to the cohort overall and this status remained mostly unchanged over the years. A similar finding for women in the one child-norm cluster can be observed. With the exception of childless women, women in the two relatively lower fertility behavior cluster were more similar to each other. Childless women retained their slightly more heterogeneous structure than the total. However, for higher parity clusters, relative heterogeneity scores increased over time.

For both four children-norm and five or more-children norm clusters showed an increase in relative heterogeneity. This result shows that the women with higher parities who were much more alike according to their selected background characteristics in the past now are more diverse. In other words, while women who were more similar to each other than average showed high fertility behaviors in the past, now, women with different background characteristics in recent cohorts started to show similar fertility behaviors.

Figure 5.20 shows the relative heterogeneity scores of clusters according to the background characteristics of their husbands. In general, the variation of the relative heterogeneity scores of husbands' background characteristics is smaller than the women's scores. A decline followed by a rise in the heterogeneity score was observed for the childless cluster. This shows that the spouses of childless women begin to resemble each other more in younger cohorts. The most remarkable change can be observed for husbands in the one-norm cluster who become less diverse over time. A similar but lower increase was also observed in groups of two and three children-norm clusters. However, the four children-norm cluster differ from the previous clusters. For this cluster, the relative heterogeneity of the husbands increased in consecutive cohorts, so that, the younger cohorts in this cluster are more dissimilar to each other. It is not possible to talk about a trend for the five or more children-norm cluster.

In the last part, Figure 5.21 the heterogeneity of the clusters can be seen over the cohorts according to the background of marriage characteristics. In this graph, the differences between clusters and the changes between cohorts can be seen more clearly. There is an increasing similarity over the years in the characteristics of the marriages of the childless cluster, with the exception of the oldest cohort. For the one child-norm cluster, there is a stagnation following a rapid homogenization process. The situation is reversed, starting with two children-norm cluster. Marriage characteristics in two and three-children clusters are becoming increasingly heterogeneous. For the four child clusters, the youngest generation is the most diverse group in terms of marital characteristics. In the cluster of five or more children, where the highest fertility is observed, an increase in homogeneity levels is observed, which is similar to the structure of childless or one-child marriages.

When the results for the three dimensions were evaluated together, more similar marriage and husband characteristics were observed over time for the childless cluster. While the basic features of women and marriages have been similar for a while in one child-norm cluster, husbands have started to become similar with time. While heterogeneity among husbands decreased in the two children-norm cluster, it was observed that heterogeneity in marriages increased, while women were calculated as the most homogeneous group. In the three children-norm cluster, a decreasing heterogeneity was observed in women and marriages, more pronounced in marriages, and husbands began to resemble each other more. While marriages in the four children cluster were similar to the differences in the general population, it was observed that heterogeneity in the characteristics of women and husbands increased. Finally, while the characteristics of women differed from each other in five or more children-norm cluster, marriages began to resemble each other.

Figure 5.19. Relative Heterogeneity Scores of Women Characteristics

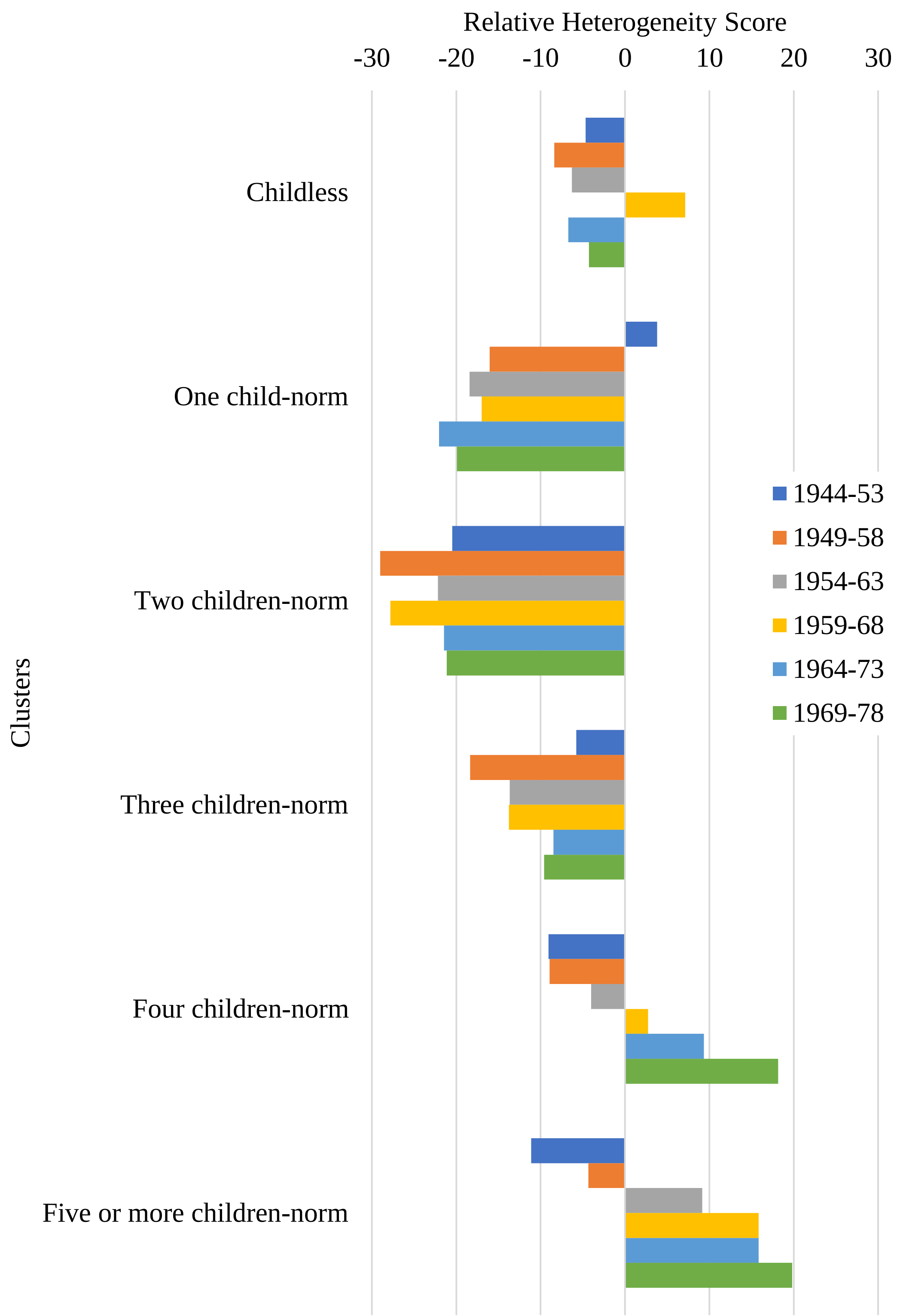


Figure 5.20. Relative Heterogeneity Scores of Husband Characteristics

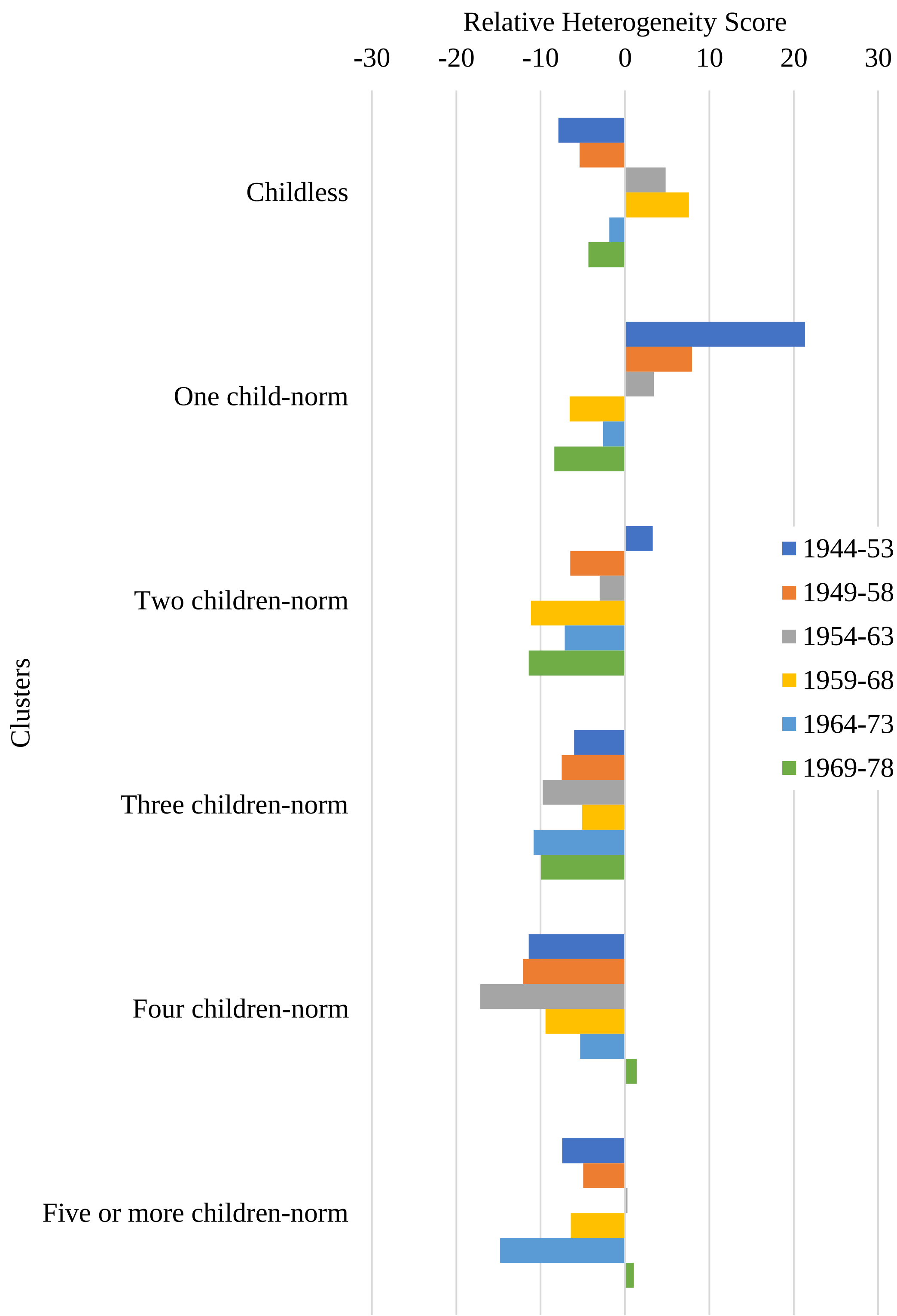
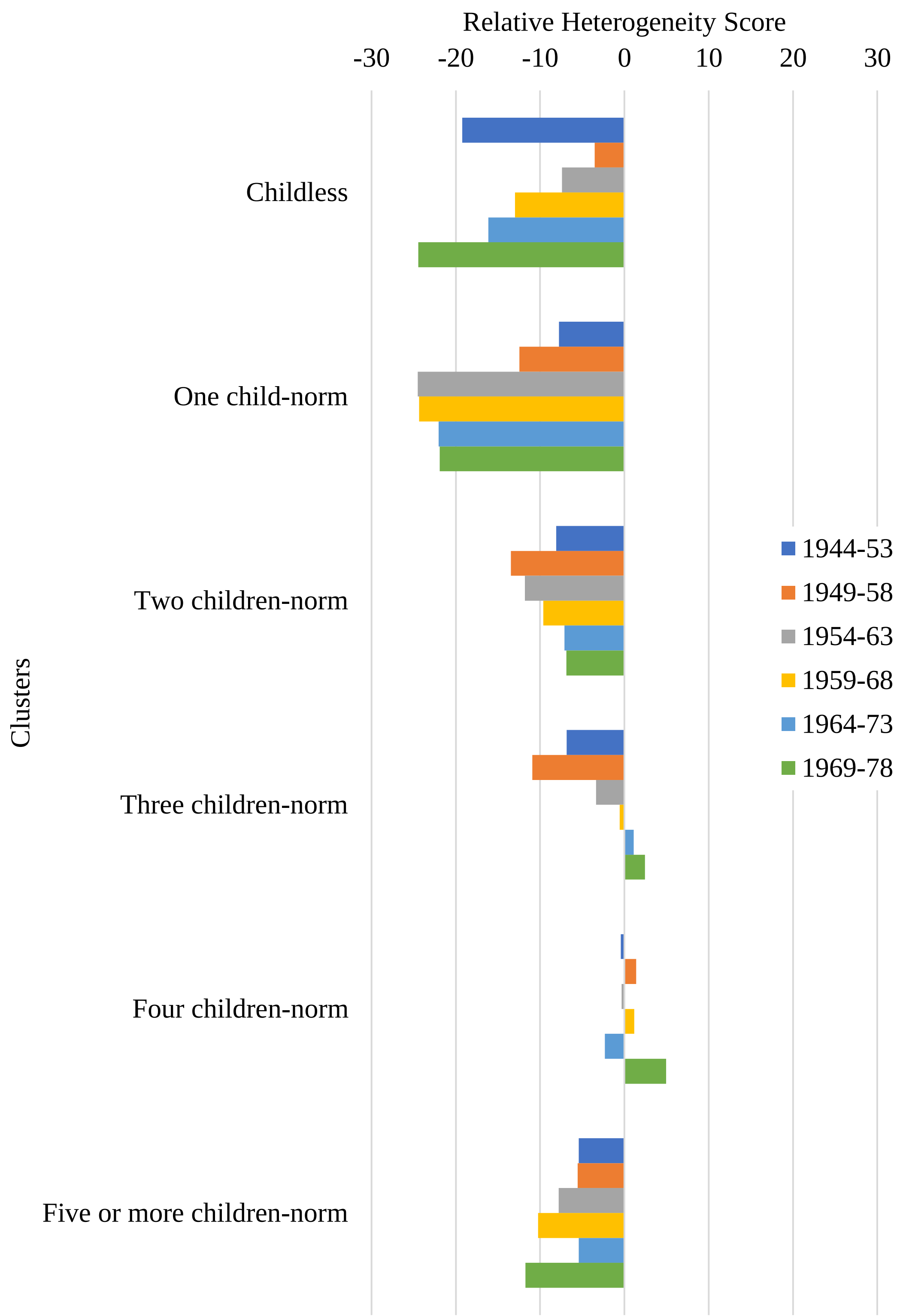


Figure 5.21. Relative Heterogeneity Scores of Marriage Characteristics



5.3. The Link Between the Fertility Behaviors and Background Characteristics

In the last part, multinomial logistic regression was employed to understand the determinants of fertility behavior clusters. Section 5.3.1 shows the descriptive analysis results according to each cohort. After descriptive statistics, multinomial logistic regression analysis was carried on each cohort's dataset separately with the variables used in descriptive analysis. In regression models, the reference group are chosen as the two children-norm cluster. Section 5.3.2 presents the odds ratio of the regression models. In the last part, in section 5.3.3, post estimation analysis was carried to determine cluster membership. Separate analyses were made for women's education and childhood place of residence in order to see the variation in fertility associated with education and urbanization, which are the focused social changes in the period under review.

5.3.1. Descriptive Analysis Results

In order to examine how women's and husbands' basic characteristics, as well as marital characteristics are associated with cluster membership, in Table 5.1 trough Table 5.6, the weighted descriptive percentage distribution of the six clusters for the six cohorts are presented. Chi-square test is used to measure significant differences across clusters for each variable with complex sample module. Between-cluster differences are measured using a Bonferroni adjustment[3] for multiple comparisons. In this way, the differences in the distributions of all variables were compared in pairs. Therefore, the descriptive results can be used to compare any two cluster. However, since the odds ratio results are presented using the two-norm children cluster as the reference group, in the descriptive tables, differences related to two-norm cluster is highlighted. In following tables, shaded values are significantly different than two children-norm distribution in their relative cluster and variable. At the bivariate level,

[3] Values in the same row and sub-category that does not share the same subscript in following descriptive results are significantly different at $p<0.05$ in the two-sided test of equality for the proportions. Values that does not have a subscript are not included in test. Test assumes equal variances.

all variables except place of birth for men in 1954-1963 are significantly different across clusters (See Appendix Table D.1 – D.6 for complex sample tests of independence). In order to interpret the variation between cohorts, descriptive results will be interpreted on a variable basis.

In general, the two children-norm cluster differentiate from the relatively higher fertility behavior clusters (three children-norm, four children-norm and five or more children-norm clusters) in terms of the background characteristics of women. In detail, among all cohorts, the cluster with the highest percentage of women with Turkish mother tongue, which can be interpreted as the ethnicity, is the two children-norm cluster. Especially in the clusters of one, two and three children-norm in the younger cohorts, there are no major differences in terms of the mother tongue of the woman. When compared in terms of educational status, the two children-norm cluster contain more educated women than all other clusters. This gap has recently widened with relatively higher fertility behavior clusters and closed with childless and one child-norm.

In the older cohorts, the percentages of women in the childless, one and two children-norm clusters who spent their childhood in the urban differ from the remaining clusters. We can interpret the childhood place of residence as hometown. In the younger cohorts, the gap between clusters widened. When moving from the one child-norm cluster to the five or more children-norm cluster, the rate of those with urban hometown decreases. When these background features of women are considered together, a situation where the hometown is differentiated for women with different fertility behaviors has emerged. The educational status of women, on the other hand, ceases to be distinctive in relatively low fertility clusters, but is still characteristic for women in higher fertility behavior clusters.

In the background characteristics of the husband, the mother tongue of the husband shows close distributions in the clusters of two and three children-norm, where the mother tongue of the husband is Turkish for more than ninety percent. While the percentage of Turkish-speaking husbands in the childless and one child-norm clusters decreases slightly, the distribution also deteriorates against Turkish-speaking husbands in higher fertility behavior clusters. The education level of the spouses also distinguishes the two children-norm. In older cohorts, the education of the husbands is a significant differentiator in terms of the three children-norm and higher fertility behaviors and the two children-norm and lower fertility behaviors. In the younger cohorts, in addition to this distinction, one child and two children-norm clusters also show a significant differentiation according to the education level of the husband.

The percentage of husbands with urban hometown is higher in clusters associated with relatively lower fertility behavior. Similar to the situation in education, there was a significant difference between relatively lower and higher fertility behaviors in recent cohorts, and the one child-norm cluster continued to be positively differentiated. When these background features are considered together, in terms of husbands, the areas where the husbands of the two children-norm cluster differed significantly from the husbands in the three children-norm cluster were their educational status and their hometown. However, there is no significant difference in the mother tongue of the spouses of the women in these two clusters. When compared with the one child-norm cluster, there was a significant differentiation according to the education level of the husbands, while the distinction in the place where they grew up decreased.

Differences seen in the distribution of the characteristics of women and their husbands according to clusters can be similarly observed in the characteristics of marriage. In child marriage rates, two children-norm cluster is positively differentiated from relatively higher fertility behavior clusters. In younger cohorts, childless and one child-norm clusters have the lowest rates of child marriage. Although the rate of consanguinity increased in younger cohorts at relatively lower fertility behavior clusters, it continues to differ significantly with relatively higher fertility behavior clusters. In the distribution of marriage arrangement, the two children-norm cluster differ significantly from both the one child-norm and the three children-norm clusters.

In relatively lower fertility behavior clusters, the rate of spouses who decide on marriage themselves increases. In the order of marriage, four children and five or more children-norm clusters are differing. Behavior where priority is given to civil marriage is above 50 percent in clusters with relatively low fertility behavior clusters in younger cohorts. When these marriage characteristics are considered together, the marriages of women in two child cluster are clearly differentiated from both marriages of women with relatively higher fertility behavior clusters and marriages of women in one child-norm cluster.

Table 5.1. Descriptive Results for the 1944-1953 Cohort

		Zero	One	Two	Three	Four	Five+	Total
Background Characteristics of Women								
Mother tongue	Turkish	96.6$_{a.b.c}$	85.4$_{a.c}$	97.8$_{b}$	94.6$_{a.b}$	94.3$_{a.b}$	79.7$_{c}$	88.3
	Other	3.4$_{a.b.c}$	14.6$_{a.c}$	2.2$_{b}$	5.4$_{a.b}$	5.7$_{a.b}$	20.3$_{c}$	11.7
Education	Complete primary/ higher	54.0$_{a.c}$	67.5$_{a}$	83.4$_{b}$	64.6$_{a}$	48.2$_{c}$	22.3$_{d}$	47.1
	No edu. or primary edu. incomplete	46.0$_{a.c}$	32.5$_{a}$	16.6$_{b}$	35.4$_{a}$	51.8$_{c}$	77.7$_{d}$	52.9
Childhood Place of Residence	Urban	43.8$_{a.b}$	46.9$_{a}$	51.0$_{a}$	41.1$_{a}$	26.0$_{b.c}$	17.7$_{c}$	30.6
	Rural	56.2$_{a.b}$	53.1$_{a}$	49.0$_{a}$	58.9$_{a}$	74.0$_{b.c}$	82.3$_{c}$	69.4
Background Characteristics of Husbands								
Mother tongue	Turkish	96.6$_{a.c.e.f}$	85.4$_{a.b.f}$	97.8$_{c}$	95.5$_{c.d.e}$	91.3$_{b.e}$	79.2$_{f}$	87.7
	Other	3.4$_{a.c.e.f}$	14.6$_{a.b.f}$	2.2$_{c}$	4.5$_{c.d.e}$	8.7$_{b.e}$	20.8$_{f}$	12.3
Education	Complete secondary or higher	20.9$_{a.b.c}$	31.9$_{a.b}$	36.1$_{a}$	20.4$_{b.c}$	11.2$_{c}$	3.5$_{d}$	15.0
	Primary complete	58.4$_{a.d.e}$	54.9$_{a.b}$	55.4$_{a.c}$	66.6$_{a.d.e}$	75.1$_{d}$	61.4$_{b.c.e}$	63.2
	No edu. or primary edu. incomplete	20.8$_{a.b}$	13.2$_{a}$	8.5$_{a}$	13.0$_{a}$	13.7$_{a}$	35.2$_{b}$	21.8
Background Characteristics of Marriages								
Women's age at first marriage	18 and above	65.5$_{a.b}$	83.9$_{a}$	76.1$_{a}$	63.3$_{b}$	52.2$_{b.c}$	38.0$_{d}$	54.4
	Before 18	34.5$_{a.b}$	16.1$_{a}$	23.9$_{a}$	36.7$_{b}$	47.8$_{b.c}$	62.0$_{d}$	45.6
Relationship to husband	No relation	93.7$_{a.b.c}$	84.8$_{a.b.c}$	88.7$_{a}$	84.0$_{a.b}$	77.1$_{b.c}$	71.4$_{c}$	78.6
	Relative	6.3$_{a.b.c}$	15.2$_{a.b.c}$	11.3$_{a}$	16.0$_{a.b}$	22.9$_{b.c}$	28.6$_{c}$	21.4
Marriage arrangement	Themselves	16.6$_{a.b.d}$	43.4$_{a}$	34.4$_{a}$	18.5$_{b}$	16.7$_{b.c}$	9.7$_{d}$	18.7
	Families	83.4$_{a.b}$	56.6$_{a}$	60.5$_{a}$	76.3$_{b}$	74.7$_{b.c}$	82.3$_{b.d}$	74.9
	Escaped/ Abducted/ Other	0.0[1]	0.0[1]	5.2$_{a}$	5.2$_{a}$	8.6$_{a}$	7.9$_{a}$	6.4
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.2. Descriptive Results for the 1949-1958 Cohort

Background Characteristics of Women								
		Zero	One	Two	Three	Four	Five+	Total
Mother tongue	Turkish	$91.2_{a,c,d,e,f}$	$86.9_{a,b}$	98.5_{c}	$93.8_{b,d}$	$91.7_{b,e}$	67.8_{f}	84.6
	Other	$8.8_{a,c,d,e,f}$	$13.1_{a,b}$	1.5_{c}	$6.2_{b,d}$	$8.3_{b,e}$	32.2_{f}	15.4
Education	Complete primary/ higher	$44.1_{a,c}$	80.9_{b}	84.1_{b}	75.8_{b}	52.8_{a}	23.8_{c}	55.0
	No edu. or primary edu. incomplete	$55.9_{a,c}$	19.1_{b}	15.9_{b}	24.2_{b}	47.2_{a}	76.2_{c}	45.0
Childhood Place of Residence	Urban	$34.0_{a,c,e}$	68.7_{b}	$58.5_{a,b}$	37.6_{c}	$32.7_{c,d,e}$	23.8_{e}	38.2
	Rural	$66.0_{a,c,e}$	31.3_{b}	$41.5_{a,b}$	62.4_{c}	$67.3_{c,d,e}$	76.2_{e}	61.8
Background Characteristics of Husbands								
Mother tongue	Turkish	$89.5_{a,c,d,e}$	$87.6_{a,b}$	96.9_{c}	$91.9_{a,c,d}$	$90.6_{b,d}$	66.4_{e}	83.3
	Other	$10.5_{a,c,d,e}$	$12.4_{a,b}$	3.1_{c}	$8.1_{a,c,d}$	$9.4_{b,d}$	33.6_{e}	16.7
Education	Complete secondary or higher	$21.4_{a,b,d}$	43.2_{a}	51.4_{a}	27.3_{b}	$18.7_{b,c}$	9.4_{d}	25.6
	Primary complete	$56.1_{a,b}$	$46.2_{a,d}$	45.2_{a}	62.8_{b}	$64.4_{b,c}$	$57.9_{b,d}$	56.3
	No edu. or primary edu. incomplete	$22.5_{a,c}$	$10.6_{a,b}$	3.4_{b}	10.0_{a}	16.9_{a}	32.7_{c}	18.1
Place of birth husband	1 mil and above	$47.3_{a,b}$	54.6_{a}	$39.4_{a,b}$	$37.6_{a,b}$	35.7_{b}	$30.8_{b,c}$	36.5
	Less than 1 mil.	$52.7_{a,b}$	45.4_{a}	$60.6_{a,b}$	$62.4_{a,b}$	64.3_{b}	$69.2_{b,c}$	63.5
Background Characteristics of Marriages								
Women's age at first marriage	18 and above	$67.1_{a,b,c}$	82.5_{a}	78.2_{a}	62.5_{b}	46.5_{c}	$39.6_{c,d}$	56.5
	Before 18	$32.9_{a,b,c}$	17.5_{a}	21.8_{a}	37.5_{b}	53.5_{c}	$60.4_{c,d}$	43.5
Relationship to husband	No relation	$79.4_{a,b,c}$	85.4_{a}	87.6_{a}	$80.5_{a,b}$	$70.5_{b,c}$	65.9_{c}	75.5
	Relative	$20.6_{a,b,c}$	14.6_{a}	12.4_{a}	$19.5_{a,b}$	$29.5_{b,c}$	34.1_{c}	24.5
Marriage arrangement	Themselves	$30.2_{a,b}$	50.9_{a}	45.1_{a}	20.2_{b}	$25.5_{b,c}$	$18.6_{b,d}$	28.1
	Families	$59.1_{a,b}$	46.5_{a}	50.4_{a}	73.8_{b}	$70.6_{b,c}$	$74.0_{b,d}$	66.3
	Escaped/ Abducted/ Other	10.7_{a}	2.7_{a}	4.5_{a}	6.0_{a}	3.9_{a}	7.4_{a}	5.7
Marriage ceremony	Only civil	$6.0_{a,b,c}$	10.0_{a}	$7.0_{a,b}$	$2.4_{b,c}$	1.0_{c}	$2.1_{c,d}$	3.6
	Both, civil first	$52.0_{a,b}$	51.5_{a}	60.3_{a}	64.8_{a}	52.2_{a}	28.3_{b}	47.6
	Both, religious first	$31.8_{a,b,c}$	$33.6_{a,b}$	31.7_{a}	$32.0_{a,b}$	44.4_{b}	61.5_{c}	44.7
	Only religious	10.1_{a}	$4.9_{a,b}$	0.9_{b}	$0.8_{b,c}$	$2.4_{a,b}$	7.8_{a}	4.0
	No ceremony	0.0[1]	0.0[1]	0.0[1]	0.0[1]	0.0[1]	0.3_{a}	0.1
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.3. Descriptive Results for the 1954-1963 Cohort

Background Characteristics of Women								
		Zero	One	Two	Three	Four	Five+	Total
Mother tongue	Turkish	$88.9_{a,b}$	$93.2_{a,b}$	96.4_{a}	$94.2_{a,b}$	91.6_{b}	63.5_{c}	87.3
	Other	$11.1_{a,b}$	$6.8_{a,b}$	3.6_{a}	$5.8_{a,b}$	8.4_{b}	36.5_{c}	12.7
Education	Complete primary/ higher	$77.8_{a,b,c}$	$84.7_{a,b}$	87.4_{a}	77.3_{b}	61.0_{c}	36.6_{d}	69.0
	No edu. or primary edu. incomplete	$22.2_{a,b,c}$	$15.3_{a,b}$	12.6_{a}	22.7_{b}	39.0_{c}	63.4_{d}	31.0
Childhood Place of Residence	Urban	$40.0_{a,c}$	66.0_{b}	51.4_{a}	36.2_{c}	$31.6_{c,d}$	21.0_{e}	38.9
	Rural	$60.0_{a,c}$	34.0_{b}	48.6_{a}	63.8_{c}	$68.4_{c,d}$	79.0_{e}	61.1
Background Characteristics of Husbands								
Mother tongue	Turkish	$82.2_{a,e}$	$91.7_{a,c}$	97.0_{b}	$95.2_{b,c,d}$	$91.8_{a,d}$	63.0_{e}	87.3
	Other	$17.8_{a,e}$	$8.3_{a,c}$	3.0_{b}	$4.8_{b,c,d}$	$8.2_{a,d}$	37.0_{e}	12.7
Education	Complete secondary or higher	$24.7_{a,c,d}$	51.5_{b}	$40.2_{a,b}$	23.1_{c}	$13.8_{d,e}$	8.0_{e}	25.5
	Primary complete	$62.3_{a,b,c,d}$	42.5_{a}	56.8_{b}	70.3_{c}	79.1_{d}	$68.3_{c,e}$	64.8
	No edu. or primary edu. incomplete	$13.0_{a,c}$	$6.1_{a,b}$	3.0_{b}	$6.6_{a,b}$	7.1_{a}	23.7_{c}	9.6
Place of birth husband	1 mil and above	$39.8_{a,b}$	$40.8_{a,b}$	42.8_{a}	$39.0_{a,b}$	30.9_{b}	$36.2_{a,b}$	38.2
	Less than 1 mil.	$60.2_{a,b}$	$59.2_{a,b}$	57.2_{a}	$61.0_{a,b}$	69.1_{b}	$63.8_{a,b}$	61.8
Background Characteristics of Marriages								
Women's age at first marriage	18 and above	$79.2_{a,b,c}$	91.8_{a}	81.0_{b}	$64.4_{c,d}$	59.1_{d}	32.6_{e}	63.8
	Before 18	$20.8_{a,b,c}$	8.2_{a}	19.0_{b}	$35.6_{c,d}$	40.9_{d}	67.4_{e}	36.2
Relationship to husband	No relation	$84.2_{a,b}$	92.2_{a}	84.7_{a}	77.3_{b}	$70.1_{b,c,d}$	65.1_{d}	77.0
	Relative	$15.8_{a,b}$	7.8_{a}	15.3_{a}	22.7_{b}	$29.9_{b,c,d}$	34.9_{d}	23.0
Marriage arrangement	Themselves	$46.6_{a,b}$	56.1_{a}	40.5_{b}	26.3_{c}	21.9_{c}	19.7_{c}	31.2
	Families	$49.5_{a,b}$	42.4_{a}	57.1_{b}	70.3_{c}	72.1_{c}	74.0_{c}	64.8
	Escaped/ Abducted/ Other	$3.9_{a,b}$	$1.5_{a,b}$	2.4_{a}	$3.4_{a,b}$	$5.9_{a,b}$	6.2_{b}	4.0
Marriage ceremony	Only civil	$3.6_{a,b}$	12.8_{a}	3.9_{b}	$2.4_{b,c}$	$1.7_{b,d}$	$1.8_{b,e}$	3.5
	Both, civil first	$41.7_{a,b}$	$50.4_{a,b}$	60.9_{a}	57.5_{a}	42.9_{b}	23.6_{c}	47.4
	Both, religious first	$51.0_{a,b,c}$	32.9_{a}	35.0_{a}	38.5_{a}	51.6_{b}	68.8_{c}	46.3
	Only religious	$0.9_{a,c,d,e}$	$3.4_{a,b,e}$	0.2_{c}	$1.6_{a,c,d}$	$3.8_{b,d,e}$	5.8_{e}	2.7
	No ceremony	2.8_{a}	0.5_{a}	0.0[1]	0.0[1]	0.0[1]	0.0[1]	0.1
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.4. Descriptive Results for the 1959-1968 Cohort

		Zero	One	Two	Three	Four	Five+	Total
Background Characteristics of Women								
Mother tongue	Turkish	81.2$_{a,c}$	92.6$_{a,b}$	96.6$_{b}$	92.6$_{a,b}$	84.2$_{c}$	55.4$_{d}$	85.5
	Other	18.8$_{a,c}$	7.4$_{a,b}$	3.4$_{b}$	7.4$_{a,b}$	15.8$_{c}$	44.6$_{d}$	14.5
Education	Complete primary/ higher	70.9$_{a,d}$	86.2$_{b}$	92.5$_{c}$	83.1$_{a,b}$	63.9$_{d}$	36.0$_{e}$	74.7
	No edu. or primary edu. incomplete	29.1$_{a,d}$	13.8$_{b}$	7.5$_{c}$	16.9$_{a,b}$	36.1$_{d}$	64.0$_{e}$	25.3
Childhood Place of Residence	Urban	50.6$_{a,b,c}$	58.9$_{a}$	55.1$_{a,b}$	46.1$_{b}$	31.9$_{c,d}$	27.9$_{d}$	45.7
	Rural	49.4$_{a,b,c}$	41.1$_{a}$	44.9$_{a,b}$	53.9$_{b}$	68.1$_{c,d}$	72.1$_{d}$	54.3
Background Characteristics of Husbands								
Mother tongue	Turkish	76.4$_{a}$	91.2$_{b}$	96.6$_{c}$	89.6$_{b}$	82.2$_{a}$	55.6$_{d}$	84.2
	Other	23.6$_{a}$	8.8$_{b}$	3.4$_{c}$	10.4$_{b}$	17.8$_{a}$	44.4$_{d}$	15.8
Education	Complete secondary or higher	39.2$_{a,b,d}$	57.0$_{a}$	46.9$_{b}$	39.0$_{b,c}$	26.2$_{d,e}$	18.0$_{e}$	39.1
	Primary complete	52.4$_{a,b,d}$	39.7$_{a}$	51.6$_{b}$	58.3$_{b,c,d}$	65.6$_{d}$	62.0$_{d,e}$	54.4
	No edu. or primary edu. incomplete	8.4$_{a,c,d}$	3.3$_{a,b}$	1.5$_{b}$	2.7$_{a,b}$	8.2$_{c}$	20.0$_{d}$	6.4
Childhood Place of Residence	Urban	48.6$_{a,b,c}$	60.4$_{a}$	52.7$_{a,b}$	44.4$_{b}$	29.6$_{c,d}$	22.6$_{d}$	43.8
	Rural	51.4$_{a,b,c}$	39.6$_{a}$	47.3$_{a,b}$	55.6$_{b}$	70.4$_{c,d}$	77.4$_{d}$	56.2
Background Characteristics of Marriages								
Women's age at first marriage	18 and above	82.2$_{a}$	95.8$_{b}$	77.4$_{a}$	59.9$_{c}$	54.8$_{c}$	35.8$_{d}$	66.9
	Before 18	17.8$_{a}$	4.2$_{b}$	22.6$_{a}$	40.1$_{c}$	45.2$_{c}$	64.2$_{d}$	33.1
Relationship to husband	No relation	89.0$_{a,b}$	87.9$_{a}$	80.4$_{b}$	72.9$_{b,c,d}$	66.5$_{d}$	54.1$_{e}$	74.0
	Relative	11.0$_{a,b}$	12.1$_{a}$	19.6$_{b}$	27.1$_{b,c,d}$	33.5$_{d}$	45.9$_{e}$	26.0
Marriage arrangement	Themselves	46.7$_{a,b}$	49.8$_{a}$	34.9$_{b}$	25.8$_{c}$	21.8$_{c,d}$	16.5$_{d}$	31.1
	Families	48.5$_{a,b,c}$	47.8$_{a}$	57.3$_{b}$	66.3$_{c,d}$	71.2$_{d,e}$	76.6$_{e}$	62.5
	Escaped/ Abducted/ Other	4.8$_{a,b}$	2.4$_{a}$	7.8$_{b}$	7.9$_{b,c}$	7.1$_{b,d}$	6.9$_{b,e}$	6.4
Marriage ceremony	Only civil	7.9$_{a,b}$	7.6$_{a}$	5.0$_{a,b}$	2.8$_{b}$	2.8$_{a,b}$	2.1$_{b,c}$	4.3
	Both, civil first	46.6$_{a,b}$	53.8$_{a}$	62.1$_{a}$	55.6$_{a}$	42.3$_{b}$	17.8$_{c}$	48.1
	Both, religious first	42.1$_{a,b}$	37.8$_{a}$	32.5$_{a}$	40.2$_{a}$	53.3$_{b}$	75.7$_{c}$	46.0
	Only religious	3.0$_{a,c}$	0.9$_{a,b}$	0.2$_{b}$	1.4$_{a,b,c}$	1.6$_{a,b,c}$	4.4$_{c}$	1.6
	No ceremony	0.4$_{a}$	0.0[1]	0.2$_{a}$	0.0[1]	0.0[1]	0.0[1]	0.1
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table 5.5. Descriptive Results for the 1964-1973 Cohort

		Zero	One	Two	Three	Four	Five+	Total
Background Characteristics of Women								
Mother tongue	Turkish	$86.0_{a,c}$	$91.4_{a,b}$	94.6_{b}	$90.4_{a,b}$	80.6_{c}	42.4_{d}	84.5
	Other	$14.0_{a,c}$	$8.6_{a,b}$	5.4_{b}	$9.6_{a,b}$	19.4_{c}	57.6_{d}	15.5
Education	Complete primary/ higher	$85.5_{a,b,c}$	91.7_{a}	91.4_{a}	83.0_{b}	71.3_{c}	37.1_{d}	80.1
	No edu. or primary edu. incomplete	$14.5_{a,b,c}$	8.3_{a}	8.6_{a}	17.0_{b}	28.7_{c}	62.9_{d}	19.9
Childhood Place of Residence	Urban	$61.7_{a,b}$	71.1_{a}	54.5_{b}	$47.2_{b,c}$	$45.9_{b,d}$	23.7_{e}	50.6
	Rural	$38.3_{a,b}$	28.9_{a}	45.5_{b}	$52.8_{b,c}$	$54.1_{b,d}$	76.3_{e}	49.4
Background Characteristics of Husbands								
Mother tongue	Turkish	$89.4_{a,b}$	89.5_{a}	92.9_{a}	90.5_{a}	78.8_{b}	41.9_{c}	83.6
	Other	$10.6_{a,b}$	10.5_{a}	7.1_{a}	9.5_{a}	21.2_{b}	58.1_{c}	16.4
Education	Complete secondary or higher	$39.8_{a,b,c}$	53.3_{a}	36.0_{b}	$24.4_{c,d}$	19.7_{d}	8.3_{e}	31.0
	Primary complete	$57.7_{a,b,c}$	44.4_{a}	62.2_{b}	72.2_{c}	$69.6_{b,c,d}$	$67.7_{b,c,e}$	63.0
	No edu. or primary edu. incomplete	$2.4_{a,b}$	2.3_{a}	1.8_{a}	3.3_{a}	10.7_{b}	24.0_{c}	6.1
Childhood Place of Residence	Urban	$54.6_{a,b,d}$	63.7_{a}	53.5_{b}	$45.8_{b,c,d}$	38.0_{d}	21.9_{e}	47.6
	Rural	$45.4_{a,b,d}$	36.3_{a}	46.5_{b}	$54.2_{b,c,d}$	62.0_{d}	78.1_{e}	52.4
Background Characteristics of Marriages								
Women's age at first marriage	18 and above	$91.8_{a,b}$	92.5_{a}	81.7_{b}	67.9_{c}	61.9_{c}	43.0_{d}	73.6
	Before 18	$8.2_{a,b}$	7.5_{a}	18.3_{b}	32.1_{c}	38.1_{c}	57.0_{d}	26.4
Relationship to husband	No relation	$83.0_{a,b,d}$	90.1_{a}	81.1_{b}	$74.7_{b,c,d}$	69.3_{d}	55.5_{e}	76.6
	Relative	$17.0_{a,b,d}$	9.9_{a}	18.9_{b}	$25.3_{b,c,d}$	30.7_{d}	44.5_{e}	23.4
Marriage arrangement	Themselves	$50.3_{a,b}$	60.5_{a}	41.6_{b}	30.1_{c}	18.6_{d}	17.3_{d}	36.8
	Families	$44.5_{a,b}$	36.1_{a}	54.7_{b}	65.4_{c}	$75.7_{c,d}$	75.8_{d}	58.7
	Escaped/ Abducted/ Other	5.2_{a}	3.3_{a}	3.7_{a}	4.5_{a}	5.7_{a}	6.8_{a}	4.5
Marriage ceremony	Only civil	14.0_{a}	$8.0_{a,c}$	3.2_{b}	2.9_{b}	$3.0_{b,c}$	0.6_{b}	3.9
	Both, civil first	$51.9_{a,b}$	53.0_{a}	57.3_{a}	49.7_{a}	33.4_{b}	20.5_{c}	47.4
	Both, religious first	26.5_{a}	$36.9_{a,b}$	$38.4_{a,b}$	46.7_{b}	62.7_{c}	75.4_{d}	46.9
	Only religious	7.6_{a}	$2.1_{a,b}$	1.0_{b}	$0.8_{b,c}$	$0.9_{b,d}$	$3.6_{a,b}$	1.7
	No ceremony	0.0[1]	0.0[1]	0.1_{a}	0.0[1]	0.0[1]	0.0[1]	0.0
Total		100.0	100,0	100,0	100,0	100,0	100,0	100,0

Table 5.6. Descriptive Results for the 1969-1978 Cohort

		Zero	One	Two	Three	Four	Five+	Total
Background Characteristics of Women								
Mother tongue	Turkish	$84.2_{a,c}$	$91.7_{a,b}$	94.5_{b}	$90.7_{a,b}$	71.7_{c}	35.3_{d}	84.4
	Other	$15.8_{a,c}$	$8.3_{a,b}$	5.5_{b}	$9.3_{a,b}$	28.3_{c}	64.7_{d}	15.6
Education	Complete primary/ higher	$89.2_{a,b,c}$	$93.5_{a,b}$	94.8_{a}	88.3_{b}	72.7_{c}	44.4_{d}	85.6
	No edu. or primary edu. incomplete	$10.8_{a,b,c}$	$6.5_{a,b}$	5.2_{a}	11.7_{b}	27.3_{c}	55.6_{d}	14.4
Childhood Place of Residence	Urban	$59.7_{a,b,c}$	68.2_{a}	58.8_{b}	43.4_{c}	$39.4_{c,d}$	23.0_{e}	52.3
	Rural	$40.3_{a,b,c}$	31.8_{a}	41.2_{b}	56.6_{c}	$60.6_{c,d}$	77.0_{e}	47.7
Background Characteristics of Husbands								
Mother tongue	Turkish	$88.8_{a,b,c}$	89.5_{a}	95.1_{b}	$90.3_{a,b}$	71.4_{c}	36.7_{d}	84.2
	Other	$11.2_{a,b,c}$	10.5_{a}	4.9_{b}	$9.7_{a,b}$	28.6_{c}	63.3_{d}	15.8
Education	Complete secondary or higher	$46.7_{a,b,c}$	58.4_{a}	46.6_{b}	$35.5_{c,e}$	$27.9_{c,d,e}$	26.1_{e}	43.1
	Primary complete	$48.8_{a,b,c}$	39.4_{a}	52.4_{b}	62.4_{c}	$62.8_{b,c,d}$	$57.2_{b,c,e}$	52.8
	No edu. or primary edu. incomplete	$4.5_{a,b}$	2.1_{a}	1.0_{a}	2.1_{a}	9.3_{b}	$16.7_{b,c}$	4.1
Childhood Place of Residence	Urban	$58{,}2_{a,b}$	$66{,}1_{a}$	$57{,}1_{a}$	$38{,}9_{b,c}$	$37{,}0_{c}$	$30{,}2_{c,d}$	50.6
	Rural	$41{,}8_{a,b}$	$33{,}9_{a}$	$42{,}9_{a}$	$61{,}1_{b,c}$	$63{,}0_{c}$	$69{,}8_{c,d}$	49.4
Background Characteristics of Marriages								
Women's age at first marriage	18 and above	$93.1_{a,b}$	94.1_{a}	82.0_{b}	69.6_{c}	62.6_{c}	35.0_{d}	76.1
	Before 18	$6.9_{a,b}$	5.9_{a}	18.0_{b}	30.4_{c}	37.4_{c}	65.0_{d}	23.9
Relationship to husband	No relation	88.8_{a}	83.9_{a}	78.6_{a}	69.6_{b}	$60.6_{b,c}$	49.4_{c}	73.5
	Relative	11.2_{a}	16.1_{a}	21.4_{a}	30.4_{b}	$39.4_{b,c}$	50.6_{c}	26.5
Marriage arrangement	Themselves	69.2_{a}	67.5_{a}	48.2_{b}	34.2_{c}	30.6_{c}	12.8_{d}	45.4
	Families	$28.7_{a,b}$	30.1_{a}	48.0_{b}	60.5_{c}	64.7_{c}	83.1_{d}	50.7
	Escaped/ Abducted/ Other	2.1_{a}	2.4_{a}	3.9_{a}	5.3_{a}	4.7_{a}	4.1_{a}	3.9
Marriage ceremony	Only civil	10.8_{a}	$7.2_{a,c}$	2.9_{b}	1.5_{b}	1.0_{b}	$1.1_{b,c}$	3.6
	Both, civil first	$43.6_{a,b}$	50.1_{a}	57.3_{a}	50.9_{a}	37.5_{b}	20.0_{c}	47.9
	Both, religious first	$44.6_{a,b}$	40.1_{a}	38.9_{a}	$45.8_{a,b}$	57.9_{b}	76.9_{c}	46.7
	Only religious	0.9_{a}	1.2_{a}	0.9_{a}	1.1_{a}	3.5_{a}	2.0_{a}	1.4
	No ceremony	0.0[1]	1.3_{a}	0.0[1]	0.6_{a}	0.0[1]	0.0[1]	0.5
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0

5.3.2. Odds ratios

The complete results of the regression model with odds ratios, standard errors, p values and confidence intervals are presented in the Appendix Table D7 through D12. The following visualizations (Figure 5.22 – 5.26) summarizes the significant variables (orange if $p < 0.01$, blue if $0.01 \leq p < 0.05$) in each cohort grouped together according to the cluster. For each variable, the hollowed bars show the reference category with an odds ratio of 1. Since the reference cluster is selected as the two children-norm in all cohorts, all the interpretations are made according to this comparison. Therefore, the increased or decreased odds of belonging to a cluster is always calculated with reference to two children-norm cluster.

The Figure 5.22 shows the significant odds ratios from the comparison of childless women and women in two children-norm cluster for 5 cohorts. Husband's higher education is seemed to be negatively associated with belonging to childless cluster. For 1949-58, 1959-68 and 1969-78 cohorts, women with a lower educated husband have higher odds of belonging to the childless cluster than the two children-norm. For the youngest cohort, having a civil marriage ceremony significantly decreases the odds of belonging to the childless cluster. Woman with Turkish mother tongue (for 1964-73) and the husbands with Turkish mother tongue (for 1954-63) can also have reduced odds of being in the childless cluster. For the youngest cohort, if the spouses decide for the marriage rather than their families, odds of belonging to childless cluster is 2.2 times. In general, it is difficult to talk about a cohort pattern for the childlessness preference which gives clues about experiencing childlessness as a result of possible infertility rather than a choice.

The Figure 5.23 shows the significant odds ratios from the comparison of women in one child-norm cluster and women in two children-norm for 5 cohorts. As discussed earlier, as the cohorts get younger, the structure of the one child-norm cluster changes and this can be observed through the variables that cause one child norm cluster to differ significantly from two child norm cluster. In younger cohorts, marrying after age 18 and the length of time a woman spent in education significantly increased the odds of being in one child-norm cluster. Interestingly, however, with the higher education level of husband lowers the odds of being in a one child-norm cluster in both younger and older cohorts. Being related to the spouse is also among the factors that reduce the odds of being in one child-norm cluster. For 1964-73 cohort, being raised in the urban significantly increases the odds of being in the one child-norm cluster. In summary, getting married after the age of 18 created a significant differentiation across the cohorts, while in younger generations, the increase in the time spent by women in education and being raised in the urban had an effect that increased the odds of belonging to one child-norm cluster.

The Figure 5.24 shows the significant odds ratios from the comparison of women in three children-norm cluster and women in two children-norm for 5 cohorts. Most striking in this comparison is that for nearly all cohorts, woman's education made a significant difference. The results show that for each year a woman spends in education, the odds of being in three children-norm cluster instead of two was reduced by about 10 percent. Similarly, getting married after age 18 reduces the odds of being in a three children-norm cluster by nearly 40 percent across cohorts. For the youngest cohort, husband being raised in the urban significantly decreases the odds of women being in the three child-norm cluster.

The Figures 5.25 and 5.26 shows the significant odds ratios from the comparison of women in four and five or more children-norm cluster with the women in two children-norm for 5 cohorts. The significant variables are similar for these two relatively higher fertility behaviour clusters. The results show that for each year a woman spends in education, the odds of being in four children-norm cluster instead of two was reduced by about 15 percent and the odds of being in five or more children-norm cluster instead of two was reduced by about 20 percent. For the younger three cohorts, husband’s education and husband’s mother tongue also have significant effect on the odds of being in these two relatively higher fertility behaviour clusters. Being related to the husband also increases the odds of belonging to the five or more children cluster. In addition, for the youngest cohort, being raised in the urban had an effect that decreased the odds of belonging to the five or more child-norm cluster.

Figure 5.22. Childless Clusters Significant Odds Ratio Results

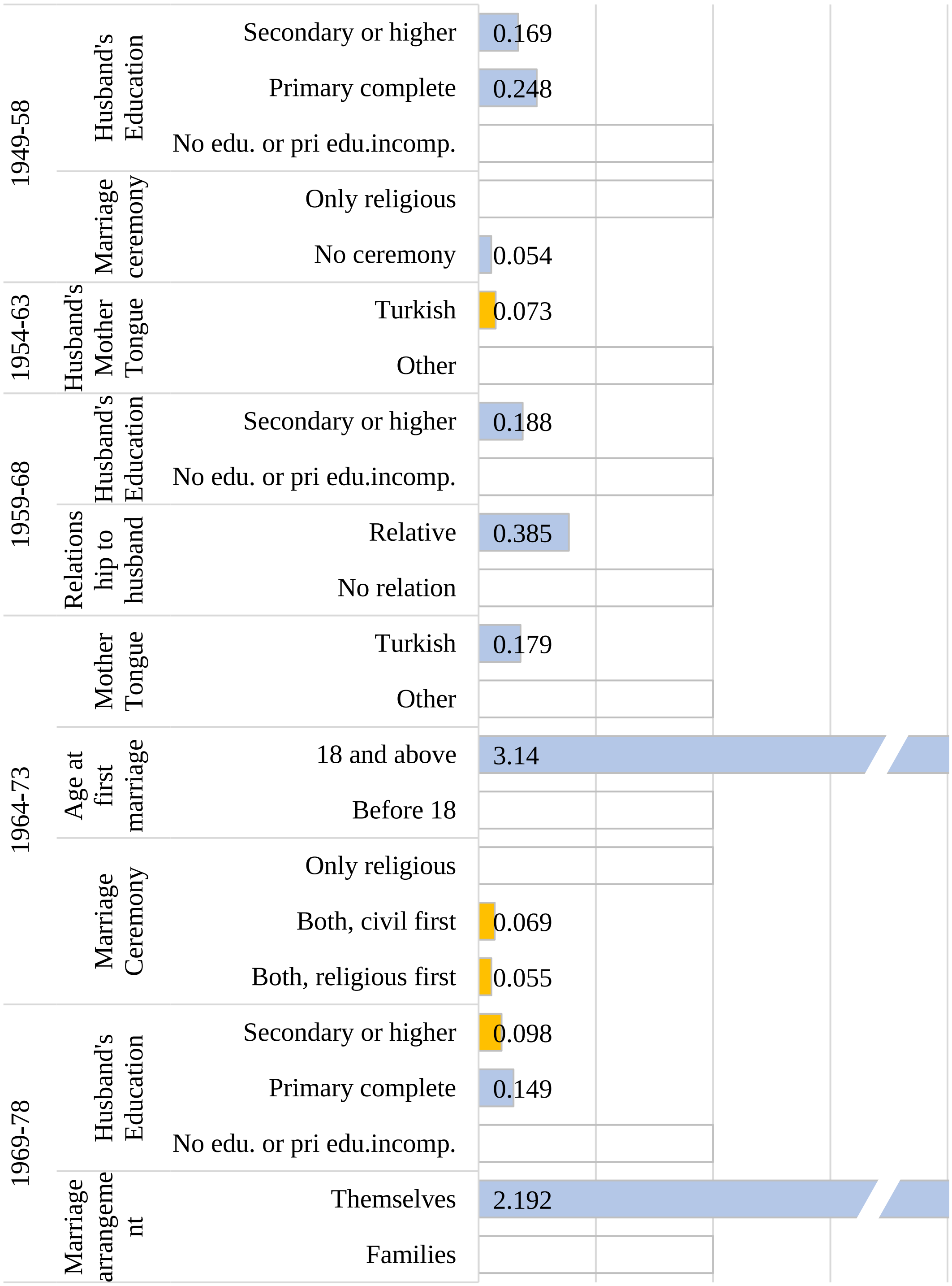


Figure 5.23. One Child-norm Clusters Significant Odds Ratio Results

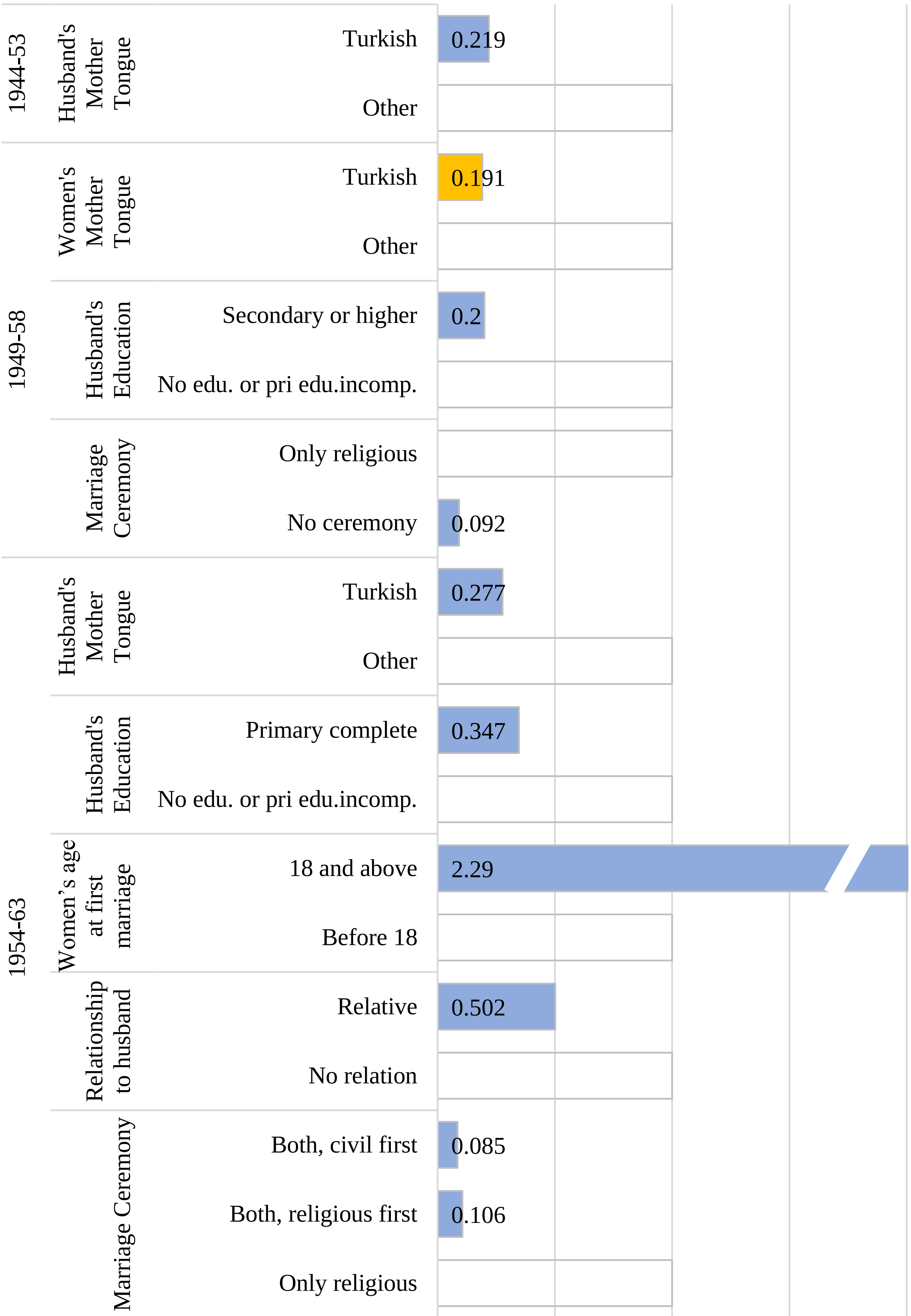


Figure 5.23. (continued) One Child-norm Clusters Significant Odds Ratio Results

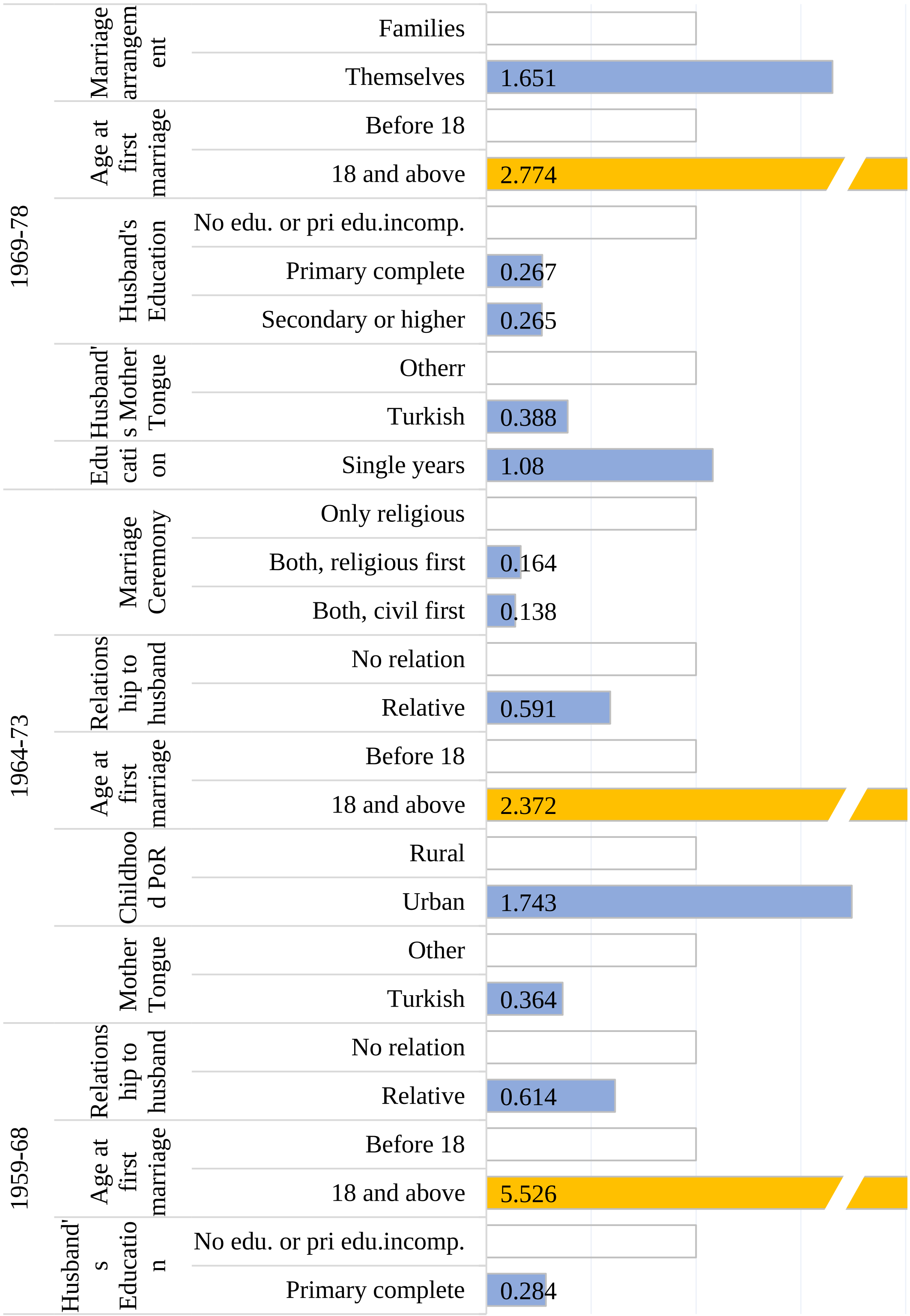


Figure 5.24. Three Children-norm Clusters Significant Odds Ratio Results

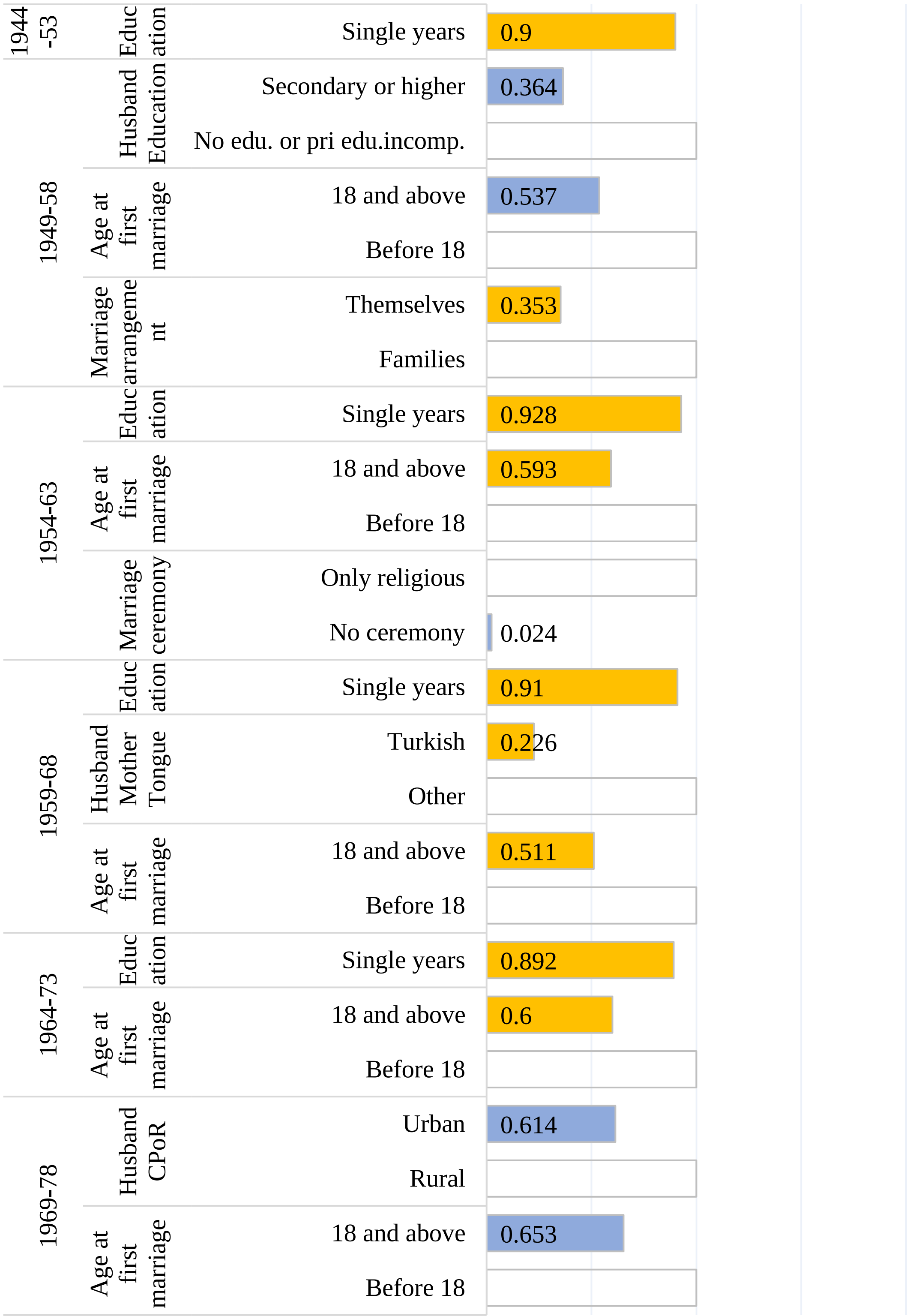


Figure 5.25. Four Children-norm Clusters Significant Odds Ratio Results

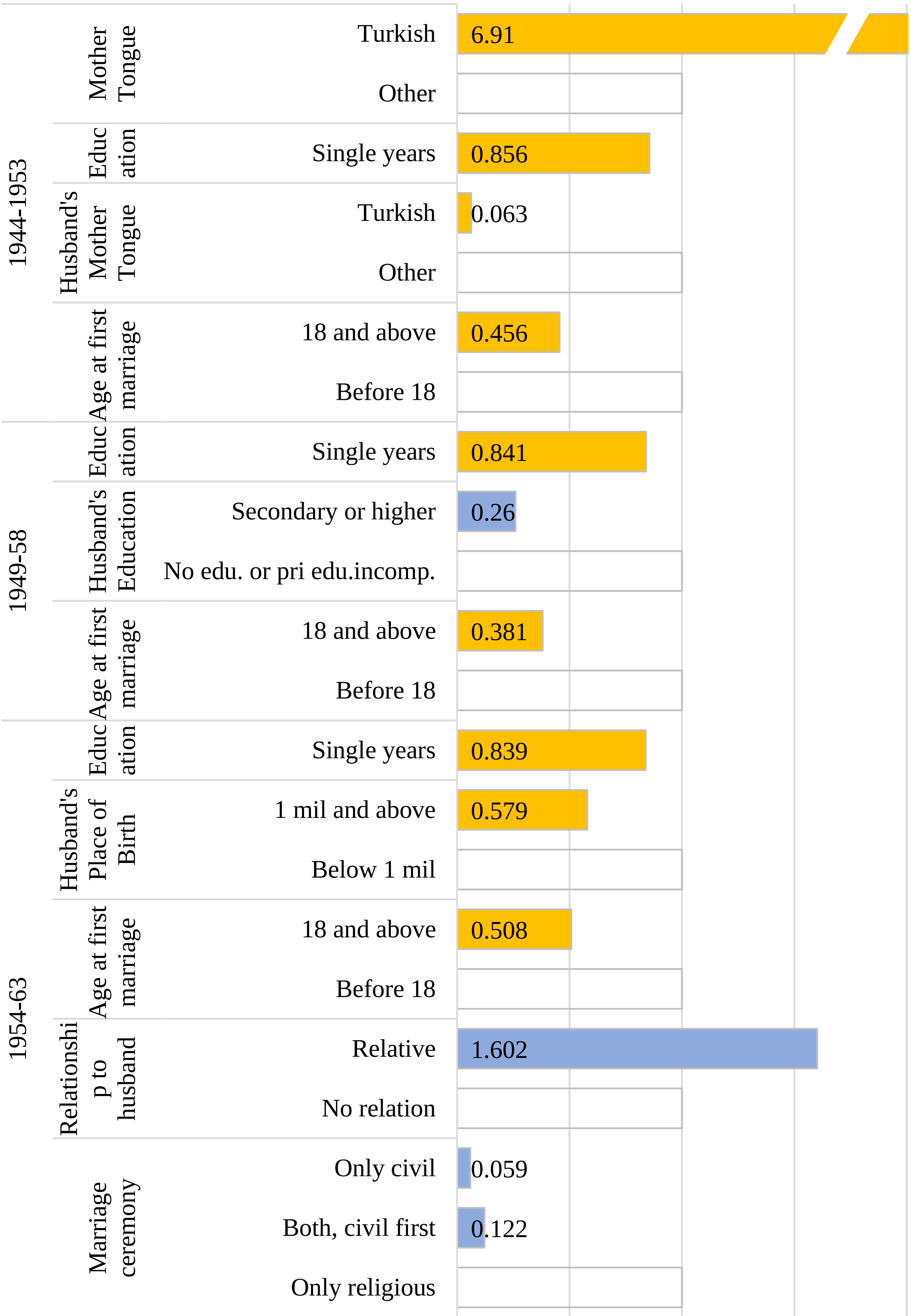


Figure 5.25. (continued) Four Children-norm Clusters Significant Odds Ratio Results

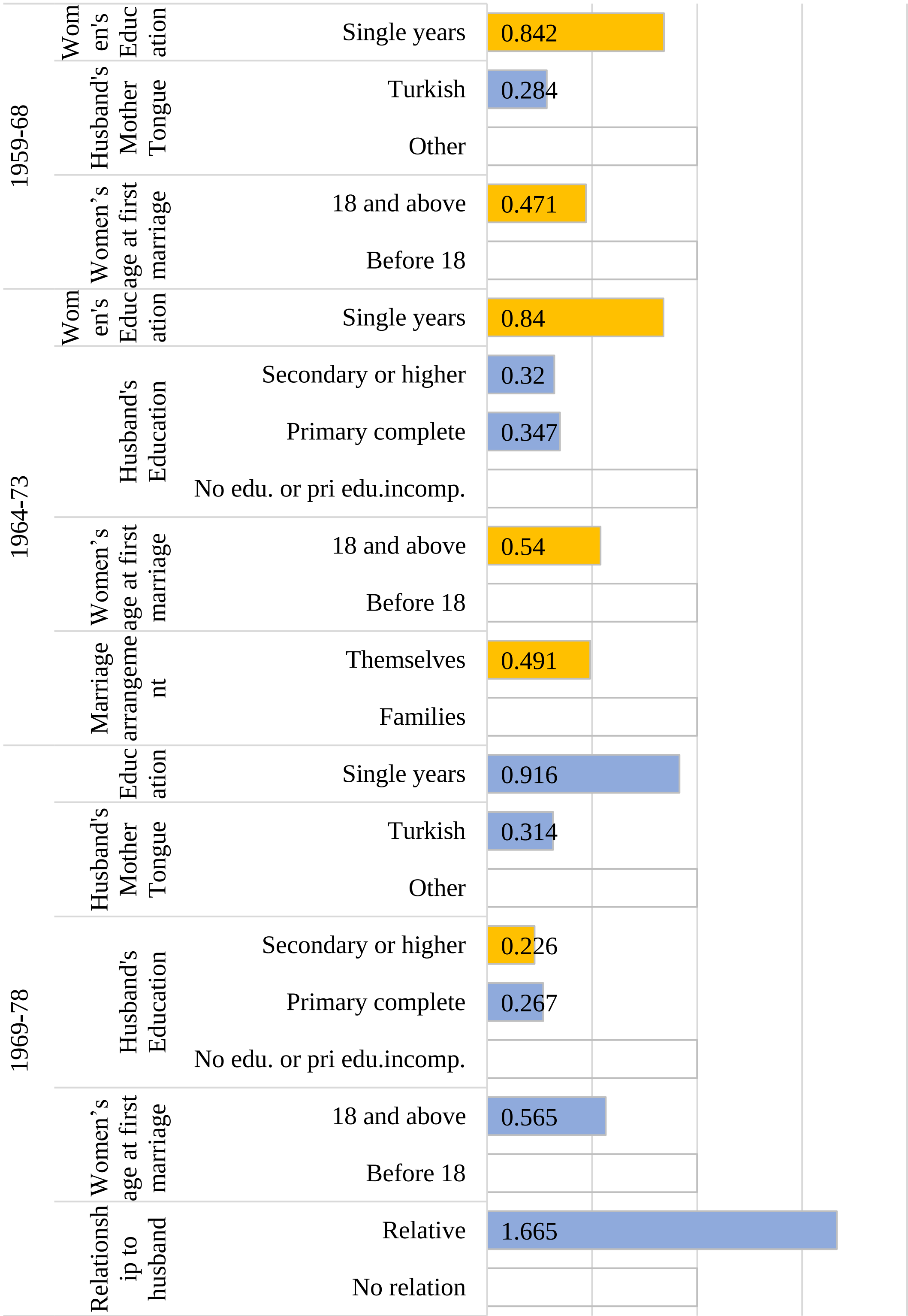


Figure 5.26. Five or more Children-norm Clusters Significant Odds Ratio Results

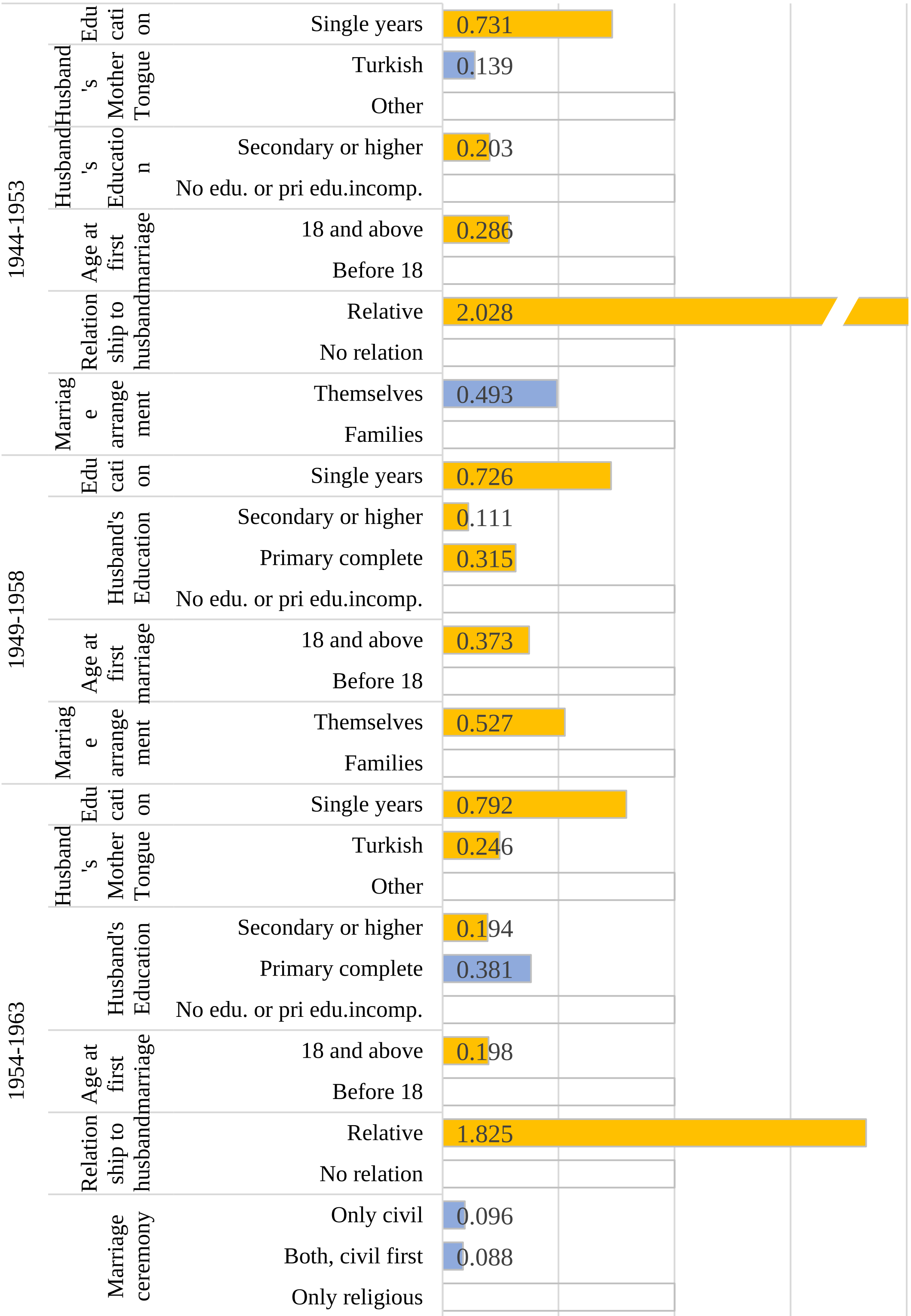
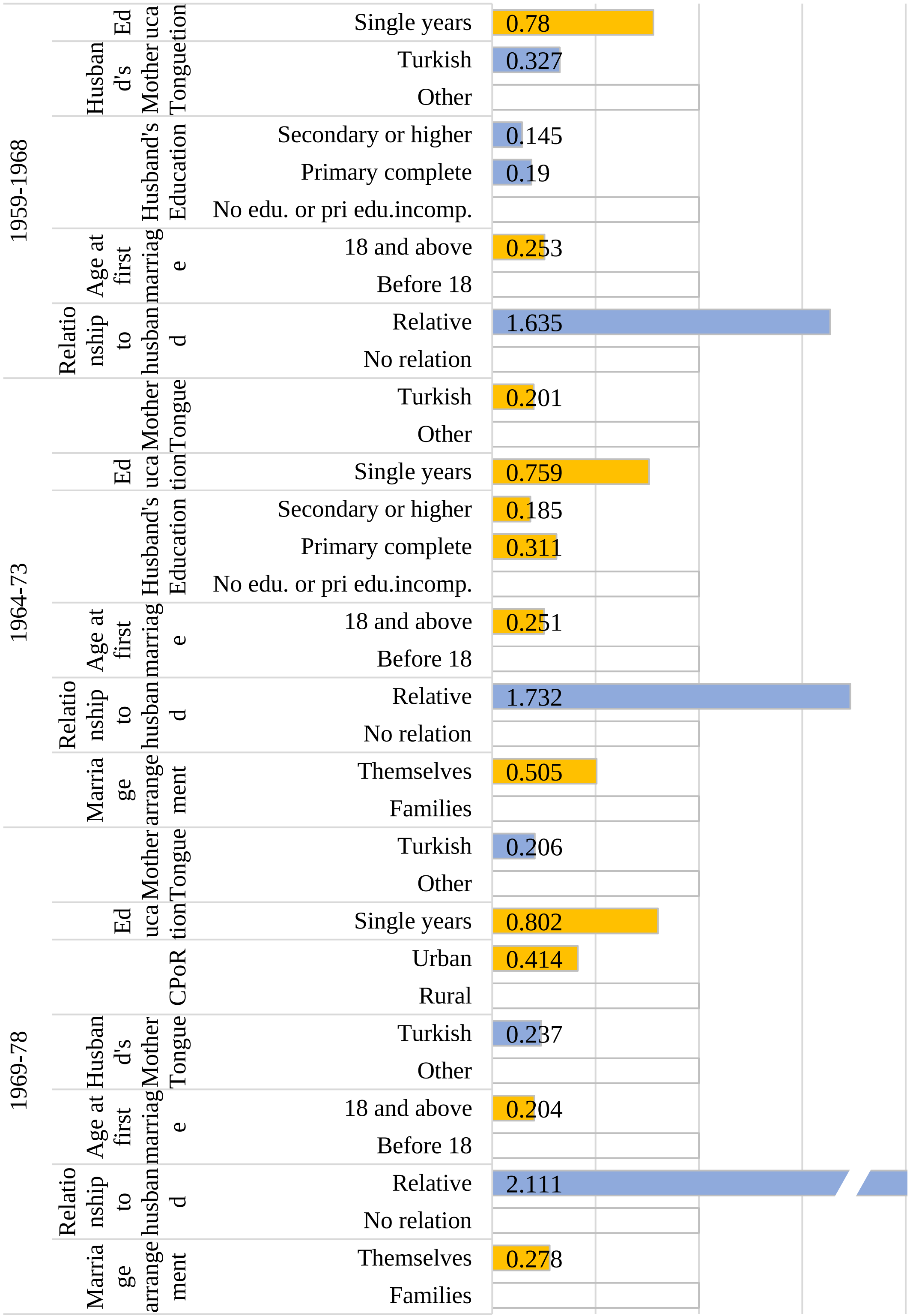


Figure 5.26. (continued) Five or more Children-norm Clusters Significant Odds Ratio Results



5.3.3. Post estimation analysis

Annex Table x shows the predicted probabilities calculated from the multinomial logistic regression model and marginal effects at group-specific means for education and childhood place of residence, as well as the interaction between those elements. The predictions show the probability of being in each cluster for ideal types, e.g., the probability of an average-educated woman raised in an urban area. Figure 5.27 summarizes the predicted probabilities of clusters for the cohort overall (colored dots), as well as two ideal types; average women with at least primary education (dark diamonds) and average women with less than primary education (light diamonds). In addition, the same probabilities are calculated separately for women raised in urban and rural areas (Figure 5.28 and Figure 5.29).

It is evident that predicted childlessness probabilities remained quite small in Turkey for the overall, urban and rural groups throughout the years. Childlessness also does not differ with the educational background of women, while the remaining clusters show clear patterns. The share of one child-norm cluster increased in Turkey among the cohorts and educated women who grew up in urban areas increasingly prefer one child or longer spacing of births after the first birth. For educated women, having only one child, or longer spacing after the first birth is becoming an alternative to the two-child norm. The predicted probability of two children-norm cluster has also increased in years, especially for the women who grew up in rural areas. Although the two-child norm was already a settled behavior among educated women from urban areas, it has become more common among women from rural backgrounds in recent cohorts.

Figure 5.27. Predicted Probabilities from Multinomial Logistic Regression for Women

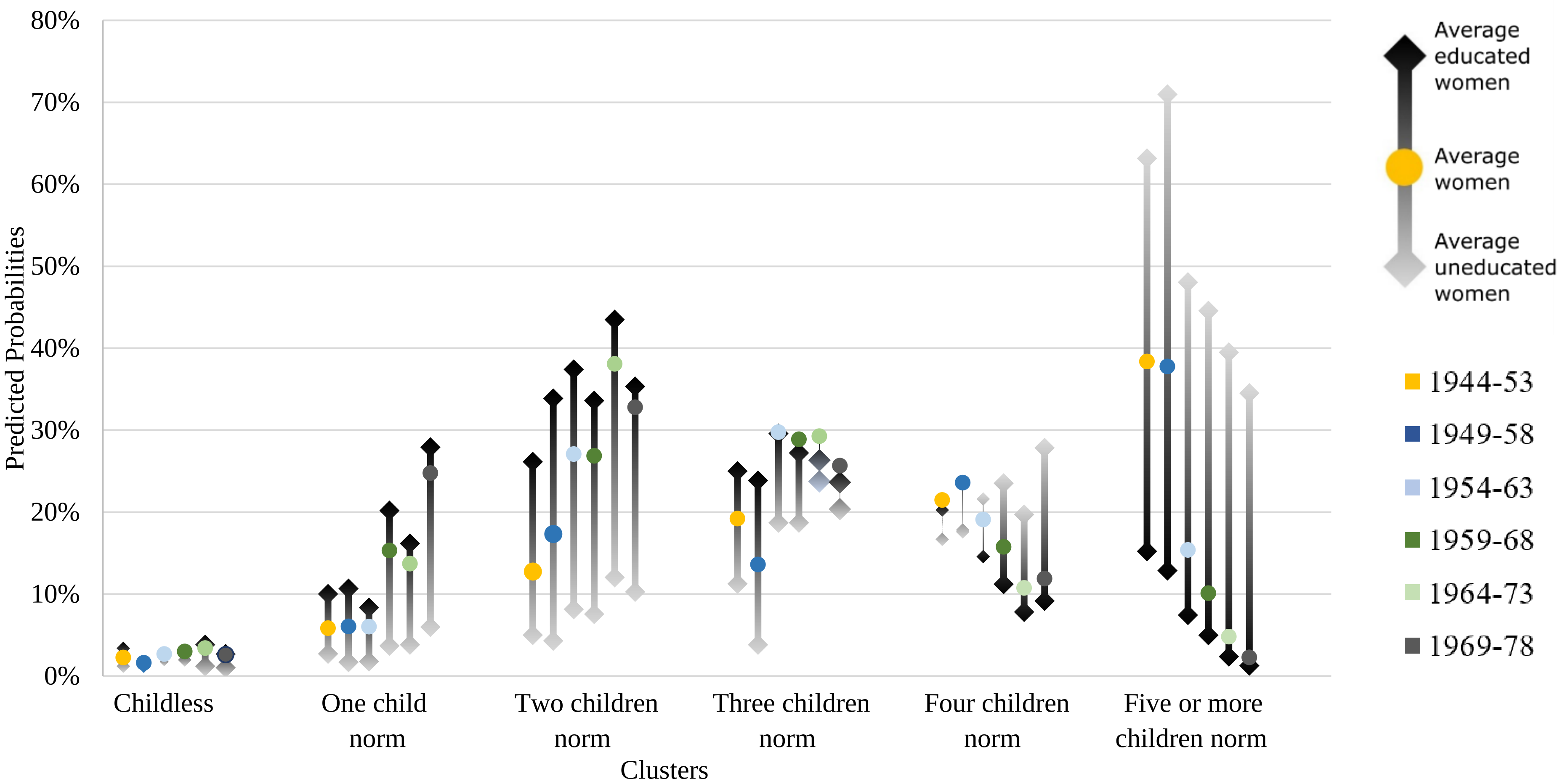


Figure 5.28. Predicted Probabilities from Multinomial Logistic Regression for Women Who Grew up in Rural Areas

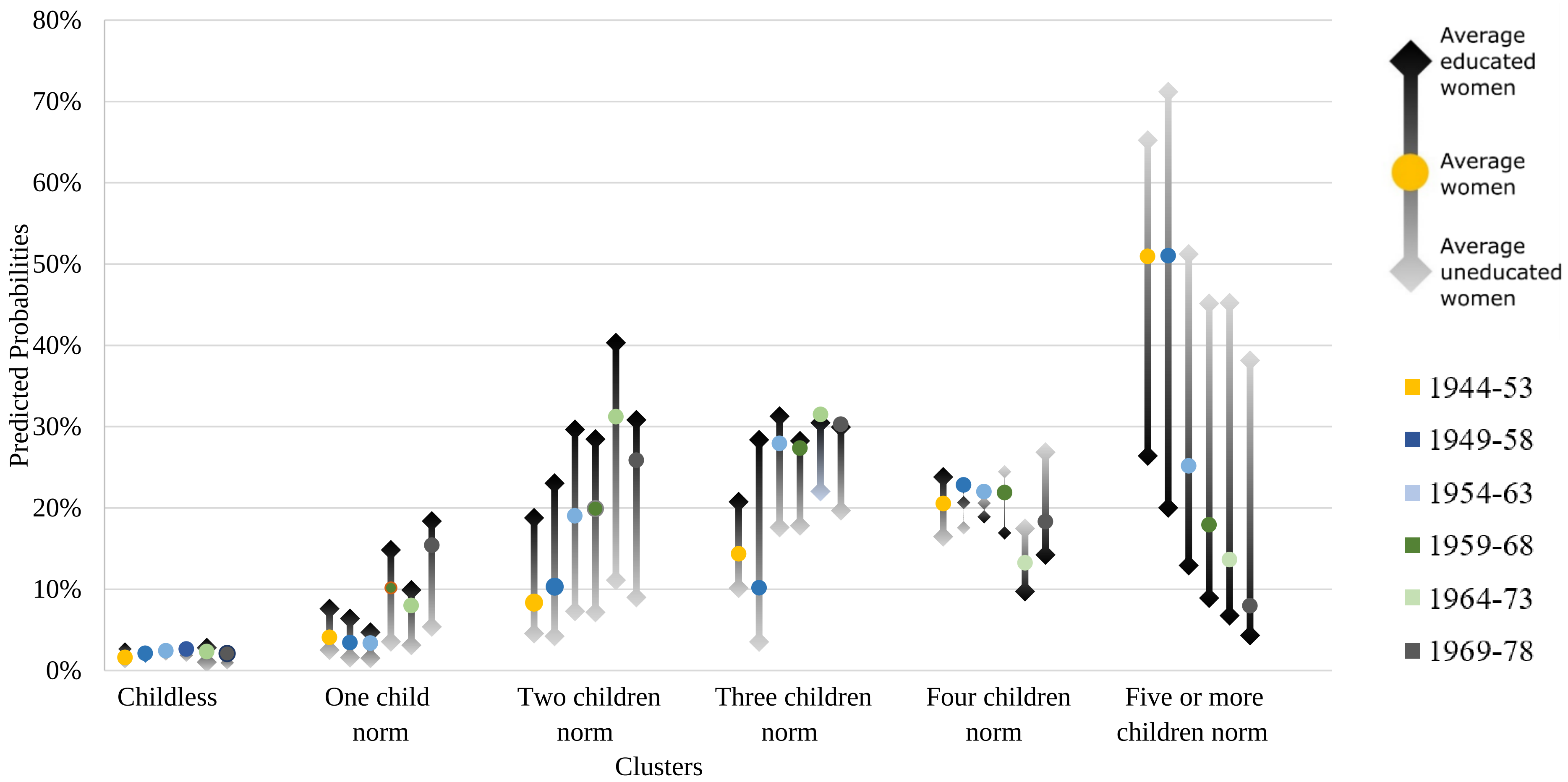
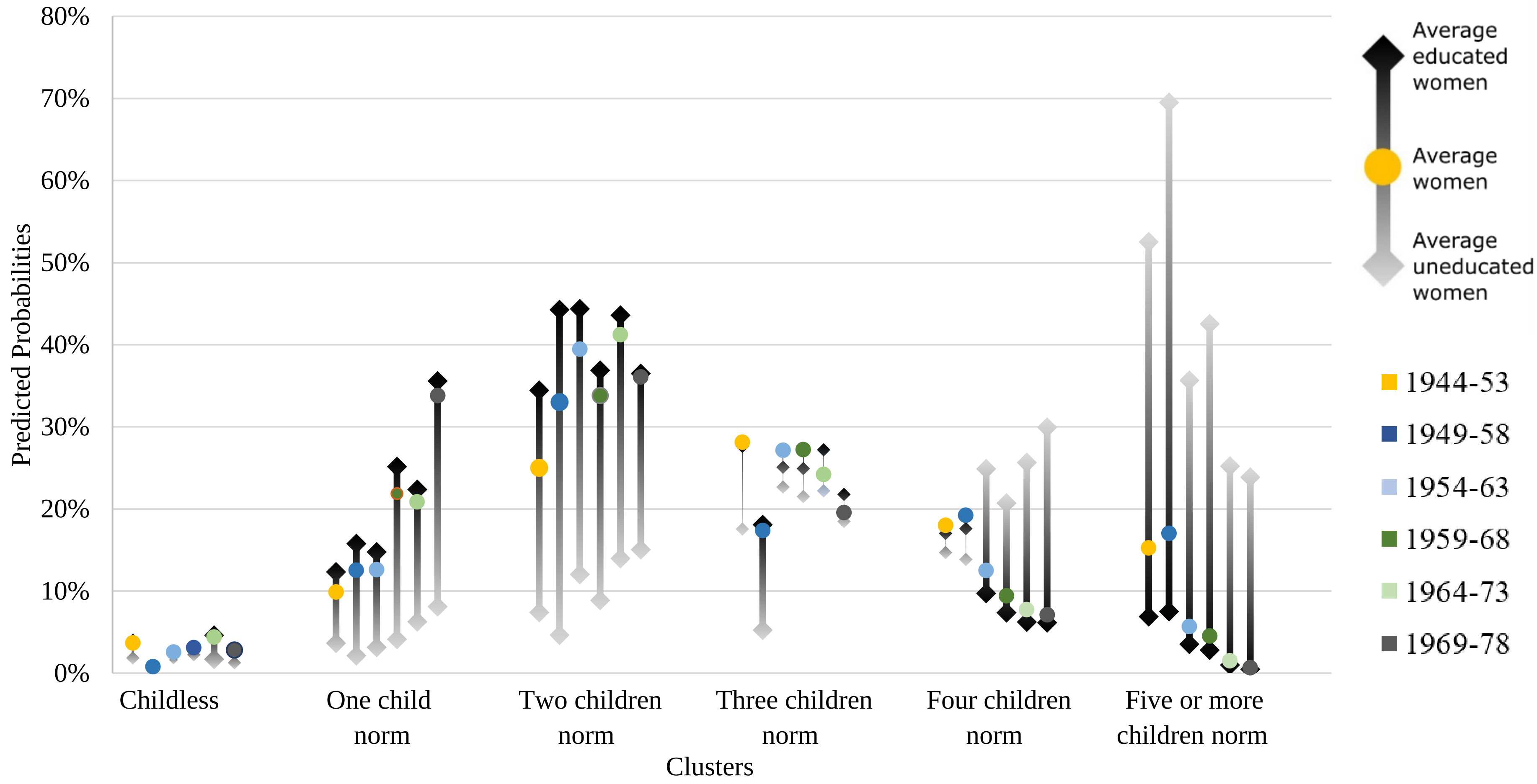


Figure 5.29. Predicted Probabilities from Multinomial Logistic Regression for Women Who Grew up in Urban Areas



Contrary to the previous two clusters, the three children-norm cluster remained relatively stable among the cohorts, but the educational difference in the three children-norm cluster diminished over time. Education has no significant effect on the three children-norm cluster for women from urban areas and the effect of education remained stable for the women who grew up in rural areas. The decreasing share of higher parities seem to coincide with an increase in the share of the three children-norm cluster, especially for rural women. Although there was only a small decrease in the share of the four children-norm category, educational difference became more significant throughout the years and shares of the four children-norm cluster increased for urban-raised women with less than primary education. Contrary to the three children-norm cluster, the educational background of women became more determinant of the four children-norm cluster over time.

There were two striking results in the five or more children-norm cluster, including the difference in fertility between uneducated and educated women, and the decrease in size of the category as a whole, which decreased by 30% with a stable difference between women according to educational background. Although the change of size in the five or more children-norm for educated women was relatively small, the decrease in rural uneducated women can be related to an increase in the three and four children-norm clusters, and the decrease of share of five or more children-norm cluster in educated rural women can be related to an increase in the two children-norm cluster.

CHAPTER 6. CONCLUSION AND DISCUSSION

It is not easy to predict the course of fertility in populations where the demographic transition is near its end. The path of fertility that regresses to replacement level depends on the cultural and historical structure of the population, as well as the course of its demographic transition. The second demographic transition and the theories associated with it provide remarkable insight into the phenomena through the experiences of Western populations, but even deeper insight may be need when interpreting the post-transition fertility of non-Western populations. Understanding fertility in relatively homogeneous population segments across a broad cohort can be considered one of these key insights. In order to understand how fertility will move in the post-transformation period, it is necessary to evaluate the changes in fertility during the transformation together with the social and cultural changes that the population has undergone.

While variations in fertility behaviors can be ignored at times of higher fertility levels, these differences emerge when fertility levels are low enough. Although there is, on average, a steady decline in fertility levels during periods of low fertility, the limitation of fertility can occur in different ways. This indicates that fertility does not vary uniformly. In this context, I have examined the fertility structures in Turkey from the perspective that conceptualized as the heterogeneity of fertility, which can be defined as multiple traces of fertility – or fertility trajectories - observed in a cohort of women which are significantly different from each other. Examining the heterogeneous structure of fertility allows understanding the movements of different fertility behaviors in the period of fertility transition. Since trying to understand this transition only with the change in fertility behavior would be evaluating the reality from a single side, societal transformations that took place in this period also worth examining.

The decline in fertility since the second half of the 20th century and the use of family planning methods constitute the majority of research interest on fertility in Turkey. In these studies, changes in fertility levels are generally associated with ongoing fertility transitions. Changes in fertility patterns go hand-in-hand with other significant social changes. Examining the heterogeneity of fertility pathways reveals trends that, when considered together with current levels of fertility and mortality, indicate Turkey is in the final stages of demographic transition. Although the path followed by Turkey in this transition is in line with the conventional course of events when the population is considered as a whole, detailed examination of fertility trajectories show this transition is by no means homogeneous. Growing urbanization and an increase in education levels for women in Turkey have led to a shift in the cultural structure of the population and as cities become more and more cosmopolitan spaces, women's participation in the public sphere has also increased. Both of these changes have increased women's opportunities to communicate with each other.

Increasing urbanization has increased the interaction of heterogeneous populations. It can be alleged that intellectual interaction, especially with migration from rural to urban areas, affected migrants and urban dwellers. The increase in women's participation in education has also significantly increased the interaction between people from different backgrounds, especially among the younger cohorts. All of these increased interactions make it possible to examine fertility changes from a diffusion of fertility behavior which is the dissemination or adoption of new information, ideas, beliefs, or social norms that may change reproductive decisions and behaviors through social interaction (Reeds, 1999). While examining the differences in fertility in the axis of education and urbanization on the basis of interaction, it has also gained importance whether the people who are likely to interact are similar to each other. In accordance with the definition of homophily, it is important that fertility behavior can be more similar among people who are similar to each other in social background characteristics, but a transition between less similar people is also necessary for a fertility behavior to diffuse.

Based on this perspective, the fertility trajectories of women cohorts in Turkey between 1944 and 1978 and the change in these trajectories in light of Turkey's changing societal structures and fertility decline were examined. To this end, the completed fertility trajectories of ever-married women are clustered from a holistic perspective and these groups are analyzed using childhood place of residence and educational status as key variables. In the study, fertility trajectories of women were created in order to understand the fertility behaviors in Turkey and the changes in these behaviors with the variations of tempo structure. For this purpose, the fertility histories of ever married women in the 40-49 age group were used by employing 1993, 1998, 2003, 2008, 2013 and 2018 TDHS data. Since these trajectories were made by analyzing women who have almost completed their fertility, it has been possible to evaluate from a cohort fertility perspective. Afterwards, women were grouped using these fertility trajectories and, in this way, fertility behavior clusters were formed. The creation of this cluster is the first step towards understanding the heterogeneous nature of fertility in Turkey. These clusters formed the main point of view of the study. All subsequent analyzes evaluated these clusters from different perspectives, focused on the internal structures of the clusters and their changes.

The analyzes have shed light on the heterogeneous nature of fertility from different perspectives. The results of the sequence analysis based on the parity state of women show that, over time, types of fertility trajectory clusters remained similar (and named with respect to their fertility behavior as; “one child-norm”, “two children-norm”, “three children-norm”, “four children-norm” and “five or more children-norm” based on the fact that a certain parity stands out as the norm) but there was a change in the sizes of them. The size of the relatively higher fertility behavior clusters (“three children-norm”, “four children-norm” and “five or more children-norm”) has declined through the years and the outstanding increase of share was observed in the one-norm cluster. While the total time spent with 5 or more children decreased significantly, the time spent childless in the reproductive zone is extended and spacing has increased, particularly between second and third births. The emergence of the same heterogeneous fertility trajectories for each cohort and the consistency of the cluster analysis confirmed the hypothesis that fertility is indeed heterogeneous in Turkey.

The second hypothesis of the thesis was that the heterogeneity of fertility in Turkey increased during the analyzed period. The results of the cluster analysis and representatives of the clusters partially verify this hypothesis. The increasing heterogeneity in the one child-norm and four children-norm clusters indicates that these fertility behaviors are in an evolutionary process or that transitional fertility behaviors are found in these clusters. For the one child-norm cluster, since the behavior of having only one child at a very late stage in the reproductive period is not observed in the younger cohorts as a representative can indicate an absence of a transition to childlessness from this cluster. The variation seen in the younger cohorts in representatives in one child, three children and four children-norm clusters indicated an increase in the heterogeneity of these groups. For three children-norm cluster, the fact that a subgroup that spent a longer time with two children is among the representatives in the recent period can be an indication of an evolvement of this fertility behavior into two children-norm. Furthermore, the significant decrease in the time spent without children between one child-norm and two children-norm clusters carries clues that the target fertility is decided at the beginning of the childbearing age. The stable structure in the two children-norm cluster specifies that this fertility behavior will continue to remain dominant in the near future. Although a relatively homogeneous structure is observed in the groups of five or more children, the decrease in size of this group indicates that high fertility behavior has become a more marginal choice. Considered all together, the heterogeneous structure increased in some fertility behaviors and remained stable for others, which indicates the hypothesis was partially confirmed.

The third hypothesis was the homogeneity of fertility behavior indicates similar background categories of women. Again, the results of the distance analysis and multinomial analysis partially verify this hypothesis. The results of distance analysis showed an increase of heterogeneity for the women in relatively higher fertility behavior clusters but a decrease in the relatively lower ones. While heterogeneity among husbands decreased in the two children-norm cluster, the fact that women were the most homogeneous group indicates that the fertility structure of this group is strongly connected to the backgrounds of the individuals. The fact that the spouses began to resemble each other despite the women and marriages started to become more dissimilar in the three children-norm cluster shows that this fertility behavior is mostly shaped by the characteristics of the husbands. The changes in the four and five or more children cluster show that these fertility behaviors are affected by cultural or social structures rather than individual background characteristics. Considered all together, the hypothesis was confirmed that the women in one, two and three children-norm clusters are similar according to their background characteristics but the women in four and five or more children cluster became increasingly heterogenous with time.

When the dimensions of women, spouses and marriage are considered together, the two children-norm cluster is clearly separated from the other clusters. The education levels of both women and spouses differ for clusters of two and three children. Looking at the differences in terms of cohorts shows that higher education is more effective than spending childhood in the city. Odds ratio results give a more detailed idea about the differentiation of two child clusters from other clusters. According to the findings, the most prominent determinant is the women's age at marriage. While a marriage after the age of 18 increases the women's odds of being in one child-norm instead of two children-norm by 2 to 5 times, marriages under 18 increase the odds of being in three children-norm by 1.6 times, in four children-norm by 1.8, and in five or more children-norm more than 4 times. The predicted probabilities reinforced that childlessness is rare among ever-married women. Educational difference became more significant over time, while the most educational differences between women and the most dramatic decreases in share were observed in the five or more children-norm category.

This study has some data-based limitations, the first of which is that the experience of ever-married women was analyzed. Although analysis of ever-married women is a limitation, it does not affect the results significantly because the survey included various types of legal and common cohabitations, such as religious marriages, and the rate of never-married women in the relevant age group is just 4.1% (HUIPS 2019). Furthermore, births for never-married women are very rare in Turkey. For instance, there are no births reported by never-married women age 40-49 in the last two waves of the TDHS. Therefore, there may be only a small underestimation of childless women in the analysis. The second limitation of the study is that women aged 40-49 were used as a proxy of completed fertility. Although in 2019, births to mothers over the age of 40 accounted for only 3% of all births (TurkStat 2020), and the age specific fertility rate of the 40-44 age group was less than 0.015 in surveys (HUIPS 2019), with the spread of assisted reproductive techniques and the overall postponement of fertility, the higher parity clusters may be underestimated.

Another limitation of this study was the chosen framework to interpret fertility trajectories. In order to make a consistent comparison for the six surveys covering a 25-year period, certain variables were used to interpret the background similarities of women. The study also focused on the properties of women before their childbearing period as determinant factors and overlooked some valuable perspectives like occupational status of women and economic status of the couple during the childbearing period. However, the employment status of women did not change significantly in Turkey over the period in question, and there is no available data on wealth status of women before their reproductive periods. Since the study focused on pre-fertility similarities and differences of women, ignoring these dimensions did not create major deficiencies.

Interpreting the results of the analyses is from a broad perspective is essential to understanding the changes in fertility structure of Turkey. When the cohort fertility of the demographic transition period in Turkey is considered, it can be seen that childlessness has never been a preferred choice for ever-married women. The absence of a distinctive structure for childless women and their spouses in terms of mother tongue, childhood place of residence and education shows that childlessness is mainly caused by infertility. The absence of any signs of transition from one child-norm to the childless cluster also supports this argument. The most striking result regarding the size of fertility can be seen in relatively higher fertility behavior clusters. Regardless of women's education and where they spent their childhood, there was a decrease of share in women who had five or more children at the end of their reproductive years. These results are expected for a period when fertility is declining. However, the presence of a heterogeneous fertility pattern for all cohorts indicates that pre-transitional fertility is heterogeneous in Turkey, as mentioned by Coale (1969) and Cleland and Wilson (1987). The change experienced in fertility behaviors throughout the cohorts showed that behaviors such as postponing childbearing and decreasing high parity births in the period following the demographic transition mentioned by Lesthaeghe (2014) were observed in the period of decreasing fertility in Turkey. Similar to the results of the study in many European countries (Sobotka et al. 2008, Potančoková et al. 2008, Kohler et al. 2002) changes in the timing of fertility reveal the variation in fertility behavior in Turkey.

In addition, although the impact of growing up in the city was evident for the earlier cohorts, the main determinant for all cohorts was the education level of women. These results indicate that the effect of urbanization in the heterogeneous structure of fertility has been replaced by the effect of education in younger cohorts. Lima et al. (2018) draws attention to a polarization arising from education in the study showing the heterogeneous nature of fertility in Latin America. The results of the fertility trajectory analysis of Turkey also show that education has a distinctive effect especially for lower and higher fertility behaviors. However, there is no hint for the polarization of parity along the cohorts. Education has the feature of accelerating the changes in fertility behavior rather than creating a duality for fertility behaviors in Turkey.

Results of predicted probabilities, similarly to the findings of Greulich (2016) and Güneş (2016) show that there are significant fertility behavior differences between educated and uneducated women, except for the two groups; four children-norm cluster for rural raised women and three children-norm cluster for urban raised women. The decline of share in the five or more children-norm cluster has caused the four children-norm cluster to become a transitional phase of fertility decline, especially for uneducated women. On the other hand, the fact that women in relatively higher fertility behavior clusters are getting less and less similar to each other, combined with the increase in the similarity of marriage properties indicates that such high fertility behaviors are no longer exist due to analyzed factors such as lesser education, but related to other unmeasured causes.

Regional fertility differences and rural-urban based distinctions, which occupy a large place in the Turkish literature (Fişek and Shorter 1968, Shorter and Macura 1982, Hancıoğlu 1997, Yavuz 2006, Koç et al. 2008, Yüceşahin and Özgür 2008, Işık and Pınarcıoğlu 2006), drew attention to differences over average fertility level indicators. In these studies, the lower fertility levels of the western regions and cities were noted, while the high fertility in the eastern and southeastern regions and rural areas was associated with cultural, ethnic and socioeconomic characteristics. When we compare the places of childhood residence of women over the predicted probabilities, a result similar to the one in the Turkish literature for the rural-urban distinction for average fertility values is obtained, but the variation in fertility behaviors is quite different for the two groups. For example, while there is a great increase in one child-norm fertility behavior among women who grow up in the city, the increase in three children-norm fertility behavior among women who grow up in rural areas stands out. These differences show the inadequacy of interpreting the fertility differences in urban and rural areas only on average fertility values. Especially when the changes in fertility behaviors reach a certain saturation, the stagnation structure in fertility that we have difficulty in interpreting through averages emerges.

In addition to the heterogeneous structure in fertility, the variation of this structure is also important for understanding heterogeneity. A change in fertility choices of a specific group of women may influence the remaining population. For the female cohorts, while new behaviors were spread at first with the effect of legal regulations and population laws, new attitudes possibly emerged in the later period when the increase in contraceptive methods usage stagnated. In this context, it is possible to interpret the fertility change in Turkey with the diffusion process. Rapidly increasing urbanization and women's participation in education, especially in the period of fertility decline, show that the relationship between these two developments is worth examining. It is possible and appropriate to examine the homogeneity of women’s fertility trajectories within the framework of homophily that diffusion presents to us. Homophily in the diffusion process can be defined as people preferring others who share similar characteristics such as their demographic and social properties when establishing social relationships and behavioral innovations diffuse among groups with social networks which are stronger among individuals with similar characteristics (Casterline 2001, Vitali, Aassve and Lappegård 2015). When urbanization and women's participation in education are inspected in terms of diffusion, developments that increase interpersonal communication and enable the interaction of different people to come to the fore. Communication between homophilous individuals provides a favorable environment for the diffusion of ideas (Rogers 1983; Blau and Schwartz 1984; Centola 2015). With the rapid migration from rural to urban areas in Turkey, populations who grew up in rural areas started to live in the cities and met the values of the urban population. When the increase in women's participation in education, which has a remarkable place in fertility behavior, is added to the migration from rural to urban areas, the possibilities of interactions that may lead to intellectual changes have increased. In the homogeneous populations, ideas and the resulting decrease in marital fertility spread over the entire population in relatively short time (Cleland and Wilson 1987).

It is worth mentioning that the background characteristics used in this study to understand heterogeneity are the features that women and men acquire in the pre-fertility period. Therefore, background characteristics are not only related to the heterogeneity of fertility trajectories, but also constitute the foundation of this heterogeneity. As Bongaarts and Watkins (1996) points out, the diffusion of fertility indicates more of an ideational shift. Therefore, it may not be possible to prove diffusion with the analysis results. In addition, since these ideational changes are not solid decisions, they may change over time. Evaluating the findings with diffusion theory will consist of interpreting the results of the analysis with an approach that fits the period when fertility changes in Turkey, rather than forming a pattern. Therefore, it would be more like making cookies that take their own shape rather than pouring the analysis results into a cake mold. When women in a fertility trajectory cluster are similar to each other according to their background characteristics, it can be interpreted as a diffusion of fertility behavior among similar women. Accordingly, the heterogeneous background structure of women in the two highest parity clusters suggests that higher fertility trajectories are not spreading among women through their background similarities. In other words, the higher fertility behaviors in Turkey became less dependent on ethnic-based, educational or residential properties. In the meantime, the decline of share in the higher parity fertility trajectories when following the cohorts over time led to various changes in clusters characterized by lower fertility. While decline in fertility did not affect the probability of having three children in post-1954 cohorts, the one child-norm and two children-norm clusters increasingly became preferred fertility trajectories. The choice of three children comes to the fore especially among educated women who grew up in rural areas. This group is the best candidate to become the preferred behavior among women with reduced fertility levels of relatively higher fertility behavior clusters since it is the highest parity cluster level where background of women and spouses are relatively homogeneous.

As seen with the two-child ideal in Europe, having two children in Turkey has always been the highest preference for educated women who grew up in the city. The increase in overall urban populations and increasing education levels for women in Turkey have subsequently led to a numerical growth of women with two children-norm fertility behavior. As Cleland (2001) stated, changes in reproductive behavior in Turkey have been greatly influenced by perceptions of how others behave. In addition, the fact that women in the two children-norm cluster are the most homogeneous group can be an indication of the diffusion of having two children among educated and urban women. This coincides with Strang and Meyer's (1993) claim that the fact that individuals are in a common social category means that diffusion must be rapid. However, the increasing heterogeneity observed in marriage characteristics shows that educated women raised in rural areas increasingly prefer two children. Among all fertility trajectory changes, the change that gave the most clues about future fertility can be found in the one child-norm cluster. In particular, when the increase of educated women's preference in having a single child, or in extending the time between the first and the second child is considered together with the high and increasing homogeneity in background characteristics, it is evident that this fertility behavior is willingly chosen. It can also be stated that women whose fertility is not very high at the beginning of the transition period prefer one child-norm trajectory as a new fertility behavior. The homogenous background of women in one child-norm and two children-norm clusters shows that lower parity trajectories diffuse through the inspected background categories.

In conclusion, the heterogeneous nature of fertility in Turkey during the demographic transition shaped the transition process and it can be predicted that such heterogeneity will also shape the post-transition fertility. The increase in urban population has also led to the diffusion of fertility choices of educated urban women from the early cohorts into the cohorts that followed. As a result, while the behavior of having two children became a norm, spacing or even limiting after the first child is an increasingly preferred choice among educated women who grew up in the city. By contrast, for women who grew up in rural areas and uneducated women, a soft transition was observed from higher parities to three children. In future cohorts, one child-norm can be expected to replace the current two children-norm, voluntary childlessness in urban and educated women will increase to significant levels, and uneducated women who grew up in rural areas, an ever-shrinking group, will have fertility structures shaped according to structures that could not be controlled for in these analyses.

Although the change in fertility has slowed down relatively in Turkey, it does not lose its currency in population policies. In particular, with the decline in the total fertility rate below the replacement level, fertility-enhancing policies gained momentum. The importance of data-based policies has also increased in this period, when data on population can be collected in a variety and continuous manner. At this point, the heterogeneous nature of fertility shown in this study proves that a single type of fertility policy cannot be possible and valid. Demonstrating the existence of fertility behaviors with different processes and different dynamics is the first step towards realizing these data-based policies. Although this study revealed the heterogeneous nature of fertility in Turkey, especially in the past, it is important to try to understand different fertility behaviors in the future based on these findings, as policies are prepared for the future, not the past. Therefore, it is essential to study the heterogeneous structure of fertility for younger generations with fertility trajectories and similar life-course approaches. However, trajectories built over fertility history may not be analysed for younger cohorts. In quantitative analyses for younger cohorts, future fertility intentions can be included in the analysis as well as past fertility. In addition, qualitative studies can be conducted to determine future fertility trajectories and to understand fertility intentions. By also carrying out all these approaches for men, Turkey's fertility can be revealed in detail.

CHAPTER 7. REFERENCES

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APPENDIX

Appendix A. Distance Calculation Function Syntax in R

```
#centroid function without weights
centroid <- function(df_points){
  c <- c(1:ncol(df_points))
  for(i in 1:ncol(df_points)){
    c[i] <- mean(df_points[,i])
  }
  return(c)
}

#centroid function with weights
centroid_ww <- function(df_points,wghts){
  c <- c(1:ncol(df_points))
  for(i in 1:ncol(df_points)){
    c[i] <- weighted.mean(df_points[,i],wghts,na.rm = FALSE)
  }
  return(c)
}

#hamming distance function without weights
mean_pairwise_hamming <- function(df_points) {
  c <- centroid(df_points)
  mph <- 0
  for(j in 1:ncol(df_points)){
    for(i in 1:nrow(df_points)){
      mph <- mph + (df_points[i,j]-c[j])^2
    }
  }
  return((2*mph)/(nrow(df_points)-1))
}

#weighted pairwise distance sum
pairwise_dist_sum_ww <- function(weights_of_points) {
  n <- length(weights_of_points)
```

```
#mean hamming distance function with weights
mean_pairwise_hamming_ww <- function(df_points,wghts) {
  c <- centroid_ww(df_points,wghts)
  mph <- 0
  for(j in 1:ncol(df_points)){
    for(i in 1:nrow(df_points)){
      mph <- mph + wghts[i]*((df_points[i,j]-c[j])^2)
    }
  }
  return((sum(wghts)*mph)/(pairwise_dist_sum_ww(wghts)))
}

#max hamm distance function with weights
max_pairwise_hamming <- function(x){
  h <- data.frame(h1 = c(1,1,0,1,0,1,1,0,1,0,1,0,0,0,1,0),
                  h2 = c(1,1,0,0,1,1,0,1,0,1,1,0,0,1,0,0),
                  h3 = c(1,0,1,1,1,1,1,1,0,0,0,0,1,0,0,0),
                  h4 = c(1,0,1,0,1,0,1,0,1,1,1,1,0,0,0,0))
  y <- h
  for (i in 1:x){
    y[i,] <- h[((i%%16)+1),]
  }
  return(mean_pairwise_hamming(y))
}

max_pairwise_hamming3 <- function(x){
  h <- data.frame(h1 = c(1,1,0,1,0,0,1,0),
                  h2 = c(1,0,0,1,1,1,0,0),
                  h3 = c(1,0,1,0,1,0,1,0))
  y <- h
  for (i in 1:x){
    y[i,] <- h[((i%%8)+1),]
  }
  return(mean_pairwise_hamming(y))
}

max_pairwise_hamming2 <- function(x){
  h <- data.frame(h1 = c(1,0,1,0),
                  h2 = c(1,0,0,1))
  y <- h
  for (i in 1:x){
    y[i,] <- h[((i%%4)+1),]
  }
  return(mean_pairwise_hamming(y))
}
```

Appendix B. Sequence Analysis Supportive Tables and Figures

Figure B. 1. Most Frequent 10 Sequences, 1944-1978 Cohorts

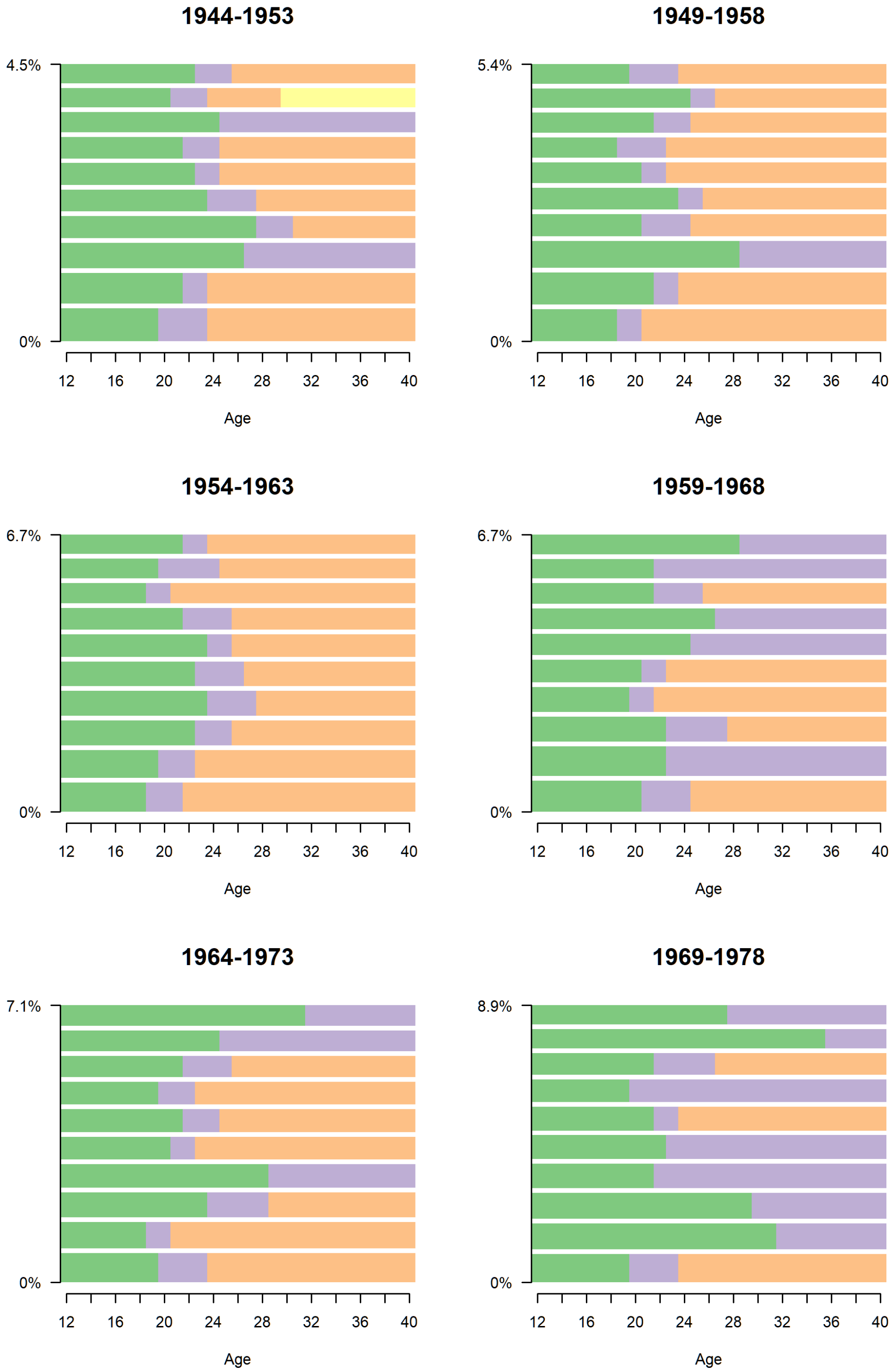

Figure B. 2. Full Sequence Indexes, 1944-1978 Cohorts

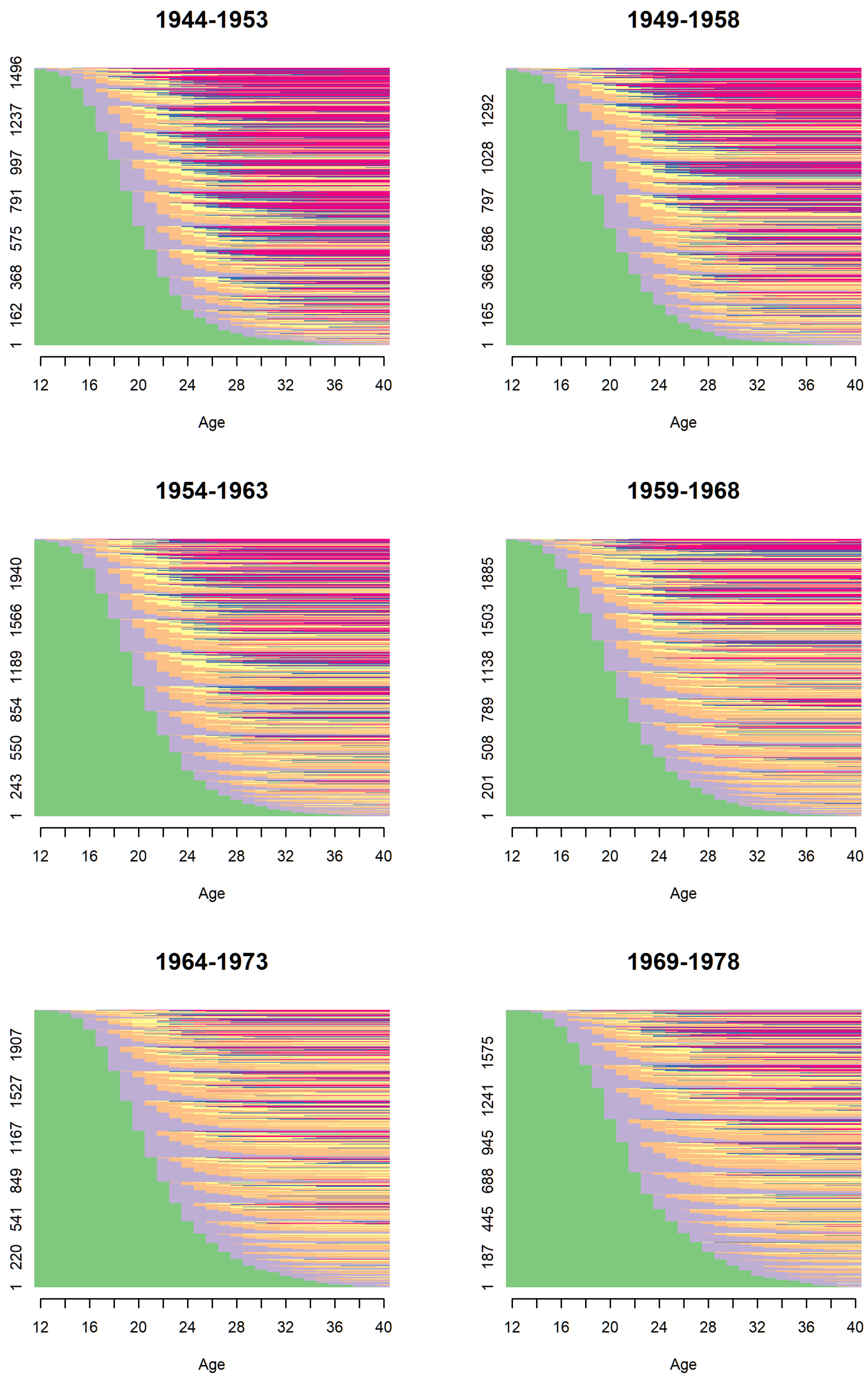

Figure B. 3. Modal State Sequences, 1944-1978 Cohorts

Figure B. 4. Cluster State Sequences of 1944-1953 Cohort

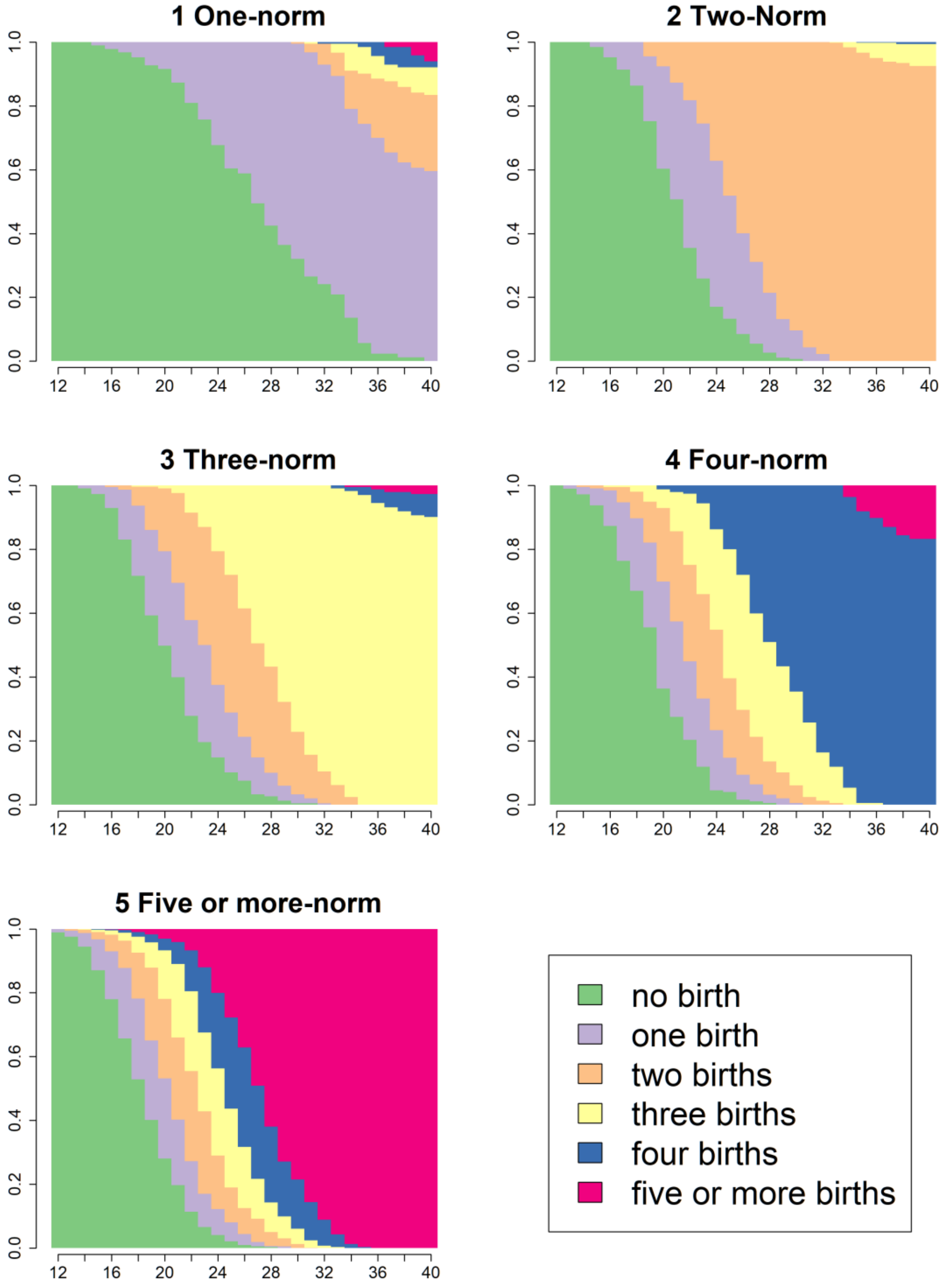

Figure B. 5. Cluster State Sequences of 1949-1958 Cohort

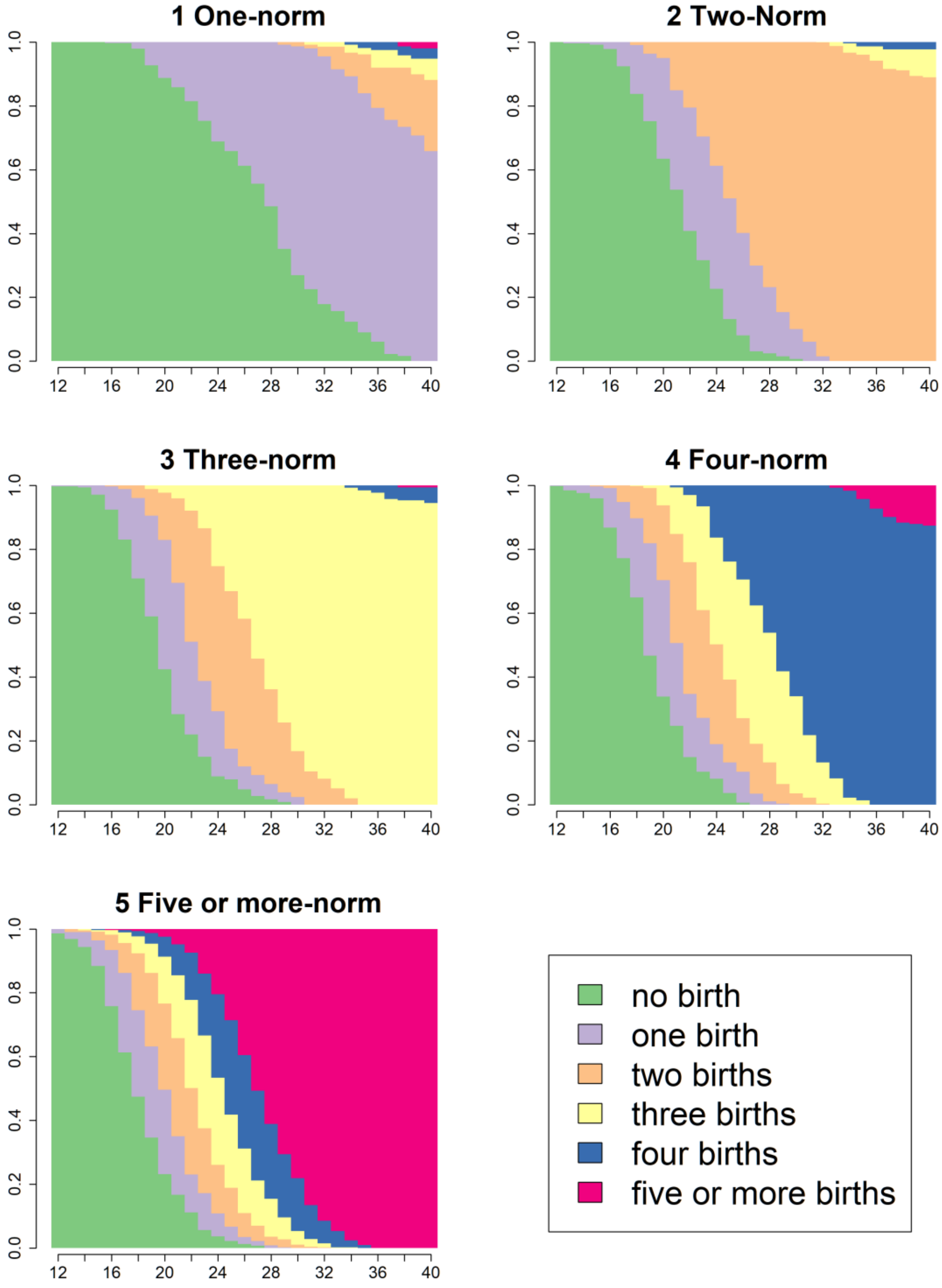

Figure B. 6. Cluster State Sequences of 1954-1963 Cohort

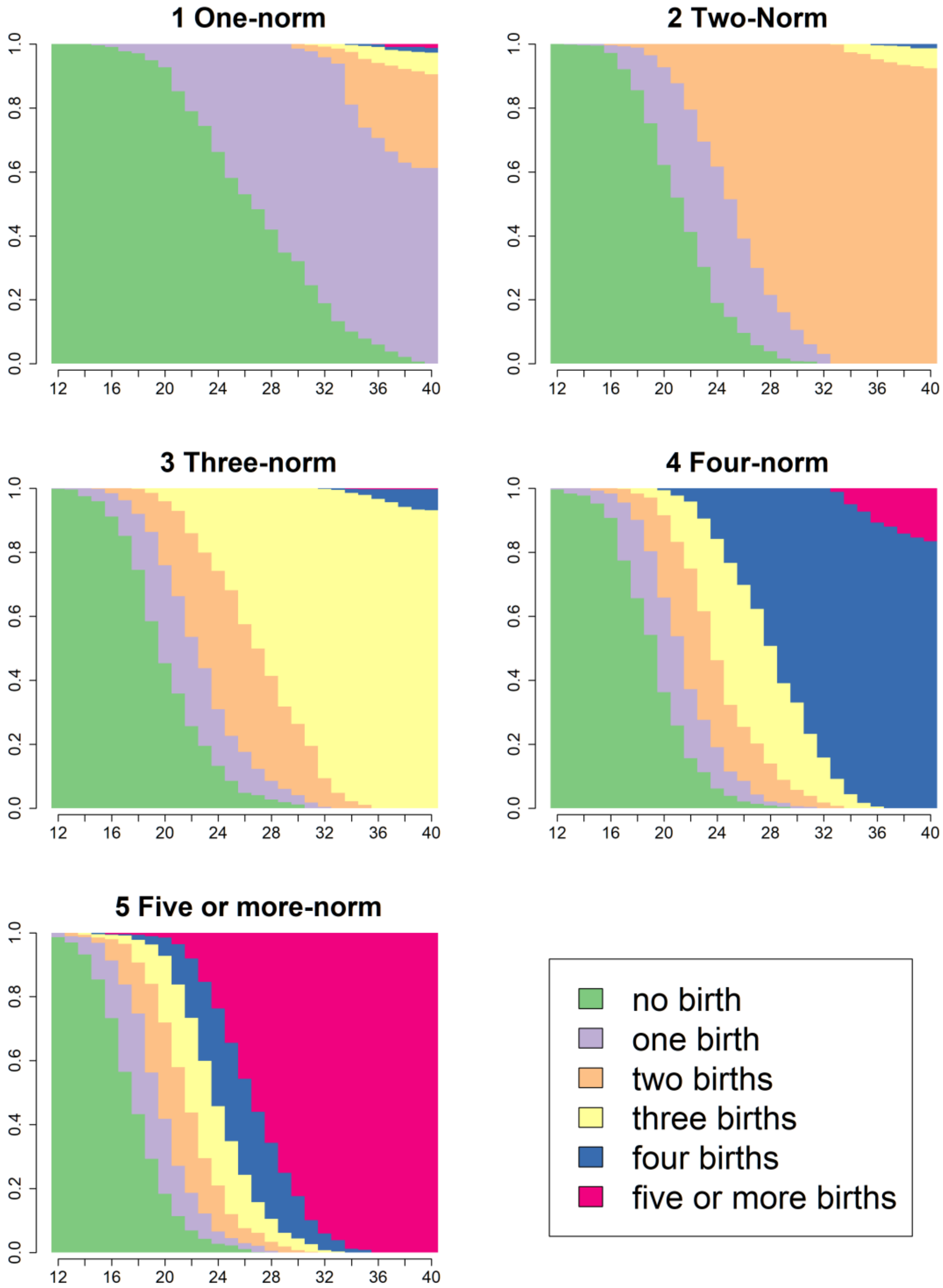

Figure B. 7. Cluster State Sequences of 1959-1968 Cohort

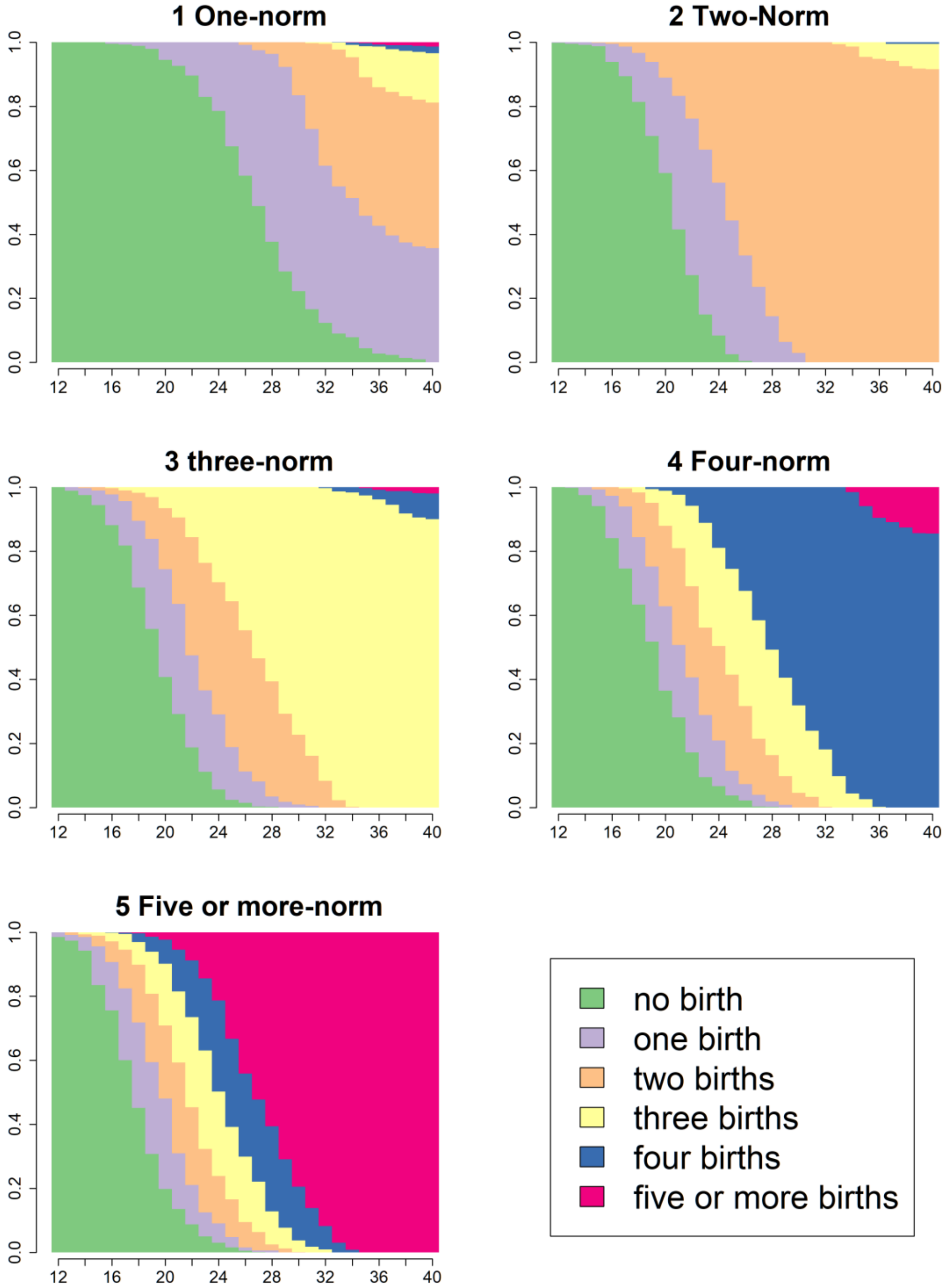

Figure B. 8. Cluster State Sequences of 1964-1973 Cohort

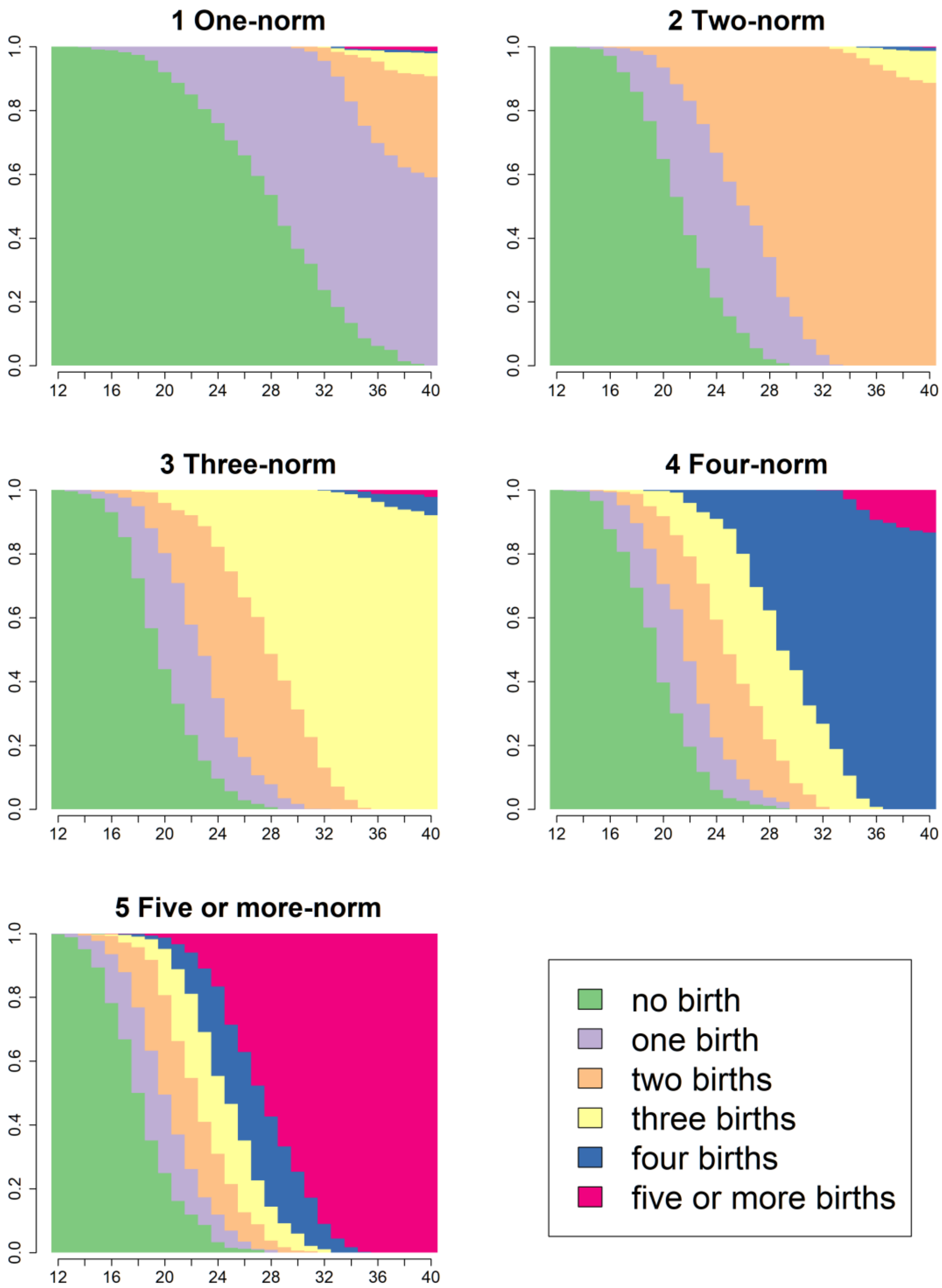

Figure B. 9. Cluster State Sequences of 1969-1978 Cohort

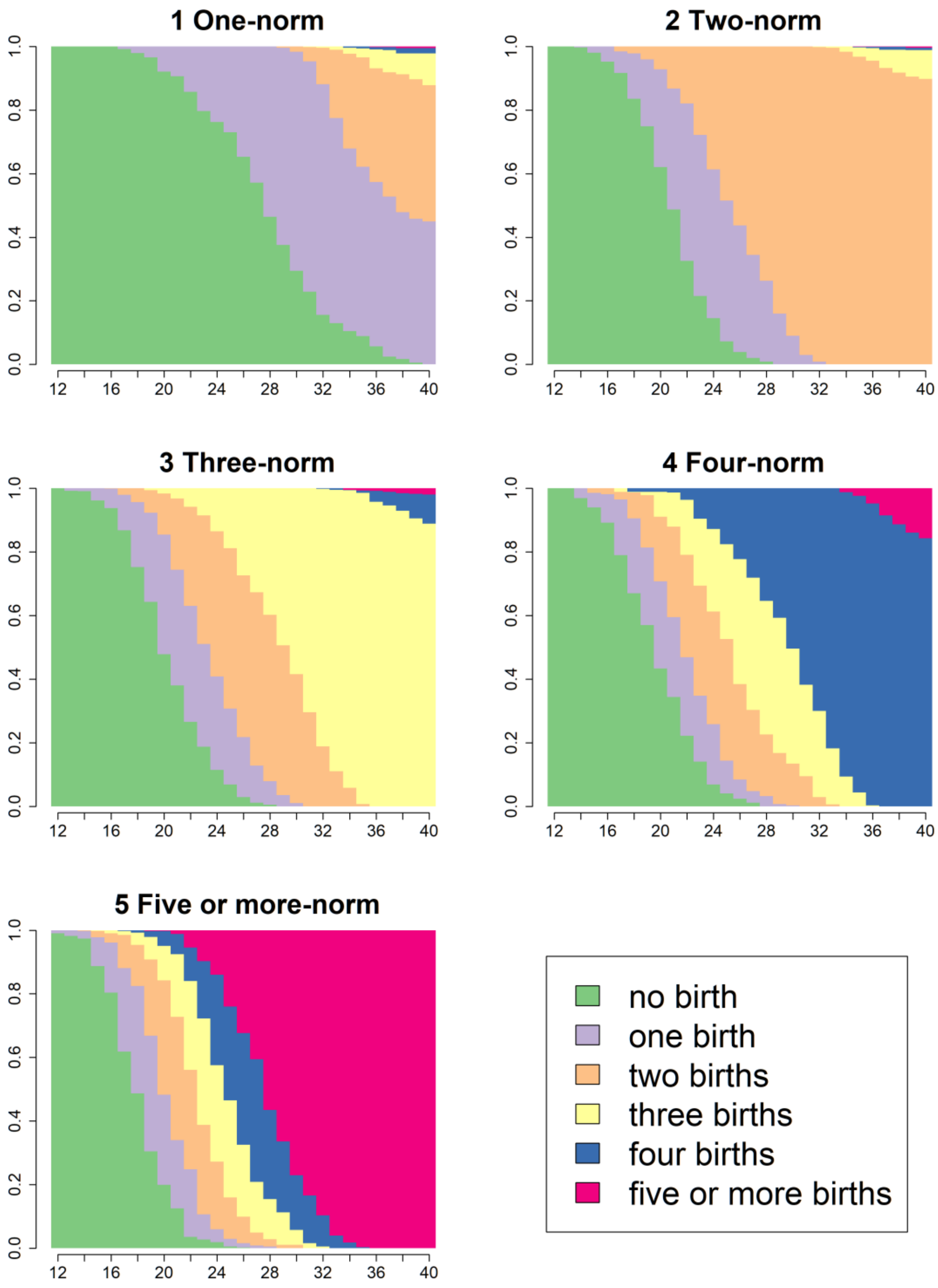

Table B. 1. ASWw Values of Clusters, 1944-1978 Cohorts

	1944-53	1949-58	1954-63	1959-68	1964-73	1969-78
One child norm	0,3416	0,4309	0,3886	0,2203	0,3602	0,3125
Two children norm	0,5847	0,5672	0,5746	0,5690	0,5216	0,5423
Three children norm	0,4838	0,5434	0,4891	0,4792	0,4555	0,4175
Four children norm	0,4103	0,4729	0,4295	0,4241	0,3794	0,3677
Five or more children norm	0,5562	0,5533	0,5763	0,5499	0,5436	0,5589

Appendix C. Distance Analysis Supportive Tables and Figures

Table C. 1. Heterogeneity Scores of Clusters, 1944-1978 Cohorts

	Clusters	Cohorts 1944-1953	1949-1958	1954-1963	1959-1968	1964-1973	1969-1978
Background of women	Childless	70.5	73.3	68.6	81.8	65.3	63.0
	One-norm	78.9	65.7	56.4	57.7	50.0	47.4
	Two-norm	54.6	52.7	52.7	46.9	50.6	46.2
	Three-norm	69.3	63.3	61.2	60.9	63.5	57.7
	Four-norm	66.0	72.8	70.8	77.4	81.4	85.5
	Five or more-norm	64.0	77.4	84.0	90.5	87.9	87.1
	Total*	75.1	81.7	74.8	74.7	72.0	67.3
Background of husband	Childless	39.2	67.2	74.9	89.7	78.1	79.4
	One-norm	68.5	80.5	73.5	75.6	77.3	75.4
	Two-norm	50.4	66.1	67.1	71.0	72.8	72.3
	Three-norm	41.1	65.1	60.4	77.0	69.1	73.8
	Four-norm	35.7	60.5	53.0	72.7	74.6	85.1
	Five or more-norm	39.7	67.6	70.4	75.7	65.1	84.8
	Total*	47.1	72.6	70.1	82.1	79.9	83.7
Background of marriage	Childless	56.6	84.8	79.9	74.8	69.5	63.0
	One-norm	68.0	75.8	62.8	63.5	63.6	65.5
	Two-norm	67.7	74.8	75.5	78.2	78.6	80.6
	Three-norm	68.9	77.4	84.0	87.3	86.8	89.9
	Four-norm	75.3	89.7	87.0	89.0	83.3	92.4
	Five or more-norm	70.4	82.7	79.5	77.6	80.3	75.7
	Total*	75.8	88.3	87.3	87.8	85.7	87.4

*The total row shows the heterogeneity score for women aged 40-49 in the cohort before clustering.

Appendix D. Multinomial Logistic Regression Analysis Supportive Tables

Table D. 1. Tests of Independence for Descriptive Results, 1944-1953

		Chi-Square	Adjusted F	df1	df2	Sig.
Background Characteristics of Women						
Mother tongue	Pearson	85,886	16,155	4,181	848,683	0,000
	Likelihood Ratio	92,855	17,466	4,181	848,683	0,000
Education	Pearson	322,812	63,771	4,816	977,641	0,000
	Likelihood Ratio	342,910	67,741	4,816	977,641	0,000
Childhood Place of Residence	Pearson	122,075	25,006	4,667	947,346	0,000
	Likelihood Ratio	122,152	25,022	4,667	947,346	0,000
Background Characteristics of Husband						
Mother tongue	Pearson	83,744	16,242	3,997	811,358	0,000
	Likelihood Ratio	92,711	17,981	3,997	811,358	0,000
Education	Pearson	250,064	24,514	8,977	1822,367	0,000
	Likelihood Ratio	251,322	24,637	8,977	1822,367	0,000
Background Characteristics of Marriage						
Age at first marriage	Pearson	156,965	29,847	4,860	986,565	0,000
	Likelihood Ratio	164,153	31,213	4,860	986,565	0,000
Relationship to husband	Pearson	44,870	8,723	4,815	977,391	0,000
	Likelihood Ratio	47,611	9,255	4,815	977,391	0,000
Marriage arrangement	Pearson	122,105	10,828	8,767	1779,656	0,000
	Likelihood Ratio	121,803	10,801	8,767	1779,656	0,000

Table D. 2. Tests of Independence for Descriptive Results, 1949-1958

		Chi-Square	Adjusted F	df1	df2	Sig.
Background Characteristics of Women						
Mother tongue	Pearson	191,160	33,955	4,545	986,311	0,000
	Likelihood Ratio	200,275	35,574	4,545	986,311	0,000
Education	Pearson	396,765	64,502	4,724	1025,197	0,000
	Likelihood Ratio	421,154	68,467	4,724	1025,197	0,000
Childhood Place of Residence	Pearson	145,081	24,686	4,405	955,875	0,000
	Likelihood Ratio	145,158	24,699	4,405	955,875	0,000
Background Characteristics of Husband						
Mother tongue	Pearson	177,700	27,166	4,307	934,524	0,000
	Likelihood Ratio	180,581	27,607	4,307	934,524	0,000
Education	Pearson	282,667	24,315	9,040	1961,727	0,000
	Likelihood Ratio	289,732	24,923	9,040	1961,727	0,000
Place of Birth	Pearson	21,682	3,814	4,769	1034,781	0,002
	Likelihood Ratio	21,228	3,734	4,769	1034,781	0,003
Background Characteristics of Marriage						
Age at first marriage	Pearson	166,774	27,647	4,706	1021,206	0,000
	Likelihood Ratio	174,266	28,889	4,706	1021,206	0,000
Relationship to husband	Pearson	64,188	11,714	4,845	1051,299	0,000
	Likelihood Ratio	66,901	12,209	4,845	1051,299	0,000
Marriage arrangement	Pearson	110,165	8,509	8,958	1943,947	0,000
	Likelihood Ratio	105,922	8,181	8,958	1943,947	0,000
Ceremony type and order	Pearson	202,037	9,198	16,156	3505,761	0,000
	Likelihood Ratio	205,295	9,346	16,156	3505,761	0,000

Table D. 3. Tests of Independence for Descriptive Results, 1954-1963

		Chi-Square	Adjusted F	df1	df2	Sig.
Background Characteristics of Women						
Mother tongue	Pearson	334,764	67,682	4,775	1427,674	0,000
	Likelihood Ratio	285,526	57,727	4,775	1427,674	0,000
Education	Pearson	392,254	53,433	4,509	1348,062	0,000
	Likelihood Ratio	389,246	53,023	4,509	1348,062	0,000
Childhood Place of Residence	Pearson	176,258	26,410	4,871	1456,476	0,000
	Likelihood Ratio	179,565	26,905	4,871	1456,476	0,000
Background Characteristics of Husband						
Mother tongue	Pearson	355,805	66,452	4,661	1393,755	0,000
	Likelihood Ratio	309,584	57,819	4,661	1393,755	0,000
Education	Pearson	361,958	28,056	8,292	2479,169	0,000
	Likelihood Ratio	351,468	27,243	8,292	2479,169	0,000
Place of Birth	Pearson	13,463	2,094	4,848	1449,544	0,066
	Likelihood Ratio	13,618	2,118	4,848	1449,544	0,063
Background Characteristics of Marriage						
Age at first marriage	Pearson	366,056	53,952	4,707	1407,305	0,000
	Likelihood Ratio	381,205	56,185	4,707	1407,305	0,000
Relationship to husband	Pearson	97,274	16,204	4,848	1449,694	0,000
	Likelihood Ratio	101,870	16,970	4,848	1449,694	0,000
Marriage arrangement	Pearson	148,455	14,545	8,734	2611,592	0,000
	Likelihood Ratio	145,790	14,284	8,734	2611,592	0,000
Ceremony type and order	Pearson	319,914	14,213	14,857	4442,172	0,000
	Likelihood Ratio	287,436	12,770	14,857	4442,172	0,000

Table D. 4. Tests of Independence for Descriptive Results, 1959-1968

		Chi-Square	Adjusted F	df1	df2	Sig.
Background Characteristics of Women						
Mother tongue	Pearson	363,765	55,003	4,741	2697,899	0,000
	Likelihood Ratio	310,106	46,890	4,741	2697,899	0,000
Education	Pearson	450,000	70,586	4,857	2763,862	0,000
	Likelihood Ratio	427,992	67,134	4,857	2763,862	0,000
Childhood Place of Residence	Pearson	117,494	15,797	4,875	2773,849	0,000
	Likelihood Ratio	120,170	16,157	4,875	2773,849	0,000
Background Characteristics of Husband						
Mother tongue	Pearson	320,931	46,081	4,747	2700,993	0,000
	Likelihood Ratio	286,700	41,166	4,747	2700,993	0,000
Education	Pearson	268,790	18,729	9,280	5280,491	0,000
	Likelihood Ratio	252,206	17,574	9,280	5280,491	0,000
Childhood Place of Residence	Pearson	156,123	20,315	4,787	2723,596	0,000
	Likelihood Ratio	161,698	21,041	4,787	2723,596	0,000
Background Characteristics of Marriage						
Age at first marriage	Pearson	386,019	52,849	4,808	2735,949	0,000
	Likelihood Ratio	432,812	59,255	4,808	2735,949	0,000
Relationship to husband	Pearson	145,621	21,684	4,623	2630,598	0,000
	Likelihood Ratio	145,922	21,729	4,623	2630,598	0,000
Marriage arrangement	Pearson	142,094	9,292	9,569	5444,553	0,000
	Likelihood Ratio	144,341	9,439	9,569	5444,553	0,000
Ceremony type and order	Pearson	260,976	9,833	15,115	8600,380	0,000
	Likelihood Ratio	269,592	10,158	15,115	8600,380	0,000

Table D. 5. Tests of Independence for Descriptive Results, 1964-1973

		Chi-Square	Adjusted F	df1	df2	Sig.
Background Characteristics of Women						
Mother tongue	Pearson	481,193	74,263	4,702	1391,905	0,000
	Likelihood Ratio	376,947	58,175	4,702	1391,905	0,000
Education	Pearson	441,465	69,258	4,868	1440,824	0,000
	Likelihood Ratio	377,119	59,163	4,868	1440,824	0,000
Childhood Place of Residence	Pearson	154,449	23,680	4,864	1439,764	0,000
	Likelihood Ratio	160,628	24,627	4,864	1439,764	0,000
Background Characteristics of Husband						
Mother tongue	Pearson	446,713	72,972	4,746	1404,818	0,000
	Likelihood Ratio	352,389	57,564	4,746	1404,818	0,000
Education	Pearson	358,953	27,739	8,942	2646,890	0,000
	Likelihood Ratio	317,081	24,503	8,942	2646,890	0,000
Childhood Place of Residence	Pearson	132,839	17,817	4,653	1377,179	0,000
	Likelihood Ratio	138,544	18,582	4,653	1377,179	0,000
Background Characteristics of Marriage						
Age at first marriage	Pearson	268,350	37,851	4,810	1423,805	0,000
	Likelihood Ratio	271,498	38,295	4,810	1423,805	0,000
Relationship to husband	Pearson	125,530	18,766	4,645	1374,773	0,000
	Likelihood Ratio	123,162	18,412	4,645	1374,773	0,000
Marriage arrangement	Pearson	190,140	12,601	9,082	2688,239	0,000
	Likelihood Ratio	195,390	12,949	9,082	2688,239	0,000
Ceremony type and order	Pearson	238,604	8,732	15,178	4492,806	0,000
	Likelihood Ratio	229,636	8,404	15,178	4492,806	0,000

Table D. 6. Tests of Independence for Descriptive Results, 1969-1978

		Chi-Square	Adjusted F	df1	df2	Sig.
Background Characteristics of Women						
Mother tongue	Pearson	422,195	69,483	4,806	1446,674	0,000
	Likelihood Ratio	328,178	54,010	4,806	1446,674	0,000
Education	Pearson	335,066	54,207	4,854	1461,130	0,000
	Likelihood Ratio	265,602	42,969	4,854	1461,130	0,000
Childhood Place of Residence	Pearson	144,851	24,503	4,741	1427,102	0,000
	Likelihood Ratio	149,008	25,207	4,741	1427,102	0,000
Background Characteristics of Husband						
Mother tongue	Pearson	396,853	60,769	4,862	1463,482	0,000
	Likelihood Ratio	314,033	48,087	4,862	1463,482	0,000
Education	Pearson	186,292	16,705	8,543	2571,584	0,000
	Likelihood Ratio	162,196	14,544	8,543	2571,584	0,000
Childhood Place of Residence	Pearson	121.738	18.599	4.712	1418.444	0.000
	Likelihood Ratio	123.735	18.904	4.712	1418.444	0.000
Background Characteristics of Marriage						
Age at first marriage	Pearson	297,750	45,331	4,311	1297,712	0,000
	Likelihood Ratio	294,733	44,872	4,311	1297,712	0,000
Relationship to husband	Pearson	115,471	16,840	4,635	1395,278	0,000
	Likelihood Ratio	112,084	16,346	4,635	1395,278	0,000
Marriage arrangement	Pearson	225,908	21,344	8,544	2571,661	0,000
	Likelihood Ratio	238,273	22,512	8,544	2571,661	0,000
Ceremony type and order	Pearson	156,636	6,123	16,676	5019,521	0,000
	Likelihood Ratio	156,211	6,106	16,676	5019,521	0,000

Table D. 7. Determinants of Cluster Membership for 1944-1953

Childless

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	1.908	1.435	0.860	0.391	0.435	8.370
		Other	1.000					
	Education	Single years	0.954	0.090	-0.500	0.618	0.793	1.148
	CPlace of Residence	Urban	1.105	0.429	0.260	0.797	0.515	2.371
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.437	0.399	-0.910	0.365	0.073	2.626
		Other	1.000					
	Education	Secondary or higher	0.355	0.319	-1.150	0.250	0.061	2.080
		Primary complete	0.477	0.256	-1.380	0.168	0.167	1.368
		No edu. or pri edu.incomp.	1.000					
Marriage	Women’s age at first marriage	18 and above	0.732	0.281	-0.810	0.417	0.344	1.558
		Before 18	1.000					
	Relationship to husband	Relative	0.440	0.286	-1.260	0.208	0.122	1.582
		No relation	1.000					
	Marriage arrangement	Themselves	0.473	0.274	-1.290	0.196	0.152	1.476
		Families	1.000					
		Escaped/ Abd./Other	0.000	0.000	-35.03	0.000	0.000	0.000
	Cons.		0.769	1.028	-0.200	0.844	0.056	10.655

One child-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.499	0.291	-1.190	0.234	0.158	1.572
		Other	1.000					
	Education	Single years	1.011	0.042	0.270	0.791	0.932	1.097
	Childhood Place of Residence	Urban	0.792	0.235	-0.790	0.432	0.443	1.418
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.219	0.129	-2.580	0.010	0.069	0.698
		Other	1.000					
	Education	Secondary or higher	0.611	0.316	-0.950	0.342	0.220	1.691
		Primary complete	0.753	0.337	-0.630	0.527	0.312	1.816
		No edu. or pri edu.incomp.	1.000					
Marriage	Women’s age at first marriage	18 and above	1.641	0.534	1.520	0.128	0.866	3.110
		Before 18	1.000					
	Rel. to husband	Relative	1.443	0.531	1.000	0.320	0.699	2.976
		No relation	1.000					
	Marriage arrangement	Themselves	1.483	0.436	1.340	0.180	0.833	2.642
		Families	1.000					
		Escaped/ Abd./Other	0.000	0.000	-39.32	0.000	0.000	0.000
	Cons.		3.078	2.369	1.460	0.145	0.678	13.974

Table D. 7. (continued) Determinants of Cluster Membership for 1944-1953

Three children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	0.955	0.689	-0.060	0.949	0.231	3.947
		Other	1.000					
	Education	Single years	0.900	0.034	-2.820	0.005	0.836	0.969
	CPlace of Residence	Urban	1.181	0.264	0.740	0.457	0.761	1.831
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.688	0.582	-0.440	0.658	0.130	3.631
		Other	1.000					
	Education	Secondary or higher	0.816	0.356	-0.470	0.642	0.346	1.926
		Primary complete	1.021	0.375	0.060	0.954	0.496	2.102
		No edu. or pri edu.incomp.	1.000					
Marriage	Women's age at first marriage	18 and above	0.697	0.162	-1.560	0.120	0.442	1.099
		Before 18	1.000					
	Relationship to husband	Relative	1.208	0.371	0.620	0.538	0.660	2.211
		No relation	1.000					
	Marriage arrangement	Themselves	0.607	0.164	-1.850	0.065	0.357	1.032
		Families	1.000					
		Escaped/ Abd./Other	0.809	0.411	-0.420	0.677	0.298	2.198
	Cons.		3.860	3.019	1.730	0.085	0.829	17.963

Four children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	6.910	5.103	2.620	0.009	1.618	29.512
		Other	1.000					
	Education	Single years	0.856	0.031	-4.330	0.000	0.797	0.918
	Childhood Place of Residence	Urban	0.720	0.154	-1.540	0.124	0.473	1.095
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.063	0.047	-3.660	0.000	0.014	0.277
		Other	1.000					
	Education	Secondary or higher	0.828	0.379	-0.410	0.680	0.337	2.035
		Primary complete	1.414	0.500	0.980	0.329	0.705	2.835
		No edu. or pri edu.incomp.	1.000					
Marriage	Women's age at first marriage	18 and above	0.456	0.112	-3.210	0.001	0.282	0.738
		Before 18	1.000					
	Rel. to husband	Relative	1.680	0.489	1.780	0.076	0.948	2.976
		No relation	1.000					
	Marriage arrangement	Themselves	0.717	0.187	-1.270	0.203	0.429	1.198
		Families	1.000					
		Escaped/ Abd./Other	1.235	0.578	0.450	0.652	0.492	3.097
	Cons.		7.538	5.271	2.890	0.004	1.907	29.806

Table D. 7. (continued) Determinants of Cluster Membership for 1944-1953

Five or more children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	1.182	0.818	0.240	0.810	0.303	4.611
		Other	1.000					
	Education	Single years	0.731	0.028	-8.190	0.000	0.677	0.788
	C. Place of Residence	Urban	0.686	0.151	-1.710	0.087	0.446	1.057
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.139	0.105	-2.600	0.010	0.031	0.616
		Other	1.000					
	Education	Secondary or higher	0.203	0.087	-3.730	0.000	0.088	0.470
		Primary complete	0.618	0.193	-1.540	0.123	0.335	1.140
		No edu. or pri edu.incomp.	1.000					
Marriage	Women's age at first marriage	18 and above	0.286	0.065	-5.480	0.000	0.183	0.449
		Before 18	1.000					
	Relationship to husband	Relative	2.028	0.536	2.680	0.008	1.207	3.409
		No relation	1.000					
	Marriage arrangement	Themselves	0.493	0.134	-2.600	0.010	0.289	0.841
		Families	1.000					
		Escaped/ Abd./Other	1.048	0.480	0.100	0.919	0.426	2.578
	Cons.		150.05	96.62	7.78	0.000	42.31	532.1

Table D. 8. Determinants of Cluster Membership for 1949-1958

Childless

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.978	1.228	-0.020	0.986	0.083	11.548
		Other	1.000					
	Education	Single years	0.822	0.090	-1.790	0.074	0.662	1.019
	Childhood Place of Residence	Urban	0.386	0.241	-1.520	0.128	0.113	1.318
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.424	0.545	-0.670	0.505	0.034	5.295
		Other	1.000					
	Education	Secondary or higher	0.169	0.122	-2.470	0.014	0.041	0.696
		Primary complete	0.248	0.170	-2.030	0.043	0.064	0.957
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	1.588	0.751	0.980	0.329	0.627	4.023
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.640	0.325	-0.880	0.380	0.236	1.737
		Before 18	1.000					
	Relationship to husband	Relative	1.396	0.803	0.580	0.562	0.451	4.323
		No relation	1.000					
	Marriage arrangement	Themselves	0.419	0.197	-1.850	0.065	0.166	1.057
		Families	1.000					
		Escaped/ Abd./Other	2.090	1.696	0.910	0.364	0.424	10.306
	Marriage ceremony	Only civil	1.065	1.536	0.040	0.965	0.063	18.125
		Both, civil first	0.281	0.336	-1.060	0.289	0.027	2.946
		Both, religious first	0.439	0.506	-0.710	0.476	0.046	4.236
		Only religious	1.000					
		No ceremony	0.054	0.072	-2.220	0.027	0.004	0.719
	Cons.		6.16	8.37	1.340	0.181	0.427	89.0

Table D.8. (continued) Determinants of Cluster Membership for 1949-1958

One child-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.191	0.106	-2.980	0.003	0.064	0.570
		Other	1.000					
	Education	Single years	1.154	0.054	3.090	0.002	1.054	1.265
	Childhood Place of Residence	Urban	1.067	0.368	0.190	0.851	0.542	2.101
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.759	0.605	-0.350	0.730	0.159	3.634
		Other	1.000					
	Education	Secondary or higher	0.200	0.140	-2.300	0.022	0.050	0.793
		Primary complete	0.392	0.251	-1.460	0.144	0.111	1.378
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	1.896	0.598	2.030	0.043	1.020	3.525
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.863	0.336	-0.380	0.705	0.401	1.855
		Before 18	1.000					
	Relationship to husband	Relative	1.457	0.576	0.950	0.342	0.669	3.170
		No relation	1.000					
	Marriage arrangement	Themselves	0.991	0.277	-0.030	0.975	0.573	1.717
		Families	1.000					
		Escaped/ Abd./Other	0.565	0.479	-0.670	0.501	0.107	2.993
	Marriage ceremony	Only civil	0.587	0.658	-0.480	0.635	0.065	5.328
		Both, civil first	0.316	0.330	-1.100	0.270	0.041	2.457
		Both, religious first	0.435	0.446	-0.810	0.417	0.058	3.269
		Only religious	1.000					
		No ceremony	0.092	0.101	-2.160	0.031	0.010	0.805
	Cons.		5.284	6.579	1.340	0.182	0.457	61.089

Table D.8. (continued) Determinants of Cluster Membership for 1949-1958

Three children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	1.056	0.905	0.060	0.949	0.196	5.689
		Other	1.000					
	Education	Single years	0.942	0.036	-1.560	0.121	0.874	1.016
	Childhood Place of Residence	Urban	0.654	0.185	-1.500	0.133	0.375	1.139
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.541	0.508	-0.650	0.513	0.086	3.423
		Other	1.000					
	Education	Secondary or higher	0.364	0.181	-2.030	0.043	0.137	0.967
		Primary complete	0.483	0.220	-1.600	0.111	0.197	1.183
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	1.058	0.243	0.250	0.806	0.674	1.660
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.537	0.131	-2.540	0.011	0.332	0.869
		Before 18	1.000					
	Relationship to husband	Relative	1.086	0.330	0.270	0.786	0.598	1.973
		No relation	1.000					
	Marriage arrangement	Themselves	0.353	0.100	-3.680	0.000	0.202	0.615
		Families	1.000					
		Escaped/ Abd./Other	0.974	0.547	-0.050	0.962	0.323	2.940
	Marriage ceremony	Only civil	*	*	*	*	*	*
		Both, civil first	*	*	*	*	*	*
		Both, religious first	*	*	*	*	*	*
		Only religious	*	*	*	*	*	*
		No ceremony	*	*	*	*	*	*
	Cons.		0.000	0.000	-9.720	0.000	0.000	0.000

Table D.8. (continued) Determinants of Cluster Membership for 1949-1958

Four children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	0.743	0.582	-0.380	0.704	0.159	3.463
		Other	1.000					
	Education	Single years	0.841	0.038	-3.810	0.000	0.769	0.919
	Childhood Place of Residence	Urban	0.799	0.230	-0.780	0.437	0.454	1.408
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.693	0.699	-0.360	0.716	0.095	5.039
		Other	1.000					
	Education	Secondary or higher	0.260	0.142	-2.460	0.014	0.089	0.761
		Primary complete	0.441	0.222	-1.620	0.105	0.163	1.188
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	1.086	0.260	0.340	0.731	0.678	1.739
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.381	0.100	-3.670	0.000	0.227	0.639
		Before 18	1.000					
	Relationship to husband	Relative	1.706	0.499	1.830	0.068	0.960	3.031
		No relation	1.000					
	Marriage arrangement	Themselves	0.714	0.182	-1.320	0.187	0.432	1.179
		Families	1.000					
		Escaped/ Abd./Other	0.479	0.306	-1.150	0.250	0.137	1.680
	Marriage ceremony	Only civil	1.296	1.397	0.240	0.810	0.156	10.788
		Both, civil first	2.804	2.473	1.170	0.243	0.495	15.881
		Both, religious first	3.537	3.123	1.430	0.153	0.623	20.064
		Only religious	1.000					
		No ceremony	0.890	0.991	-0.100	0.917	0.100	7.942
	Cons.		6.228	7.972	1.430	0.154	0.503	77.134

Table D.8. (continued) Determinants of Cluster Membership for 1949-1958

Five or more children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	0.266	0.185	-1.910	0.057	0.068	1.041
		Other	1.000					
	Education	Single years	0.726	0.034	-6.830	0.000	0.662	0.796
	Childhood Place of Residence	Urban	0.770	0.214	-0.940	0.347	0.446	1.329
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.544	0.503	-0.660	0.511	0.088	3.349
		Other	1.000					
	Education	Secondary or higher	0.111	0.053	-4.640	0.000	0.044	0.281
		Primary complete	0.315	0.134	-2.720	0.007	0.137	0.726
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	0.891	0.225	-0.460	0.649	0.543	1.464
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.373	0.095	-3.870	0.000	0.226	0.615
		Before 18	1.000					
	Relationship to husband	Relative	1.601	0.435	1.730	0.084	0.938	2.733
		No relation	1.000					
	Marriage arrangement	Themselves	0.527	0.119	-2.840	0.005	0.338	0.821
		Families	1.000					
		Escaped/ Abd./Other	1.012	0.613	0.020	0.984	0.307	3.331
	Marriage ceremony	Only civil	1.169	1.060	0.170	0.863	0.197	6.946
		Both, civil first	0.696	0.517	-0.490	0.626	0.161	2.999
		Both, religious first	1.366	1.004	0.420	0.672	0.322	5.798
		Only religious	1.000					
		No ceremony	*	*	*	*	*	*
	Cons.		259.088	287.363	5.010	0.000	29.277	2292.8

Table D. 9. Determinants of Cluster Membership for 1954-1963

Childless

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	2.944	2.338	1.360	0.175	0.619	14.009
		Other	1.000					
	Education	Single years	1.003	0.051	0.060	0.952	0.907	1.109
	Childhood Place of Residence	Urban	0.745	0.300	-0.730	0.465	0.337	1.645
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.073	0.052	-3.710	0.000	0.018	0.292
		Other	1.000					
	Education	Secondary or higher	0.184	0.114	-2.740	0.006	0.055	0.620
		Primary complete	0.331	0.204	-1.800	0.073	0.099	1.109
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	0.877	0.314	-0.370	0.713	0.434	1.771
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.977	0.422	-0.050	0.957	0.418	2.283
		Before 18	1.000					
	Relationship to husband	Relative	1.052	0.464	0.120	0.908	0.442	2.502
		No relation	1.000					
	Marriage arrangement	Themselves	1.777	0.602	1.700	0.090	0.913	3.457
		Families	1.000					
		Escaped/ Abd./Other	2.238	1.780	1.010	0.312	0.469	10.673
	Marriage ceremony	Only civil	0.387	0.655	-0.560	0.575	0.014	10.727
		Both, civil first	0.254	0.390	-0.890	0.373	0.012	5.200
		Both, religious first	0.646	0.955	-0.300	0.768	0.035	11.793
		Only religious	1.000					
		No ceremony	0.000	0.000	-8.870	0.000	0.000	0.000
	Cons.		2.900	4.485	0.690	0.491	0.139	60.461

Table D.9. (continued) Determinants of Cluster Membership for 1954-1963

One child-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	1.191	0.658	0.320	0.751	0.402	3.527
		Other	1.000					
	Education	Single years	1.039	0.035	1.120	0.262	0.972	1.109
	Childhood Place of Residence	Urban	1.476	0.368	1.560	0.119	0.905	2.409
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.277	0.159	-2.240	0.026	0.090	0.855
		Other	1.000					
	Education	Secondary or higher	0.393	0.198	-1.860	0.064	0.146	1.056
		Primary complete	0.347	0.161	-2.280	0.023	0.140	0.862
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	0.876	0.207	-0.560	0.576	0.551	1.393
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	2.290	0.790	2.400	0.017	1.163	4.510
		Before 18	1.000					
	Relationship to husband	Relative	0.502	0.175	-1.980	0.048	0.253	0.995
		No relation	1.000					
	Marriage arrangement	Themselves	1.165	0.312	0.570	0.568	0.689	1.970
		Families	1.000					
		Escaped/ Abd./Other	1.047	1.110	0.040	0.966	0.130	8.409
	Marriage ceremony	Only civil	0.218	0.259	-1.280	0.199	0.021	2.235
		Both, civil first	0.085	0.097	-2.170	0.030	0.009	0.790
		Both, religious first	0.106	0.120	-1.980	0.048	0.011	0.979
		Only religious	1.000					
		No ceremony	0.107	0.174	-1.370	0.170	0.004	2.604
	Cons.		7.156	8.882	1.590	0.113	0.625	81.921

Table D.9. (continued) Determinants of Cluster Membership for 1954-1963

Three children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.840	0.523	-0.280	0.779	0.247	2.855
		Other	1.000					
	Education	Single years	0.928	0.023	-3.010	0.003	0.884	0.974
	Childhood Place of Residence	Urban	0.903	0.163	-0.560	0.573	0.634	1.287
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.831	0.511	-0.300	0.763	0.248	2.781
		Other	1.000					
	Education	Secondary or higher	0.517	0.244	-1.400	0.164	0.204	1.309
		Primary complete	0.702	0.309	-0.800	0.423	0.296	1.668
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	0.833	0.146	-1.040	0.299	0.591	1.176
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.593	0.110	-2.820	0.005	0.412	0.853
		Before 18	1.000					
	Relationship to husband	Relative	1.259	0.241	1.200	0.229	0.864	1.834
		No relation	1.000					
	Marriage arrangement	Themselves	0.769	0.142	-1.420	0.155	0.536	1.105
		Families	1.000					
		Escaped/ Abd./Other	1.075	0.465	0.170	0.867	0.460	2.513
	Marriage ceremony	Only civil	0.144	0.170	-1.640	0.101	0.014	1.465
		Both, civil first	0.203	0.213	-1.520	0.129	0.026	1.593
		Both, religious first	0.231	0.244	-1.390	0.166	0.029	1.837
		Only religious	1.000					
		No ceremony	0.024	0.037	-2.360	0.019	0.001	0.532
	Cons.		23.188	27.183	2.680	0.008	2.319	231.8

Table D.9. (continued) Determinants of Cluster Membership for 1954-1963

Four children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	1.646	0.772	1.060	0.289	0.655	4.135
		Other	1.000					
	Education	Single years	0.839	0.029	-5.050	0.000	0.784	0.899
	Childhood Place of Residence	Urban	0.911	0.153	-0.550	0.582	0.655	1.268
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.376	0.189	-1.940	0.052	0.140	1.010
		Other	1.000					
	Education	Secondary or higher	0.592	0.296	-1.050	0.295	0.222	1.582
		Primary complete	0.993	0.466	-0.010	0.989	0.396	2.494
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	0.579	0.109	-2.910	0.004	0.401	0.837
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.508	0.089	-3.870	0.000	0.360	0.716
		Before 18	1.000					
	Relationship to husband	Relative	1.602	0.318	2.380	0.018	1.085	2.366
		No relation	1.000					
	Marriage arrangement	Themselves	0.756	0.159	-1.330	0.185	0.500	1.143
		Families	1.000					
		Escaped/ Abd./Other	1.500	0.665	0.910	0.361	0.628	3.584
	Marriage ceremony	Only civil	0.059	0.071	-2.350	0.019	0.005	0.626
		Both, civil first	0.122	0.128	-2.000	0.046	0.015	0.968
		Both, religious first	0.220	0.230	-1.450	0.149	0.028	1.721
		Only religious	1.000					
		No ceremony	0.103	0.180	-1.300	0.194	0.003	3.190
	Cons.		32.672	35.543	3.200	0.001	3.857	276.8

Table D.9. (continued) Determinants of Cluster Membership for 1954-1963

Five or more children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.535	0.281	-1.190	0.233	0.191	1.498
		Other	1.000					
	Education	Single years	0.792	0.029	-6.450	0.000	0.738	0.850
	Childhood Place of Residence	Urban	0.706	0.156	-1.580	0.115	0.457	1.088
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.246	0.131	-2.630	0.009	0.086	0.702
		Other	1.000					
	Education	Secondary or higher	0.194	0.098	-3.260	0.001	0.072	0.521
		Primary complete	0.381	0.173	-2.120	0.034	0.156	0.931
		No edu. or pri edu.incomp.	1.000					
	Place of Birth	1 mil and above	0.872	0.183	-0.650	0.514	0.578	1.316
		Below 1 mil	1.000					
Marriage	Women's age at first marriage	18 and above	0.198	0.038	-8.450	0.000	0.136	0.289
		Before 18	1.000					
	Relationship to husband	Relative	1.825	0.371	2.960	0.003	1.224	2.721
		No relation	1.000					
	Marriage arrangement	Themselves	0.762	0.147	-1.410	0.160	0.521	1.114
		Families	1.000					
		Escaped/ Abd./Other	2.001	0.910	1.530	0.128	0.820	4.886
	Marriage ceremony	Only civil	0.096	0.107	-2.110	0.036	0.011	0.854
		Both, civil first	0.088	0.088	-2.430	0.015	0.012	0.627
		Both, religious first	0.273	0.274	-1.300	0.196	0.038	1.956
		Only religious	1.000					
		No ceremony	0.000	0.000	-12.380	0.000	0.000	0.000
	Cons.		592.1	602.05	6.280	0.000	80.35	4363

Table D. 10. Determinants of Cluster Membership for 1954-1963

Childless

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.401	0.228	-1.610	0.109	0.131	1.225
		Other	1.000					
	Education	Single years	0.925	0.062	-1.170	0.242	0.811	1.054
	Childhood Place of Residence	Urban	0.803	0.494	-0.360	0.721	0.240	2.686
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.455	0.259	-1.380	0.168	0.149	1.394
		Other	1.000					
	Education	Secondary or higher	0.188	0.160	-1.970	0.049	0.035	0.996
		Primary complete	0.232	0.194	-1.750	0.081	0.045	1.196
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	1.274	0.681	0.450	0.651	0.445	3.643
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	1.404	0.644	0.740	0.460	0.570	3.457
		Before 18	1.000					
	Relationship to husband	Relative	0.385	0.180	-2.040	0.042	0.153	0.965
		No relation	1.000					
	Marriage arrangement	Themselves	1.795	0.777	1.350	0.177	0.767	4.200
		Families	1.000					
		Escaped/ Abd./Other	0.683	0.627	-0.410	0.678	0.113	4.147
	Marriage ceremony	Only civil	0.102	0.149	-1.570	0.118	0.006	1.788
		Both, civil first	0.153	0.196	-1.470	0.143	0.013	1.884
		Both, religious first	0.227	0.284	-1.180	0.237	0.019	2.654
		Only religious	1.000					
		No ceremony	0.595	1.176	-0.260	0.793	0.012	28.92
	Cons.		14.103	20.735	1.800	0.072	0.786	253.2

Table D.10. (continued) Determinants of Cluster Membership for 1959-1968

One child-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.916	0.453	-0.180	0.859	0.347	2.421
		Other	1.000					
	Education	Single years	1.054	0.033	1.650	0.100	0.990	1.122
	Childhood Place of Residence	Urban	0.660	0.148	-1.850	0.065	0.425	1.025
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.424	0.204	-1.780	0.076	0.164	1.093
		Other	1.000					
	Education	Secondary or higher	0.286	0.185	-1.940	0.053	0.080	1.019
		Primary complete	0.284	0.173	-2.070	0.039	0.086	0.940
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	1.400	0.328	1.440	0.151	0.884	2.217
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	5.526	1.927	4.900	0.000	2.785	10.96
		Before 18	1.000					
	Relationship to husband	Relative	0.614	0.136	-2.200	0.028	0.397	0.949
		No relation	1.000					
	Marriage arrangement	Themselves	1.345	0.269	1.480	0.138	0.909	1.991
		Families	1.000					
		Escaped/ Abd./Other	0.437	0.192	-1.880	0.060	0.184	1.036
	Marriage ceremony	Only civil	0.347	0.444	-0.830	0.408	0.028	4.275
		Both, civil first	0.331	0.406	-0.900	0.368	0.030	3.690
		Both, religious first	0.489	0.603	-0.580	0.562	0.043	5.505
		Only religious	1.000					
		No ceremony	0.000	0.000	-26.62	0.000	0.000	0.000
	Cons.		2.884	4.047	0.750	0.451	0.183	45.4

Table D.10. (continued) Determinants of Cluster Membership for 1959-1968

Three children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	2.604	1.269	1.960	0.050	1.000	6.783
		Other	1.000					
	Education	Single years	0.910	0.026	-3.320	0.001	0.861	0.962
	Childhood Place of Residence	Urban	0.975	0.216	-0.110	0.910	0.632	1.505
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.226	0.099	-3.390	0.001	0.095	0.535
		Other	1.000					
	Education	Secondary or higher	0.763	0.524	-0.390	0.693	0.198	2.937
		Primary complete	0.708	0.453	-0.540	0.590	0.201	2.490
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.975	0.208	-0.120	0.904	0.641	1.481
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.511	0.096	-3.570	0.000	0.353	0.739
		Before 18	1.000					
	Relationship to husband	Relative	1.213	0.237	0.990	0.325	0.826	1.781
		No relation	1.000					
	Marriage arrangement	Themselves	0.888	0.178	-0.590	0.555	0.599	1.318
		Families	1.000					
		Escaped/ Abd./Other	0.760	0.243	-0.860	0.391	0.406	1.423
	Marriage ceremony	Only civil	0.122	0.150	-1.710	0.087	0.011	1.362
		Both, civil first	0.278	0.324	-1.100	0.272	0.028	2.738
		Both, religious first	0.326	0.382	-0.960	0.340	0.033	3.259
		Only religious	1.000					
		No ceremony	0.000	0.000	-27.75	0.000	0.000	0.000
	Cons.		20.141	26.761	2.260	0.024	1.481	273.8

Table D.10. (continued) Determinants of Cluster Membership for 1959-1968

Four children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	1.367	0.708	0.600	0.546	0.494	3.779
		Other	1.000					
	Education	Single years	0.842	0.037	-3.870	0.000	0.772	0.919
	Childhood Place of Residence	Urban	0.833	0.224	-0.680	0.497	0.490	1.414
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.284	0.140	-2.550	0.011	0.107	0.750
		Other	1.000					
	Education	Secondary or higher	0.281	0.196	-1.820	0.069	0.071	1.104
		Primary complete	0.321	0.216	-1.690	0.092	0.086	1.203
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.676	0.174	-1.520	0.128	0.408	1.120
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.471	0.088	-4.020	0.000	0.326	0.681
		Before 18	1.000					
	Relationship to husband	Relative	1.288	0.246	1.330	0.185	0.885	1.874
		No relation	1.000					
	Marriage arrangement	Themselves	0.788	0.188	-1.000	0.320	0.493	1.261
		Families	1.000					
		Escaped/ Abd./Other	0.620	0.220	-1.350	0.178	0.309	1.244
	Marriage ceremony	Only civil	0.201	0.251	-1.290	0.199	0.017	2.323
		Both, civil first	0.310	0.346	-1.050	0.295	0.034	2.786
		Both, religious first	0.545	0.606	-0.550	0.585	0.062	4.832
		Only religious	1.000					
		No ceremony	0.000	0.000	-27.57	0.000	0.000	0.000
	Cons.		53.887	71.092	3.020	0.003	4.038	719.2

Table D.10. (continued) Determinants of Cluster Membership for 1959-1968

Five or more children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.455	0.237	-1.510	0.131	0.164	1.265
		Other	1.000					
	Education	Single years	0.780	0.035	-5.470	0.000	0.713	0.853
	Childhood Place of Residence	Urban	1.024	0.311	0.080	0.938	0.564	1.859
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.327	0.167	-2.180	0.029	0.120	0.894
		Other	1.000					
	Education	Secondary or higher	0.145	0.108	-2.600	0.010	0.034	0.626
		Primary complete	0.190	0.124	-2.540	0.011	0.053	0.687
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.532	0.156	-2.160	0.031	0.300	0.945
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.253	0.054	-6.490	0.000	0.167	0.384
		Before 18	1.000					
	Relationship to husband	Relative	1.635	0.372	2.160	0.031	1.046	2.557
		No relation	1.000					
	Marriage arrangement	Themselves	0.682	0.195	-1.340	0.182	0.388	1.197
		Families	1.000					
		Escaped/ Abd./Other	0.625	0.243	-1.210	0.227	0.291	1.342
	Marriage ceremony	Only civil	0.197	0.249	-1.280	0.200	0.016	2.363
		Both, civil first	0.109	0.126	-1.920	0.056	0.011	1.054
		Both, religious first	0.452	0.506	-0.710	0.478	0.050	4.082
		Only religious	1.000					
		No ceremony	0.000	0.000	-26.360	0.000	0.000	0.000
	Cons.		546.56	715.547	4.810	0.000	41.77	7152

Table D. 11. Determinants of Cluster Membership for 1964-1973

Childless

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.179	0.118	-2.600	0.010	0.049	0.656
		Other	1.000					
	Education	Single years	1.000	0.027	0.010	0.992	0.949	1.054
	Childhood Place of Residence	Urban	1.719	0.594	1.570	0.118	0.872	3.391
		Rural	1.000					
Husband	Mother Tongue	Turkish	2.261	1.545	1.190	0.233	0.591	8.650
		Other	1.000					
	Education	Secondary or higher	0.764	0.489	-0.420	0.674	0.217	2.684
		Primary complete	0.734	0.443	-0.510	0.609	0.224	2.404
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.713	0.268	-0.900	0.369	0.341	1.491
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	3.140	1.687	2.130	0.034	1.093	9.018
		Before 18	1.000					
	Relationship to husband	Relative	0.969	0.368	-0.080	0.934	0.460	2.041
		No relation	1.000					
	Marriage arrangement	Themselves	1.235	0.405	0.640	0.520	0.649	2.350
		Families	1.000					
		Escaped/ Abd./Other	1.664	1.219	0.700	0.487	0.395	7.014
	Marriage ceremony	Only civil	0.270	0.298	-1.180	0.237	0.031	2.367
		Both, civil first	0.069	0.064	-2.890	0.004	0.011	0.424
		Both, religious first	0.055	0.052	-3.070	0.002	0.009	0.350
		Only religious	1.000					
		No ceremony	0.000	0.000	-10.390	0.000	0.000	0.000
	Cons.		1.356	1.581	0.260	0.794	0.137	13.400

Table D.11. (continued) Determinants of Cluster Membership for 1964-1973

One child-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.364	0.181	-2.030	0.042	0.137	0.966
		Other	1.000					
	Education	Single years	1.013	0.020	0.670	0.504	0.975	1.054
	Childhood Place of Residence	Urban	1.743	0.387	2.500	0.013	1.127	2.697
		Rural	1.000					
Husband	Mother Tongue	Turkish	1.453	0.672	0.810	0.419	0.586	3.605
		Other	1.000					
	Education	Secondary or higher	0.747	0.393	-0.550	0.580	0.266	2.101
		Primary complete	0.565	0.289	-1.120	0.264	0.207	1.542
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.853	0.178	-0.760	0.446	0.565	1.286
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	2.372	0.745	2.750	0.006	1.281	4.395
		Before 18	1.000					
	Relationship to husband	Relative	0.591	0.155	-2.000	0.046	0.353	0.991
		No relation	1.000					
	Marriage arrangement	Themselves	1.559	0.283	2.440	0.015	1.091	2.228
		Families	1.000					
		Escaped/ Abd./Other	1.353	0.635	0.640	0.520	0.538	3.402
	Marriage ceremony	Only civil	0.455	0.435	-0.820	0.411	0.070	2.976
		Both, civil first	0.138	0.117	-2.340	0.020	0.026	0.729
		Both, religious first	0.164	0.142	-2.080	0.038	0.030	0.903
		Only religious	1.000					
		No ceremony	0.000	0.000	-10.440	0.000	0.000	0.000
	Cons.		2.327	2.264	0.870	0.386	0.344	15.737

Table D.11. (continued) Determinants of Cluster Membership for 1964-1973

Three children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf.	Interval]
Women	Mother Tongue	Turkish	0.453	0.214	-1.670	0.095	0.179	1.147
		Other	1.000					
	Education	Single years	0.892	0.024	-4.240	0.000	0.846	0.941
	Childhood Place of Residence	Urban	1.101	0.204	0.520	0.606	0.764	1.584
		Rural	1.000					
Husband	Mother Tongue	Turkish	1.462	0.626	0.890	0.376	0.630	3.392
		Other	1.000					
	Education	Secondary or higher	0.803	0.396	-0.450	0.656	0.305	2.115
		Primary complete	0.869	0.393	-0.310	0.756	0.358	2.111
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.928	0.183	-0.380	0.705	0.630	1.368
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.600	0.105	-2.910	0.004	0.425	0.847
		Before 18	1.000					
	Relationship to husband	Relative	1.119	0.213	0.590	0.554	0.770	1.627
		No relation	1.000					
	Marriage arrangement	Themselves	0.828	0.141	-1.100	0.270	0.593	1.158
		Families	1.000					
		Escaped/ Abd./Other	0.956	0.411	-0.100	0.917	0.411	2.222
	Marriage ceremony	Only civil	1.028	1.048	0.030	0.978	0.139	7.617
		Both, civil first	0.828	0.781	-0.200	0.842	0.130	5.284
		Both, religious first	1.038	1.009	0.040	0.970	0.154	7.008
		Only religious	1.000					
		No ceremony	0.000	0.000	-8.730	0.000	0.000	0.000
	Cons.		3.930	3.957	1.360	0.175	0.544	28.39

Table D.11. (continued) Determinants of Cluster Membership for 1964-1973

Four children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.457	0.218	-1.640	0.101	0.179	1.165
		Other	1.000					
	Education	Single years	0.840	0.029	-4.980	0.000	0.784	0.900
	Childhood Place of Residence	Urban	1.598	0.391	1.920	0.056	0.988	2.583
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.834	0.375	-0.400	0.687	0.345	2.018
		Other	1.000					
	Education	Secondary or higher	0.320	0.159	-2.300	0.022	0.121	0.848
		Primary complete	0.347	0.159	-2.310	0.021	0.141	0.855
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.681	0.158	-1.650	0.098	0.431	1.075
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.540	0.109	-3.040	0.002	0.363	0.804
		Before 18	1.000					
	Relationship to husband	Relative	1.331	0.305	1.250	0.212	0.849	2.087
		No relation	1.000					
	Marriage arrangement	Themselves	0.491	0.119	-2.940	0.003	0.305	0.790
		Families	1.000					
		Escaped/ Abd./Other	0.940	0.470	-0.120	0.901	0.352	2.509
	Marriage ceremony	Only civil	1.389	1.670	0.270	0.785	0.131	14.737
		Both, civil first	0.875	0.898	-0.130	0.896	0.116	6.577
		Both, religious first	1.736	1.782	0.540	0.591	0.231	13.041
		Only religious	1.000					
		No ceremony	0.000	0.000	-7.810	0.000	0.000	0.000
	Cons.		6.923	7.452	1.800	0.073	0.836	57.34

Table D.11. (continued) Determinants of Cluster Membership for 1964-1973

Five or more-children

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.201	0.114	-2.830	0.005	0.066	0.613
		Other	1.000					
	Education	Single years	0.759	0.028	-7.520	0.000	0.706	0.816
	Childhood Place of Residence	Urban	0.675	0.177	-1.500	0.135	0.403	1.131
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.413	0.228	-1.600	0.109	0.140	1.220
		Other	1.000					
	Education	Secondary or higher	0.185	0.089	-3.500	0.000	0.072	0.476
		Primary complete	0.311	0.134	-2.710	0.007	0.133	0.726
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.626	0.176	-1.660	0.097	0.360	1.088
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.251	0.053	-6.530	0.000	0.166	0.381
		Before 18	1.000					
	Relationship to husband	Relative	1.732	0.437	2.180	0.030	1.055	2.842
		No relation	1.000					
	Marriage arrangement	Themselves	0.505	0.132	-2.610	0.009	0.302	0.845
		Families	1.000					
		Escaped/ Abd./Other	1.573	0.932	0.760	0.445	0.491	5.038
	Marriage ceremony	Only civil	0.175	0.201	-1.520	0.130	0.018	1.670
		Both, civil first	0.627	0.543	-0.540	0.590	0.114	3.441
		Both, religious first	1.233	1.085	0.240	0.812	0.219	6.945
		Only religious	1.000					
		No ceremony	0.000	0.000	-7.370	0.000	0.000	0.001
	Cons.		95.104	83.607	5.180	0.000	16.91	534.66

Table D. 12. Determinants of Cluster Membership for 1969-1978

Childless

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.305	0.262	-1.380	0.167	0.057	1.642
		Other[r]	1.000					
	Education	Single years	1.060	0.055	1.110	0.266	0.957	1.173
	Childhood Place of Residence	Urban	0.828	0.290	-0.540	0.591	0.417	1.646
		Rural[r]	1.000					
Husband	Mother Tongue	Turkish	1.230	1.274	0.200	0.842	0.161	9.407
		Other[r]	1.000					
	Education	Secondary or higher	0.098	0.077	-2.960	0.003	0.021	0.459
		Primary complete	0.149	0.118	-2.400	0.017	0.031	0.709
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.823	0.252	-0.630	0.526	0.451	1.503
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	2.851	1.578	1.890	0.059	0.961	8.455
		Before 18	1.000					
	Relationship to husband	Relative	0.493	0.268	-1.300	0.195	0.170	1.436
		No relation	1.000					
	Marriage arrangement	Themselves	2.192	0.797	2.160	0.031	1.074	4.474
		Families	1.000					
		Escaped/ Abd./Other	0.615	0.490	-0.610	0.542	0.129	2.938
	Marriage ceremony	Only civil	2.765	3.599	0.780	0.435	0.215	35.616
		Both, civil first	0.804	0.949	-0.180	0.854	0.079	8.169
		Both, religious first	1.212	1.408	0.170	0.869	0.124	11.869
		Only religious	1.000					
		No ceremony	1.102	1.565	0.070	0.945	0.068	17.914
		Cons.	0.509	0.784	-0.440	0.661	0.025	10.49

Table D. 12. (continued) Determinants of Cluster Membership for 1969-1978

One child-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.993	0.491	-0.010	0.989	0.376	2.624
		Other[r]	1.000					
	Education	Single years	1.080	0.029	2.920	0.004	1.025	1.138
	Childhood Place of Residence	Urban	0.857	0.182	-0.720	0.469	0.565	1.301
		Rural[r]	1.000					
Husband	Mother Tongue	Turkish	0.388	0.181	-2.030	0.043	0.155	0.971
		Other[r]	1.000					
	Education	Secondary or higher	0.265	0.156	-2.260	0.024	0.084	0.841
		Primary complete	0.267	0.155	-2.280	0.023	0.086	0.834
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	1.120	0.214	0.590	0.552	0.770	1.630
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	2.774	0.819	3.460	0.001	1.554	4.953
		Before 18	1.000					
	Relationship to husband	Relative	0.853	0.187	-0.720	0.469	0.554	1.313
		No relation	1.000					
	Marriage arrangement	Themselves	1.651	0.329	2.520	0.012	1.117	2.441
		Families	1.000					
		Escaped/ Abd./Other	0.804	0.374	-0.470	0.639	0.322	2.004
	Marriage ceremony	Only civil	0.916	0.758	-0.110	0.916	0.181	4.648
		Both, civil first	0.552	0.376	-0.870	0.383	0.145	2.103
		Both, religious first	0.632	0.432	-0.670	0.502	0.165	2.418
		Only religious	1.000					
		No ceremony	*	*	*	*	*	*
		Cons.	2.255	2.224	0.820	0.410	0.325	15.64

Table D. 12. (continued) Determinants of Cluster Membership for 1969-1978

Three children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.958	0.408	-0.100	0.920	0.416	2.209
		Other[r]	1.000					
	Education	Single years	0.960	0.027	-1.450	0.147	0.909	1.014
	Childhood Place of Residence	Urban	0.941	0.186	-0.310	0.758	0.638	1.387
		Rural[r]	1.000					
Husband	Mother Tongue	Turkish	0.520	0.226	-1.500	0.133	0.221	1.222
		Other[r]	1.000					
	Education	Secondary or higher	0.701	0.417	-0.600	0.551	0.218	2.256
		Primary complete	0.728	0.417	-0.550	0.580	0.236	2.245
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.614	0.127	-2.360	0.018	0.409	0.921
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.653	0.124	-2.240	0.025	0.449	0.948
		Before 18	1.000					
	Relationship to husband	Relative	1.277	0.253	1.230	0.218	0.865	1.886
		No relation	1.000					
	Marriage arrangement	Themselves	0.723	0.131	-1.790	0.075	0.507	1.033
		Families	1.000					
		Escaped/ Abd./Other	0.940	0.307	-0.190	0.850	0.495	1.784
	Marriage ceremony	Only civil	0.421	0.393	-0.930	0.354	0.067	2.632
		Both, civil first	0.952	0.745	-0.060	0.950	0.205	4.424
		Both, religious first	1.213	0.923	0.250	0.800	0.272	5.407
		Only religious	1.000					
		No ceremony	*	*	*	*	*	*
		Cons.	4.551	4.505	1.530	0.126	0.651	31.79

Table D. 12. (continued) Determinants of Cluster Membership for 1969-1978

Four children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.544	0.290	-1.140	0.253	0.191	1.547
		Other[r]	1.000					
	Education	Single years	0.916	0.033	-2.420	0.016	0.853	0.983
	Childhood Place of Residence	Urban	0.844	0.205	-0.700	0.486	0.525	1.359
		Rural[r]	1.000					
Husband	Mother Tongue	Turkish	0.314	0.165	-2.200	0.028	0.112	0.883
		Other[r]	1.000					
	Education	Secondary or higher	0.226	0.126	-2.670	0.008	0.076	0.675
		Primary complete	0.267	0.148	-2.390	0.017	0.090	0.791
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.729	0.179	-1.290	0.199	0.450	1.181
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.565	0.128	-2.520	0.012	0.362	0.882
		Before 18	1.000					
	Relationship to husband	Relative	1.665	0.364	2.330	0.020	1.084	2.556
		No relation	1.000					
	Marriage arrangement	Themselves	0.744	0.169	-1.300	0.194	0.475	1.163
		Families	1.000					
		Escaped/ Abd./Other	0.967	0.469	-0.070	0.946	0.373	2.509
	Marriage ceremony	Only civil	0.199	0.234	-1.370	0.170	0.020	1.998
		Both, civil first	0.494	0.460	-0.760	0.449	0.079	3.076
		Both, religious first	0.838	0.760	-0.190	0.845	0.141	4.969
		Only religious	1.000					
		No ceremony	0.839	0.944	-0.160	0.876	0.092	7.646
		Cons.	34.614	37.611	3.260	0.001	4.099	292.3

Table D. 12. (continued) Determinants of Cluster Membership for 1969-1978

Five children-norm

			Odds Ratio	Lin. Std. Err.	t	P>|t|	[95% Conf. Interval]	
Women	Mother Tongue	Turkish	0.206	0.136	-2.400	0.017	0.057	0.750
		Other	1.000					
	Education	Single years	0.802	0.036	-4.910	0.000	0.734	0.876
	Childhood Place of Residence	Urban	0.414	0.122	-2.980	0.003	0.231	0.740
		Rural	1.000					
Husband	Mother Tongue	Turkish	0.237	0.161	-2.120	0.034	0.062	0.899
		Other	1.000					
	Education	Secondary or higher	0.341	0.239	-1.540	0.125	0.086	1.348
		Primary complete	0.316	0.221	-1.650	0.100	0.080	1.246
		No edu. or pri edu.incomp.	1.000					
	Childhood Place of Residence	Urban	0.970	0.291	-0.100	0.918	0.538	1.747
		Rural	1.000					
Marriage	Women's age at first marriage	18 and above	0.204	0.055	-5.890	0.000	0.120	0.347
		Before 18	1.000					
	Relationship to husband	Relative	2.111	0.633	2.490	0.013	1.172	3.802
		No relation	1.000					
	Marriage arrangement	Themselves	0.278	0.077	-4.600	0.000	0.161	0.480
		Families	1.000					
		Escaped/ Abd./Other	0.861	0.437	-0.290	0.768	0.318	2.331
	Marriage ceremony	Only civil	0.679	0.798	-0.330	0.742	0.068	6.822
		Both, civil first	1.580	1.416	0.510	0.610	0.272	9.187
		Both, religious first	3.193	2.761	1.340	0.180	0.585	17.437
		Only religious	1.000					
		No ceremony	8.963	14.916	1.320	0.188	0.341	235.34
		Cons.	40.616	44.819	3.360	0.001	4.652	354.6

Table D. 13. Multinomial Regression Predicted Probabilities

		Childless				One-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1944-53	Total	0.023	0.016	0.037	0.021	0.059	0.041	0.099	0.058
	s.e.	0.005	0.005	0.010	0.010	0.008	0.007	0.017	0.017
	p	0.000	0.000	0.000	0.049	0.000	0.000	0.000	0.001
	No educ.	0.012	0.011	0.018	0.008	0.027	0.025	0.036	0.011
	s.e.	0.005	0.004	0.010	0.008	0.006	0.006	0.012	0.009
	p	0.009	0.008	0.056	0.312	0.000	0.000	0.002	0.231
	Prim +	0.034	0.027	0.040	0.014	0.100	0.076	0.123	0.047
	s.e.	0.007	0.007	0.011	0.012	0.011	0.012	0.018	0.020
	p	0.000	0.000	0.000	0.270	0.000	0.000	0.000	0.020
	Δ educ.	0.022	0.016	0.022	0.006	0.073	0.051	0.087	0.036
	s.e.	0.008	0.007	0.013	0.009	0.011	0.010	0.015	0.014
	p	0.009	0.036	0.089	0.500	0.000	0.000	0.000	0.010
1949-58	Total	0.016	0.021	0.008	-0.013	0.061	0.034	0.125	0.091
	s.e.	0.004	0.006	0.004	0.006	0.011	0.008	0.023	0.022
	p	0.000	0.000	0.039	0.030	0.000	0.000	0.000	0.000
	No educ.	0.016	0.019	0.009	-0.010	0.017	0.016	0.021	0.005
	s.e.	0.006	0.006	0.006	0.006	0.005	0.005	0.010	0.008
	p	0.003	0.001	0.138	0.090	0.001	0.001	0.026	0.476
	Prim +	0.009	0.015	0.005	-0.010	0.107	0.064	0.158	0.094
	s.e.	0.004	0.006	0.003	0.005	0.014	0.013	0.024	0.026
	p	0.032	0.017	0.104	0.051	0.000	0.000	0.000	0.000
	Δ educ.	-0.007	-0.004	-0.004	0.001	0.090	0.048	0.136	0.088
	s.e.	0.008	0.008	0.007	0.003	0.013	0.011	0.022	0.022
	p	0.344	0.613	0.598	0.874	0.000	0.000	0.000	0.000

Note: Standard errors in second row, p-values in third row.

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Two-norm				Three-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1944-53	Total	0.127	0.084	0.250	0.166	0.192	0.144	0.281	0.138
	s.e.	0.013	0.011	0.025	0.024	0.014	0.014	0.028	0.029
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	No educ.	0.050	0.046	0.074	0.028	0.113	0.101	0.176	0.074
	s.e.	0.008	0.008	0.015	0.012	0.013	0.012	0.028	0.025
	p	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.003
	Prim +	0.261	0.188	0.344	0.157	0.250	0.208	0.276	0.069
	s.e.	0.020	0.020	0.028	0.029	0.019	0.020	0.029	0.031
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.025
	Δ educ.	0.211	0.142	0.270	0.128	0.137	0.106	0.101	-0.005
	s.e.	0.019	0.017	0.026	0.022	0.022	0.019	0.032	0.022
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.807
1949-58	Total	0.174	0.104	0.330	0.227	0.136	0.102	0.174	0.072
	s.e.	0.024	0.020	0.035	0.033	0.015	0.011	0.026	0.025
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
	No educ.	0.043	0.042	0.046	0.004	0.038	0.035	0.052	0.017
	s.e.	0.013	0.013	0.017	0.011	0.006	0.005	0.014	0.012
	p	0.001	0.001	0.007	0.699	0.000	0.000	0.000	0.163
	Prim +	0.339	0.230	0.443	0.212	0.239	0.284	0.181	-0.103
	s.e.	0.024	0.027	0.034	0.042	0.023	0.027	0.026	0.032
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
	Δ educ.	0.296	0.188	0.396	0.208	0.200	0.249	0.128	-0.120
	s.e.	0.024	0.024	0.034	0.036	0.022	0.026	0.024	0.026
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Standard errors in second row, p-values in third row.

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Four-norm				Five or more norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1944-53	Total	0.215	0.205	0.180	-0.025	0.384	0.510	0.152	-0.357
	s.e.	0.014	0.015	0.021	0.025	0.018	0.020	0.020	0.028
	p	0.000	0.000	0.000	0.311	0.000	0.000	0.000	0.000
	No educ.	0.167	0.165	0.170	0.006	0.632	0.652	0.525	-0.127
	s.e.	0.015	0.016	0.024	0.023	0.022	0.022	0.041	0.040
	p	0.000	0.000	0.000	0.807	0.000	0.000	0.000	0.002
	Prim +	0.203	0.238	0.147	-0.091	0.152	0.264	0.069	-0.195
	s.e.	0.018	0.019	0.021	0.023	0.017	0.022	0.012	0.019
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Δ educ.	0.036	0.073	-0.023	-0.097	-0.479	-0.388	-0.456	-0.068
	s.e.	0.023	0.021	0.025	0.016	0.028	0.027	0.039	0.028
	p	0.116	0.001	0.347	0.000	0.000	0.000	0.000	0.015
1949-58	Total	0.236	0.228	0.192	-0.036	0.378	0.511	0.171	-0.340
	s.e.	0.020	0.022	0.029	0.035	0.024	0.028	0.025	0.034
	p	0.000	0.000	0.000	0.304	0.000	0.000	0.000	0.000
	No educ.	0.176	0.176	0.176	0.000	0.710	0.712	0.695	-0.017
	s.e.	0.018	0.021	0.027	0.032	0.023	0.024	0.040	0.043
	p	0.000	0.000	0.000	0.992	0.000	0.000	0.000	0.693
	Prim +	0.178	0.207	0.139	-0.068	0.129	0.200	0.075	-0.125
	s.e.	0.020	0.023	0.025	0.029	0.019	0.027	0.015	0.023
	p	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000
	Δ educ.	0.002	0.031	-0.037	-0.068	-0.581	-0.512	-0.620	-0.108
	s.e.	0.026	0.025	0.030	0.024	0.030	0.031	0.042	0.029
	p	0.931	0.210	0.208	0.004	0.000	0.000	0.000	0.000

Note: Standard errors in second row, p-values in third row.

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Childless				One-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1954-63	Total	0.027	0.025	0.026	0.001	0.060	0.034	0.126	0.092
	s.e.	0.005	0.006	0.007	0.009	0.008	0.006	0.017	0.017
	p	0.000	0.000	0.000	0.874	0.000	0.000	0.000	0.000
	No educ.	0.017	0.017	0.016	-0.001	0.018	0.015	0.031	0.016
	s.e.	0.004	0.005	0.006	0.006	0.004	0.004	0.009	0.007
	p	0.000	0.000	0.010	0.826	0.000	0.000	0.000	0.025
	Prim +	0.027	0.025	0.025	0.000	0.083	0.047	0.148	0.101
	s.e.	0.005	0.007	0.007	0.009	0.010	0.008	0.019	0.019
	p	0.000	0.000	0.000	0.992	0.000	0.000	0.000	0.000
	Δ educ.	0.009	0.008	0.009	0.001	0.066	0.032	0.116	0.084
	s.e.	0.005	0.006	0.006	0.005	0.008	0.006	0.016	0.015
	p	0.083	0.160	0.139	0.755	0.000	0.000	0.000	0.000
1959-68	Total	0.030	0.026	0.031	0.004	0.153	0.102	0.219	0.117
	s.e.	0.005	0.006	0.008	0.009	0.017	0.015	0.023	0.020
	p	0.000	0.000	0.000	0.627	0.000	0.000	0.000	0.000
	No educ.	0.020	0.019	0.022	0.004	0.037	0.035	0.041	0.006
	s.e.	0.006	0.005	0.010	0.009	0.008	0.008	0.011	0.007
	p	0.000	0.000	0.027	0.672	0.000	0.000	0.000	0.423
	Prim +	0.028	0.026	0.029	0.003	0.202	0.148	0.252	0.103
	s.e.	0.006	0.006	0.008	0.009	0.018	0.019	0.023	0.024
	p	0.000	0.000	0.000	0.763	0.000	0.000	0.000	0.000
	Δ educ.	0.009	0.007	0.006	-0.001	0.165	0.113	0.210	0.097
	s.e.	0.007	0.006	0.010	0.005	0.015	0.015	0.019	0.019
	p	0.232	0.253	0.531	0.810	0.000	0.000	0.000	0.000

Note: Standard errors in second row, p-values in third row.

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Two children-norm				Three children-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1954-63	Total	0.271	0.190	0.394	0.204	0.298	0.280	0.272	-0.008
	s.e.	0.015	0.016	0.024	0.028	0.016	0.017	0.023	0.027
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.766
	No educ.	0.081	0.073	0.120	0.047	0.187	0.176	0.227	0.051
	s.e.	0.012	0.011	0.020	0.015	0.019	0.019	0.030	0.027
	p	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.059
	Prim +	0.374	0.297	0.444	0.147	0.296	0.313	0.251	-0.062
	s.e.	0.016	0.019	0.025	0.031	0.016	0.019	0.022	0.026
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019
	Δ educ.	0.293	0.224	0.323	0.100	0.109	0.137	0.024	-0.113
	s.e.	0.018	0.018	0.025	0.023	0.024	0.023	0.030	0.020
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.417	0.000
1959-68	Total	0.269	0.199	0.338	0.139	0.289	0.273	0.272	-0.001
	s.e.	0.018	0.017	0.025	0.025	0.016	0.019	0.020	0.027
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.963
	No educ.	0.076	0.072	0.089	0.017	0.187	0.178	0.215	0.037
	s.e.	0.016	0.014	0.025	0.015	0.019	0.019	0.028	0.026
	p	0.000	0.000	0.000	0.266	0.000	0.000	0.000	0.162
	Prim +	0.336	0.285	0.369	0.084	0.272	0.282	0.249	-0.033
	s.e.	0.017	0.020	0.024	0.029	0.015	0.020	0.019	0.026
	p	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.198
	Δ educ.	0.260	0.213	0.280	0.067	0.085	0.104	0.034	-0.070
	s.e.	0.020	0.021	0.025	0.020	0.022	0.021	0.029	0.021
	p	0.000	0.000	0.000	0.001	0.000	0.000	0.239	0.001

Note: Standard errors in second row, p-values in third row.

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Four children-norm				Five or more children-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1954-63	Total	0.191	0.220	0.125	-0.095	0.154	0.252	0.057	-0.195
	s.e.	0.014	0.016	0.016	0.020	0.013	0.019	0.010	0.021
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	No educ.	0.216	0.206	0.249	0.043	0.480	0.512	0.357	-0.156
	s.e.	0.019	0.020	0.032	0.031	0.026	0.028	0.041	0.044
	p	0.000	0.000	0.000	0.168	0.000	0.000	0.000	0.000
	Prim +	0.146	0.189	0.097	-0.092	0.074	0.129	0.035	-0.094
	s.e.	0.015	0.017	0.015	0.016	0.010	0.014	0.008	0.014
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Δ educ.	-0.070	-0.017	-0.152	-0.135	-0.406	-0.383	-0.321	0.062
	s.e.	0.025	0.023	0.033	0.025	0.028	0.028	0.039	0.034
	p	0.005	0.468	0.000	0.000	0.000	0.000	0.000	0.073
1959-68	Total	0.158	0.219	0.095	-0.125	0.101	0.180	0.045	-0.134
	s.e.	0.012	0.016	0.013	0.019	0.012	0.016	0.009	0.016
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	No educ.	0.235	0.245	0.207	-0.037	0.446	0.451	0.425	-0.026
	s.e.	0.021	0.022	0.030	0.029	0.028	0.029	0.044	0.044
	p	0.000	0.000	0.000	0.194	0.000	0.000	0.000	0.556
	Prim +	0.112	0.169	0.074	-0.096	0.050	0.089	0.028	-0.061
	s.e.	0.012	0.017	0.012	0.016	0.008	0.012	0.006	0.010
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Δ educ.	-0.123	-0.075	-0.133	-0.058	-0.396	-0.362	-0.397	-0.035
	s.e.	0.026	0.026	0.031	0.019	0.029	0.029	0.043	0.037
	p	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.341

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Childless				One children-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1964-73	Total	0.034	0.024	0.044	0.021	0.137	0.080	0.209	0.129
	s.e.	0.006	0.006	0.009	0.010	0.013	0.012	0.020	0.020
	p	0.000	0.000	0.000	0.035	0.000	0.000	0.000	0.000
	No educ.	0.012	0.010	0.017	0.007	0.038	0.031	0.063	0.032
	s.e.	0.004	0.004	0.006	0.004	0.008	0.007	0.014	0.011
	p	0.003	0.007	0.003	0.121	0.000	0.000	0.000	0.003
	Prim +	0.038	0.028	0.046	0.018	0.162	0.099	0.224	0.125
	s.e.	0.006	0.007	0.009	0.010	0.014	0.013	0.021	0.022
	p	0.000	0.000	0.000	0.084	0.000	0.000	0.000	0.000
	Δ educ.	0.026	0.018	0.029	0.011	0.123	0.068	0.161	0.093
	s.e.	0.005	0.005	0.008	0.008	0.011	0.009	0.018	0.017
	p	0.000	0.000	0.000	0.150	0.000	0.000	0.000	0.000
1969-78	Total	0.026	0.021	0.028	0.007	0.248	0.154	0.338	0.184
	s.e.	0.005	0.006	0.006	0.008	0.016	0.017	0.020	0.023
	p	0.000	0.001	0.000	0.338	0.000	0.000	0.000	0.000
	No educ.	0.010	0.009	0.013	0.003	0.060	0.054	0.081	0.027
	s.e.	0.004	0.004	0.007	0.005	0.011	0.010	0.018	0.013
	p	0.019	0.021	0.057	0.501	0.000	0.000	0.000	0.041
	Prim +	0.027	0.023	0.028	0.005	0.279	0.184	0.356	0.172
	s.e.	0.005	0.007	0.006	0.008	0.016	0.019	0.020	0.025
	p	0.000	0.001	0.000	0.509	0.000	0.000	0.000	0.000
	Δ educ.	0.017	0.013	0.015	0.002	0.219	0.130	0.275	0.145
	s.e.	0.004	0.005	0.006	0.005	0.015	0.016	0.019	0.019
	p	0.000	0.007	0.008	0.702	0.000	0.000	0.000	0.000

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Two children-norm				Three children-norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1964-73	Total	0.381	0.312	0.412	0.100	0.293	0.315	0.242	-0.073
	s.e.	0.017	0.021	0.022	0.029	0.016	0.020	0.019	0.026
	p	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.004
	No educ.	0.120	0.111	0.140	0.029	0.237	0.220	0.272	0.052
	s.e.	0.017	0.017	0.022	0.017	0.024	0.024	0.032	0.028
	p	0.000	0.000	0.000	0.094	0.000	0.000	0.000	0.061
	Prim +	0.435	0.403	0.436	0.033	0.263	0.305	0.222	-0.083
	s.e.	0.017	0.021	0.023	0.030	0.016	0.019	0.019	0.024
	p	0.000	0.000	0.000	0.274	0.000	0.000	0.000	0.001
	Δ educ.	0.314	0.292	0.296	0.004	0.026	0.085	-0.050	-0.134
	s.e.	0.020	0.019	0.025	0.021	0.027	0.024	0.035	0.026
	p	0.000	0.000	0.000	0.842	0.332	0.000	0.150	0.000
1969-78	Total	0.328	0.259	0.361	0.102	0.257	0.303	0.195	-0.107
	s.e.	0.017	0.021	0.021	0.028	0.015	0.021	0.017	0.026
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	No educ.	0.103	0.090	0.150	0.060	0.204	0.197	0.218	0.021
	s.e.	0.018	0.017	0.028	0.020	0.025	0.026	0.031	0.027
	p	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.436
	Prim +	0.353	0.308	0.365	0.057	0.236	0.299	0.185	-0.115
	s.e.	0.017	0.022	0.021	0.028	0.015	0.021	0.017	0.024
	p	0.000	0.000	0.000	0.044	0.000	0.000	0.000	0.000
	Δ educ.	0.251	0.218	0.214	-0.004	0.033	0.103	-0.033	-0.136
	s.e.	0.021	0.020	0.030	0.023	0.028	0.026	0.032	0.023
	p	0.000	0.000	0.000	0.868	0.235	0.000	0.298	0.000

Table D. 13. (continued) Multinomial Regression Predicted Probabilities

		Four-norm				Five or more norm			
		Total	Rural	Urban	Δ resid.	Total	Rural	Urban	Δ resid.
1964-73	Total	0.107	0.132	0.077	-0.055	0.048	0.137	0.015	-0.122
	s.e.	0.009	0.014	0.009	0.016	0.007	0.015	0.004	0.014
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	No educ.	0.197	0.175	0.257	0.082	0.395	0.452	0.252	-0.200
	s.e.	0.020	0.019	0.037	0.034	0.029	0.033	0.036	0.041
	p	0.000	0.000	0.000	0.017	0.000	0.000	0.000	0.000
	Prim +	0.078	0.097	0.062	-0.035	0.024	0.068	0.010	-0.058
	s.e.	0.008	0.012	0.008	0.013	0.004	0.010	0.003	0.009
	p	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000
	Δ educ.	-0.119	-0.077	-0.194	-0.117	-0.371	-0.385	-0.242	0.142
	s.e.	0.021	0.019	0.036	0.026	0.030	0.031	0.035	0.036
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1969-78	Total	0.119	0.184	0.071	-0.112	0.023	0.080	0.006	-0.073
	s.e.	0.011	0.016	0.012	0.019	0.005	0.014	0.002	0.013
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
	No educ.	0.278	0.269	0.299	0.031	0.345	0.382	0.239	-0.143
	s.e.	0.033	0.034	0.044	0.041	0.033	0.039	0.038	0.050
	p	0.000	0.000	0.000	0.448	0.000	0.000	0.000	0.004
	Prim +	0.092	0.142	0.061	-0.081	0.013	0.043	0.005	-0.038
	s.e.	0.011	0.014	0.011	0.015	0.003	0.009	0.002	0.008
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
	Δ educ.	-0.187	-0.126	-0.238	-0.112	-0.332	-0.338	-0.234	0.104
	s.e.	0.036	0.034	0.044	0.032	0.033	0.037	0.038	0.046
	p	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022

Appendix E. Original Article

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RESEARCH ARTICLE

Cohort fertility heterogeneity during the fertility decline period in Turkey

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Abstract
The decline in fertility, rapid urbanization and the increase in women's education levels in Turkey are simultaneous transformations. The coexistence and interaction of these transformations is the focal point for the interpretation of fertility trajectories in Turkey. This article explores Turkey's heterogeneous fertility structure by examining the fertility trajectories of women between 1949 and 1978 cohorts. It also examines changes in these trajectories in light of Turkey's fertility decline and interprets those changes through comparisons of women whose fertility behaviors are similar. Using three waves (1998, 2008 and 2018) of the Turkey Demographic and Health Survey data, we employed sequence analysis to calculate fertility trajectories and form clusters from these trajectories. The background similarities of women in the same fertility clusters were investigated with distance analysis, and we calculated predicted probabilities from multinomial logistic regression results and predicted cluster membership. The heterogeneous nature of fertility in Turkey during the demographic transition period shaped the transition process and it can be predicted that such heterogeneity will shape post-transition fertility. The behavior of having two children became the norm during this period, and greater spacing between births or even stopping after the first child became a preferred option among educated women who grew up in cities. For women who grew up in rural areas and uneducated women, we observed a transition from higher parities to three-norm.

Keywords: Fertility; Heterogeneity; Turkey; Birth History

Introduction

Understanding fertility patterns has been the primary focus of fertility studies for more than half a century. Most fertility literature has attempted to explain observed fertility levels with behavioral models and proximate determinants (Bongaarts 1978; Kohler et al. 2002; Goldstein et al. 2009), socioeconomic models (Becker 1960; Caldwell 1982; Van de Kaa 1987; McDonald 2000), or institutional approaches (McNicoll 1980; Szreter 1993; Rindfuss et al. 2003). The focus of these studies has mainly been on changes in the mean period and cohort fertility levels of the population, where mathematical modeling and fertility theories are widely used to analyze trends in average fertility levels of women with similar characteristics. However, women in the same cohort may have different fertility outcomes despite having similar characteristics, while women with dissimilar demographic backgrounds may display very similar fertility trajectories. In this study fertility trajectories refers to the total fertility structure of quantum (parity of women) and tempo (time spent in each parity) of women between ages 12 and 40. Employing fertility trajectories to understand the fertility structure of the population and its change over time is as functional and essential as using fertility outcomes such as total fertility rates. The interpretation of these trajectories allows us to get closer to reality when the criteria for detecting differences in fertility behavior are based on women's choices, rather than *a priori* distinctions made by the researcher (Blau and Schwartz 1984). This article reveals differences in fertility trajectories in Turkey to portray women with various fertility patterns and interprets those differences based on the women's various characteristics. To achieve this, we clustered the fertility trajectories of female cohorts and analyzed their pathways.

Changes in fertility are rarely uniform in a population and it is important to evaluate fertility in terms of differences in timing and size across reproductive ages, just as it is important to interpret fertility over its determinants. Heterogeneity in fertility can be defined as multiple fertility trajectories observed in a cohort of women which are significantly different from each other. Such an approach is an effective means understanding the composition of a population since childbearing is one of the most enduring demographic events, subject to the influence of individual decisions, and one that has important implications for a population in terms of structure and size. The demographic transition approach has often overlooked fertility heterogeneity and focused more on change in fertility size since intrinsic changes in fertility are of secondary importance. On the other hand, when examining the periods in which the fertility structure and accordingly fertility rates change, fertility differentiation such as postponing fertility, voluntary childlessness or the prevalence of births out of wedlock are frequently mentioned factors. For example, the second demographic transition (SDT) theorizes that cultural shifts and changes trigger individualization in demographic behavior. Lesthaeghe (2010) mentions that these changes can be observed heterogeneously in populations reflecting various cultural and historical paths. Indeed, social relationships and networks depend on the social environment, i.e. the composition of the community, as well as on the cultural and socio-psychological factors that govern individual tendencies and preferences (Blau and Schwartz 1984). The interpersonal channels are stronger among individuals with similar characteristics and the communication of ideas takes place through these channels. The preference of individuals to communicate with others who share like characteristics, called homophily, may result in the grouping of demographic behaviors within a society. For this reason, the course of change in fertility behavior over time becomes more important than the emergence of change, especially when focusing on the period where fertility has already started to decline.

Declining fertility, rapid urbanization and the increase in women's education levels in Turkey are simultaneous transformations that pave the way for an increase in interpersonal ties. The coexistence and interaction of these transformations is the focal point for the interpretation of fertility trajectories in Turkey. In this study, we examined the heterogeneous nature of fertility in Turkey in the second half of the 20th century, when both social structures and period level fertility in Turkey underwent rapid transformation. To this end, we analyzed the fertility course of women cohorts between 1949 and 1978 using the fertility history datasets of the three Turkey Demographic and Health Surveys (TDHS) 1998, 2008 and 2018. The TDHS is a nationally representative sample survey designed to provide information trends on fertility, infant mortality, family planning, and mother and child health (Hacettepe University Institute of Population Studies (HUIPS) 2019). In order to investigate fertility heterogeneity in Turkey, sequence analysis is used to reveal the fertility trajectories of ever-married women aged 40-49. Clusters of fertility trajectories are formed in order to group tempo and quantum-related fertility patterns. Unlike parity-based grouping, these clusters are based on the common experience of time spent with a certain number of children.

We argue that interpersonal communication, especially among women, increase alongside observed declines of fertility in Turkey during periods when social changes are experienced more acutely and immediately at the personal level. To reach this interpretation, we examined how women who exhibit similar fertility trajectories share other similar characteristics before their reproductive ages. In order to identify these similarities, we focused on the women's social background characteristics, their spouses, and their marriage formations with the help of distance analysis. To reflect the men's share of fertility decisions, we examined similarities between husbands for women with similar fertility trajectories. In addition, we inspected the marital background of spouses in order to evaluate cultural effects on fertility behaviors. In this context, this study discusses similarities in childhood place of residence for the woman and her husband, their education levels and other features underlying the establishment of their marriage. To complement these descriptive findings, we used multinomial logistic regression analysis to calculate the predicted probabilities of cluster membership in terms of women's childhood place of residence and education level, thereby linking fertility decline with increases in women's education and overall urbanization in Turkey.

Background

Some traces of fertility behavior differences in the population can be found early in the literature (Bongaarts and Potter 1983; Knodel 1987), and population and mortality heterogeneity can be found even earlier (Keyfitz and Littman 1979; Land and Rogers 1982), however less attention has been paid to assessing the variation and heterogeneity of fertility courses. Indeed, there are several notable examples of the shortcomings of the demographic transition framework wherein the non-homogeneous nature of fertility decline is rarely discussed (Coale 1969; Cleland and Wilson 1987; Kohler et al. 2002; Kreager and Bochow 2017). With second demographic transition (SDT) literature, attention has been drawn for the first time to the diversification of fertility outcomes. Lesthaeghe (2010) points out that the second demographic transition (SDT) results in non-stationary populations with a multitude of living arrangements, sometimes characterized by a "convergence to diversity", and further claims that fertility cannot be studied without a framework that reflects changing lifestyle preferences. Pesando (2019) refers to this heterogeneity as "persistent diversity with development". Indeed, it is possible to see a later upsurge in the literature on behavioral diversities among individuals. The rise of the life-course approach (Huinink and Kohli 2014), the literature on social interaction effects on fertility (Rossier and Bernardi 2009) and an emphasis on the decision-making process of individuals (Hakim 2003) show how fertility can be examined from a more integrated perspective. Pesando (2019) examines the persistent diversity of global family change, noting that divergent demographic trajectories of fertility have begun to characterize high-income societies. All these recent works focus on the fact that fertility has no monolithic and homogeneous structure, especially in populations where changes in fertility size and structure continue. In light of these studies, it is necessary to understand constituent and more homogeneous fertility trajectories and their transition, in order to correctly understand structural change in fertility.

Contrary to what was experienced at the beginning of the first demographic transition, variations in fertility structure are based on fragmented and more fluid behavioral changes. As suggested by the SDT, cultural shifts and changes trigger individualization in demographic behavior (Lesthaeghe 2010). Higher education is linked to a higher likelihood of accepting new family values and predicts new ideas and behaviors that originate among young, highly educated, and less traditional people in urban settings (Vitali et al. 2015). Accordingly, interpersonal connections and networks come to the fore in examining these changes.

In Turkey, changes in fertility have taken place alongside rapid societal transformations. The total fertility rate in Turkey declined steadily in the second half of the 20th century, from a total fertility rate of 5 children in the 1970s to around replacement level in the 2010s (HUIPS 2019). In parallel with the rest of the world, neoliberal economic policies have been adopted and Gross Domestic Product (GDP) per capita has more than doubled in 50 years (World Bank 2021a). Following the First Five-Year Development Plan in 1963 (State Planning Organization (SPO) 1963), anti-natalist policies such as the authorization of family-planning methods and the easing of laws banning abortion were adapted under the new population law in 1965 (Population Planning Law 1965). In 1983, with the legalization of abortion, a new population law was accepted and the family planning-oriented approach was continued (Population Planning Law 1983).

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Despite these regulations, the population of Turkey, which was 40 million in 1975, doubled to 80 million in 2017. Accordingly, a similar increase was also seen in the analyzed female cohorts. While there were approximately 2.5 million women aged 40-49 in 1990 (TurkStat 2010), the number of women aged 40-49 is over 5.5 million according to the 2018 Address Based Population Registration System results (TurkStat 2019).

The most significant societal transformations in Turkey during the fertility decline period are urbanization and the increase in the education level of women. While the population living in the urban areas was around 40% in the 1970s, changing economic structures required more workers for the growing urban settlements. Beginning in the 1980s, the influx of migrants from rural to urban settlements has continued unabated and as a result, the urban population in Turkey went from 65% in 2000 to over 75% today (World Bank 2021c). In Turkey, where urban fertility levels are always lower than rural areas (HUIPS 2019), the findings of Kavas and Thornton (2019) confirmed that most of the urban population acknowledges the relationship between development and low fertility. Parallel to urbanization, the education level of women increased significantly in the second half of the 20th century. The percentage of ever-married women aged 15-49 with high school or higher education increased from 14 in 1998 to 32 in 2018 (HUIPS 1999; HUIPS 2019), and the literacy rate of women 15 years of age and over has increased from 45% in 1975 to 93% in 2017 (World Bank 2021b). In addition to the temporal contiguity of social changes, there have also been changes more directly related to fertility. Although the median age at first marriage increased from 19.5 in 1998 to 21.4 in 2018 for women in the 25-49 age group, the relatively early marriages and universality of marriage behavior among women means the pattern of having the first birth shortly after marriage in Turkey is retained, and the median age at first birth is calculated as 23.3 years (HUIPS 2019). In accordance with the age at first birth pattern, the currently childbearing group peaks with the 25-29-year-olds in Turkey, although that peak used to belong to the 20-24 age group. The change in the fertility of women aged 40-49, who have mostly passed their reproductive ages, has been in parallel to the overall decline of fertility. The mean number of children ever born to women aged 40-49 decreased from 4.3 children for the 1949-58 cohort to 2.7 children for 1969-78 cohort. (HUIPS 1999; HUIPS 2019). On the other hand, contraceptive prevalence has increased from 63% to 70% in 1993 to 2018 period (HUIPS 2019).

Fertility in Turkey has been largely studied as an extension of global fertility research trends and is mainly focused on language groups and regional differences that are indicators of ethnicity in that country. The study by Koç, Hancıoğlu and Çavlin (2008) shows the demographic differentials and integrational aspects of Turkish and Kurdish populations in Turkey. Their results indicate that strong demographic differentials exist between Turkish and Kurdish populations and the convergence of the two groups is not yet apparent. Yavuz (2006) also investigated the fertility decline in Turkey according to main language groups. His findings suggest that parity progression intensities of Turkish speaking mothers are lower than Kurdish speaking mothers, which implies that the fertility decline started much later for the latter group. Gore and Carlson (2010) stated in their study that besides ethnicity, education also influences marriage patterns and therefore fertility patterns. The results of their study showed that although low-educated Kurdish women married earlier than Turkish women, the difference was reversed among educated women. In addition, the study of Greulich et al. (2016) concludes that differences in female education are the driving force behind the regional heterogeneity of fertility in Turkey. As well, regional differentiation is apparent in other research in Turkey (Yüceşahin and Özgür 2008; Caarls and de Valk 2018). Although studies on Turkey's fertility refer to various rates and phases of the fertility transition in spatially distant population groups (Duben and Behar 2002), differences in fertility are usually related to predefined observed variables. These approaches only evaluated fertility by linking it to diversity in the demographic structure and did not go beyond this; however, the increase in the mean age at first birth in postponed marriages, together with the slowdown in fertility decline, gives clues that the change in Turkey may not be uniform.

Table 1. Number of unweighted observations of ever-married women aged 40-49

Surveys	Cohorts	Age Groups 40-44	45-49	40-49
1998 TDHS	1949-1958	874	698	1572
2008 TDHS	1959-1968	1170	1038	2208
2018 TDHS	1969-1978	1023	935	1958

Data and Methods

The data source of this study is the Turkey Demographic and Health Surveys (TDHS), which is part of the global DHS series. Turkey Demographic and Health Surveys are household-based nationally representative sample surveys designed to provide information on fertility, infant and child mortality, family planning, and maternal and child health. The surveys are carried out by Hacettepe University Institute of Population Studies (HUIPS). This study is based on three quinquennial TDHS datasets; 1998, 2008 and 2018, which contain the complete birth histories of women aged 15-49. For the purposes of the research, we limited the focus of the study to women aged 40-49, as near-complete fertility histories were needed to properly analyze women's fertility trajectories. Furthermore, since the 2008 study were conducted on ever-married women, all analyses were carried on ever-married women (Table 1). The vast majority of births in Turkey take place within marriage, so the exclusion of never-married women is negligible when analyzing fertility trajectories. However, since women who have never been married can be assumed as childless, overall childless women may have been underestimated. The proportion of women aged 40-49 who have never been married is 2, 1 and 4 percent for the 1949-58, 1959-68 and 1969-78 cohorts respectively. All ever-married women (currently married, divorced and widowed) were analyzed for their fertility structure with the sequence analysis. However, we excluded remarried women (5, 4 and 5 percent for the 1949-58, 1959-68 and 1969-78 ever-married cohorts respectively) from distance analysis and multinomial regression since there was more than one group of variables related to the husbands and marriage characteristics.

The analysis in this study was carried out in three steps. For the first part, we used the sequence analysis approach originally proposed by Abbott (1995) for ever-married women 40-49 separately in each dataset. The sequence analysis method can be used to describe the quantum and tempo of interrelated events and their sequencing (their order of happening) (Di Giulio et al. 2019). This strategy emphasizes the holistic nature of trajectories, and rather than handling them as a point in time, treats every observation as a life-course trajectory. By focusing on the analysis of entire trajectories rather than single events, sequence analysis considers the interrelation between multiple events (Barban and Sironi 2019). After separating the childless 40-49 women from the data, childbearing trajectories of women are constructed as sequences of 29 states from ages 12 to 40, where each age between 12 and 40 represents a parity-related state. Since the children ever born to women aged 40-49 in the cohort with the highest fertility was 4.8 (HUIPS 2019), the alphabet constructed for sequence analysis contained six mutually exclusive states according to children ever born, namely; "no birth", "one birth", "two births", "three births", "four births" and "five or more births". Then, women in each age can be represented with a state according to their number of children ever born in the corresponding age. After that, we employed the TraMineR package available in R to construct sequences in each dataset and used the optimal matching (OM) method (with insertion/deletion cost as 1, and the transition rates between states observed in the sequence data as substitution costs) to calculate distances between sequences and form the dissimilarity matrix for each dataset. We used the results of hierarchical clustering (calculated with Ward algorithm) as initial medoids (fertility trajectories in each cluster whose sum of dissimilarities to all the trajectories in the cluster is minimal) in a PAM (partitioning around medoid)

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algorithm. Since PAM algorithm assign each fertility trajectory to the closest medoid, in each cluster, women are closer to their cluster medoid than the medoids of the remaining clusters. Based on the clustering analysis and the weighted average silhouette width (ASWw) of the clusters, the optimal number of clusters were selected for each dataset. The ASWw value is a measure of coherence of assignments. High coherence indicates high between-group distances and strong within-group homogeneity. For this reason, the fact that a woman is in a particular cluster according to her fertility trajectory indicates that her fertility is more similar to the fertility behavior of this cluster than the others. Two women falling into the same cluster regardless of their last parity results from having similar fertility behaviors for ages 12-40 in terms of tempo and quantum. In other words, clustering by fertility trajectories allows us to consider the amount of the reproductive period spent at each parity. Although women in a certain final parity come to the fore in the resulting clusters, women in different final parities can coexist in the same clusters. Therefore, we interpreted clusters considering similar fertility behaviors rather than same final parities. While it seems to contradict orthodox categorization practices, this illustrates the importance of considering the timing of fertility. The clustering analysis resulted in five clusters in each data set and after combining the previously separated childless women, there were six clusters in total.

In the second part, we performed distance analysis in order to interpret the fertility behaviors in the light of the differences regarding the basic characteristics before the fertility period. We measured the similarity of women in each cluster to calculate the heterogeneity of background characteristics on three dimensions; background characteristics of women, their husbands and their marriages. In order to measure dissimilarities, we calculated the heterogeneity scores $\phi(P)$ using Hamming distances between observations, for six clusters of three surveys. On the axis of urbanization and increase in educational levels, the background characteristics of women and men consist of the place of residence where they spent their childhood, their educational status and their mother tongue (Table 2). In addition to these, since it contains cultural codes, the marriage characteristics dimension was created from the variables of age at first marriage of women, kinship with her husband, arrangement of marriage and marriage ceremony. The background characteristics used in this study to understand heterogeneity are the features that women and men acquire mainly in the pre-fertility period. Therefore, background characteristics are not only related to the heterogeneity of fertility trajectories, but also constitute the foundation of this heterogeneity. Even though other aspects such as religiosity contain invaluable insights to the fertility, the available data are insufficient to provide these variables to make retrospective comparable analyses. We used the selected variables with binary categories to give equal weights to each variable in a dimension and so as to preserve the difference in the categories of the variable for all 3 cohorts in distance analysis.

The Hamming distance $d_H(x_1, x_2)$ is defined as the number of variables at which the two observations x_1 and x_2 are different. The variables are recoded with binary categories and the Hamming distance between two observation according to these variables is hypothesized as the theoretical distance between women in that dimension. Since the Hamming distance between two observations can be measured, it is also possible to calculate the pairwise distance of a group of observations. The pairwise Hamming distance H between n observation would then be,

$$H = \sum_{k=1}^{k=n-1} \sum_{k'=k+1}^{k'=n} d_H(x_k, x_{k'})$$

The sum of all possible pairwise distances gives the pairwise distance of observations. When the pairwise distance is divided to number of distances, the average pairwise distance in a group of observation is calculated. The average pairwise distance is,

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Table 2. Variables for distance analysis and multinomial logistic regression

	Categories for multinomial regression	Categories for distance analysis
Background Characteristics of Women		
Mother tongue	Turkish	1 Turkish
	Kurdish	0 Other
	Other	
Education	Education in single years	1 Complete primary or higher
		0 No education or prim. Incomp.
Childhood Place of Residence	Urban	1 Urban
	Rural	0 Rural
Background Characteristics of Husbands		
Mother tongue	Turkish	1 Turkish
	Kurdish	0 Other
	Other	
Education	Complete secondary or higher	1 Complete secondary or higher
	Primary complete	0 Less than secondary
	No education or primary education incomplete	
Childhood Place of Residence	Urban	1 Urban
	Rural	0 Rural
Background Characteristics of Marriages		
Women's age at first marriage	18 and above	1 18 and above
	Before 18	0 Before 18
Relationship to husband	No relation	1 No relation
	Relative	0 Relative
Marriage arrangement	Themselves	1 Themselves
	Families	0 Families/ Escaped/Abducted/Other
	Escaped/Abducted/Other	
Marriage ceremony	Only civil	1 Only civil or civil first
	Both, civil first	
	Both, religious first	0 Only religious, religious first or no ceremony
	Only religious	
	No ceremony	

$$H_{avg} = \frac{2 * H}{n * (n - 1)}$$

In order to calculate average Hamming distances, the algorithm introduced by Morrison (2004) were used. His algorithm first calculates the centroid (moment of inertia) of the observations. The i-th coordinate of the centroid of equally weighted points is,

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$$c_i = \frac{\sum_{j=1}^{j=n} x_{ij}}{n}$$

where x_{ij} are the values of observations (in this case x_{25} indicates the 5th observation in second variable). Then, total pairwise Hamming distance becomes the sum of the moments of inertia about their centroid (Morrison, 2004),

$$H = n * \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} \left(x_{ij} - c_i\right)^2$$

where m is the number of variables and n is the number of observations. However, this calculation of the distance does not take case weights into consideration. When the case weights are introduced to the above equations, the weighted total pairwise Hamming distance becomes,

$$H^w = \sum_{j=1}^{n} w_j * \sum_{i=1}^{i=m} \sum_{j=1}^{j=n} w_j * \left(x_{ij} - c_i\right)^2$$

where w_j is the case weight of observation j. Since the weights are introduced, the weighted total pairwise Hamming distance can be divided by the sum of pairwise products of weights to calculate the average of the total distance. The average weighted pairwise Hamming distance becomes,

$$H^w_{avg} = \frac{H^w}{\sum_{i=1}^{i=n-1} \sum_{j=i+1}^{j=n} \left(w_i * w_j\right)}$$

H^w_{avg} takes values between 0 (minimum heterogeneity) and $\frac{m}{2}$ (maximum heterogeneity) where m is the number of variables and n is sufficiently large. For example, for the TDHS, if all observations have the same value at every background characteristic of women, which means the population is extremely homogenous, the indicator will take a value of 0. On the other hand, for a sufficiently large n, if the observations are distributed evenly to all possible categories, which means the population is at maximum heterogeneity, the indicator will take a value of 3/2 (since m=3 for the background of women). In order to normalize the indicator and generate heterogeneity scores ϕ,

$$\phi(P) = \left(\frac{H^w_{avg}(P)}{H_{max}(P)}\right) * 100$$

is used where H_{max} is the maximum heterogeneous distribution of the population P. For these scores, higher values indicate a more heterogeneous distribution of women. The relative heterogeneity scores were calculated as $\Delta\phi_c = \phi_c(P) - \phi_t(P)$, the difference between the heterogeneity score of a cluster and the score of the whole cohort. Relative heterogeneity scores are used to understand the similarities of background characteristics of the clusters with the overall cohort. Positive values represent more heterogeneous nature of the cluster related to the cohort overall and negative values show less heterogeneity.

In the last part, we further analyzed the fertility trajectories of cohorts using multinomial logistic regression using the same variables as the distance analysis but using more detailed categories (Table 2). The predicted cluster membership probabilities of "ideal types", i.e. an average educated/uneducated woman where other independent variables were kept in their group means, are calculated with the help of two variables: women's education and childhood place of residence. The probability distribution of educated and uneducated average women in clusters and the change of these probabilities through cohorts not only help to understand past experiences, but also contain clues about future changes. Distance measures are calculated with R and regression analyses and marginal effects were calculated with SPost13 package in Stata (Long and Freese 2014).

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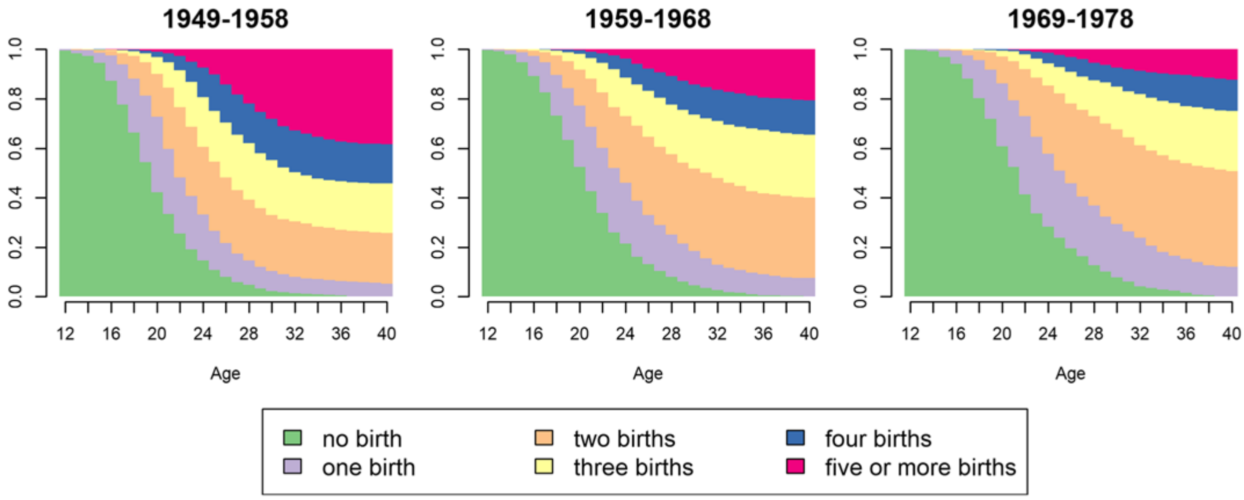

Figure 1. Children ever born state distribution plots of women aged 40-49 with children according to cohorts.

Results

The cumulative state sequences up to age 40 of women aged 40-49 years who have had at least one birth are shown in Figure 1 by their childbearing trajectories between the ages of 12 and 40, where areas of different colors show the time spent in each parity. The results of the sequence analysis revealed that the total time spent with 5 or more children decreased significantly in younger cohorts and the time spent childless in the reproductive zone is extended. Furthermore, cluster analysis revealed that the fertility trajectories of ever-married women aged 40-49 with at least one birth can be grouped into 5 clusters according to the ASWw values of clusters. For each year, the same parity-related categories emerged from the cluster analysis. Although women with different final parities may co-exist in the clusters, we have named the clusters as follows: "one-norm", "two-norm", "three-norm", "four-norm" and "five or more-norm" based on the fact that a certain parity stands out as the norm.

The results of cluster analysis showed that the types of clusters remained unvaried over the years, but the size of these clusters has changed. Figure 2 shows the change of cluster sizes through the women's cohorts. The changes in cluster sizes show those associated with higher fertility have declined over time. Most notably, the share of five or more-norm cluster decreased from 35% to 9% over 20 years, while the size of lower parity clusters increased. Furthermore, the percentage of women in the two-norm cluster increased one and a half times in 20 years, causing this cluster to stand out among fertility trajectories. The most outstanding increase was observed in the one-norm category. The share of women in the one-norm cluster increased from 8% to 26%, while the share of women in the childless cluster remained relatively stable in size. We examined the cohort trend of mean years spent in each parity state with sequence analysis to provide more insight into the tempo structure of the clusters (Figure 3). For one-norm cluster, we observed a decrease followed by an increase in time spent in parity one. For the remaining clusters, main trend can be specified as the increased spacing of births. Especially the time spent in second parity increased for three-norm, four-norm and five or more-norm clusters.

Following the sequence analysis, we calculated the heterogeneity scores, $\phi(P)$, for six clusters in each cohort according to three categories of background properties, namely women's, husband's and marriage characteristics (Table 3). Figure 4 shows the relative heterogeneity scores $\Delta\phi_c$, the difference between heterogeneity score of a cluster and the score of the whole cohort for each year by dimensions. Positive values of $\Delta\phi_c$ indicate relatively more heterogeneous structure. The most striking finding is that women in the two-norm cluster are much more homogeneous according to their background characteristics compared to the cohort overall. A similar finding for women in the one-norm cluster can be observed; however, for higher parity clusters, relative heterogeneity

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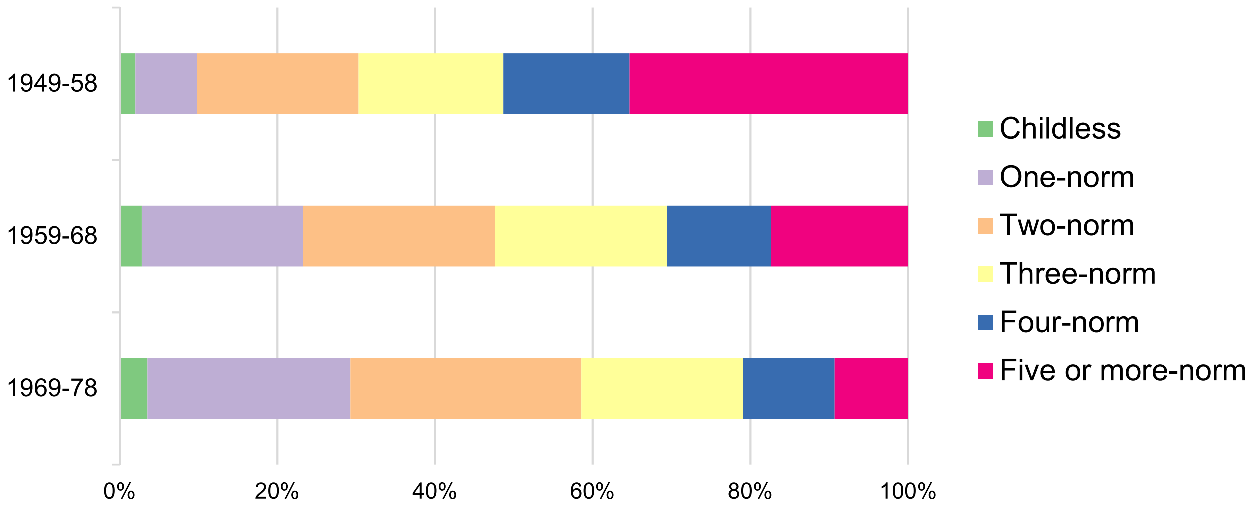

Figure 2. Fertility trajectory cluster size change among cohorts.

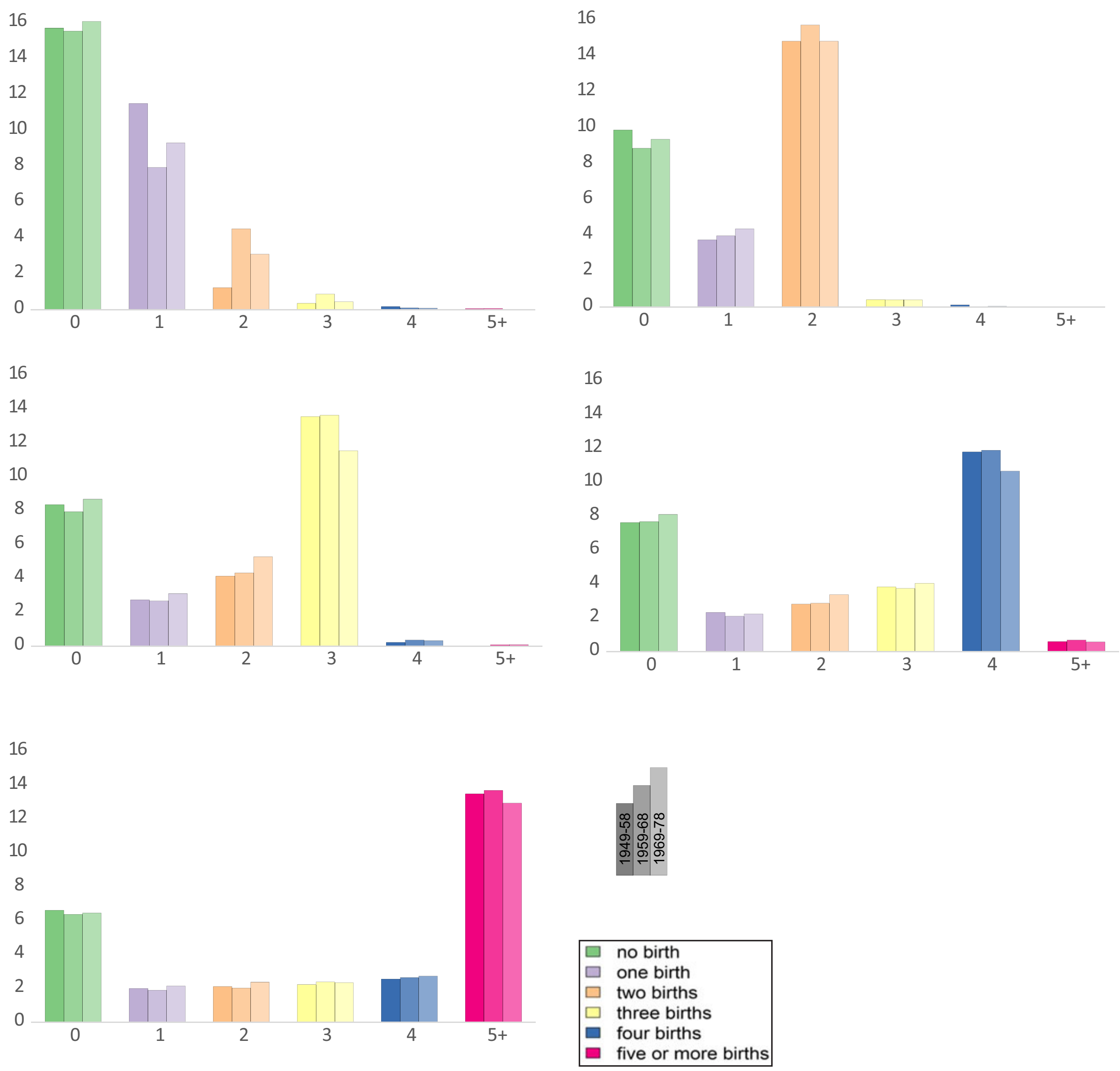

Figure 3. Mean years spent in each state among cohorts.

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Table 3. Heterogeneity Scores of Clusters in TDHS

	Clusters	Cohorts 1949-58	1959-68	1969-78
Background of women	Childless	73.3	81.8	63.0
	One-norm	65.7	57.7	47.4
	Two-norm	52.7	46.9	46.2
	Three-norm	63.3	60.9	57.7
	Four-norm	72.8	77.4	85.5
	Five or more-norm	77.4	90.5	87.1
	Total*	81.7	74.7	67.3
Background of husband	Childless	67.2	89.7	79.4
	One-norm	80.5	75.6	75.4
	Two-norm	66.1	71.0	72.3
	Three-norm	65.1	77.0	73.8
	Four-norm	60.5	72.7	85.1
	Five or more-norm	67.6	75.7	84.8
	Total*	72.6	82.1	83.7
Background of marriage	Childless	84.8	74.8	63.0
	One-norm	75.8	63.5	65.5
	Two-norm	74.8	78.2	80.6
	Three-norm	77.4	87.3	89.9
	Four-norm	89.7	89.0	92.4
	Five or more-norm	82.7	77.6	75.7
	Total*	88.3	87.8	87.4

*The total row shows the heterogeneity score for women aged 40-49 in the cohort before clustering.

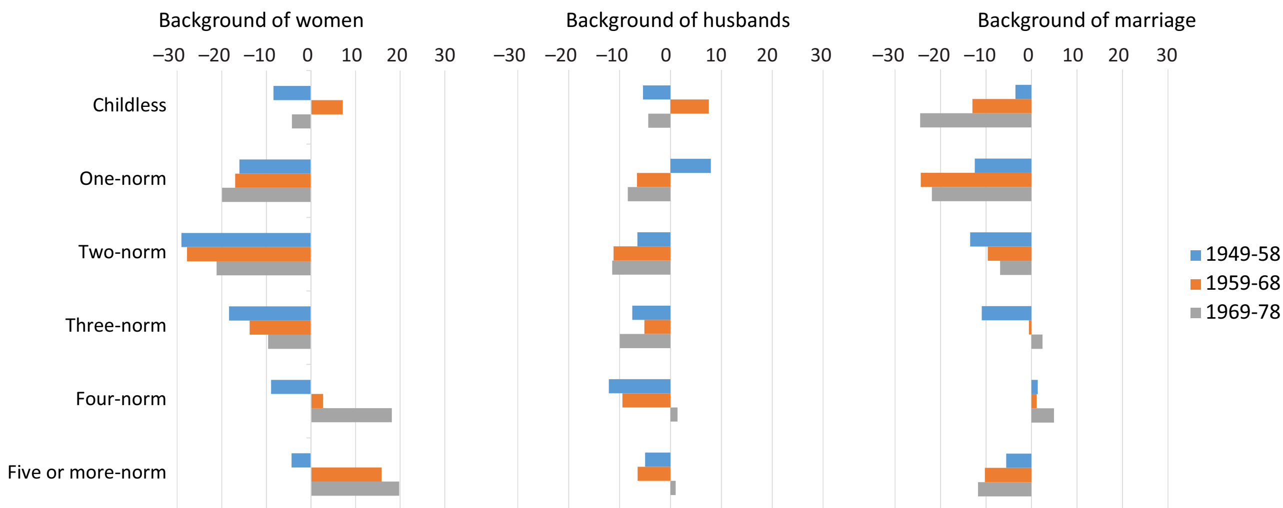

Figure 4. Relative heterogeneity scores of clusters according to background characteristics.

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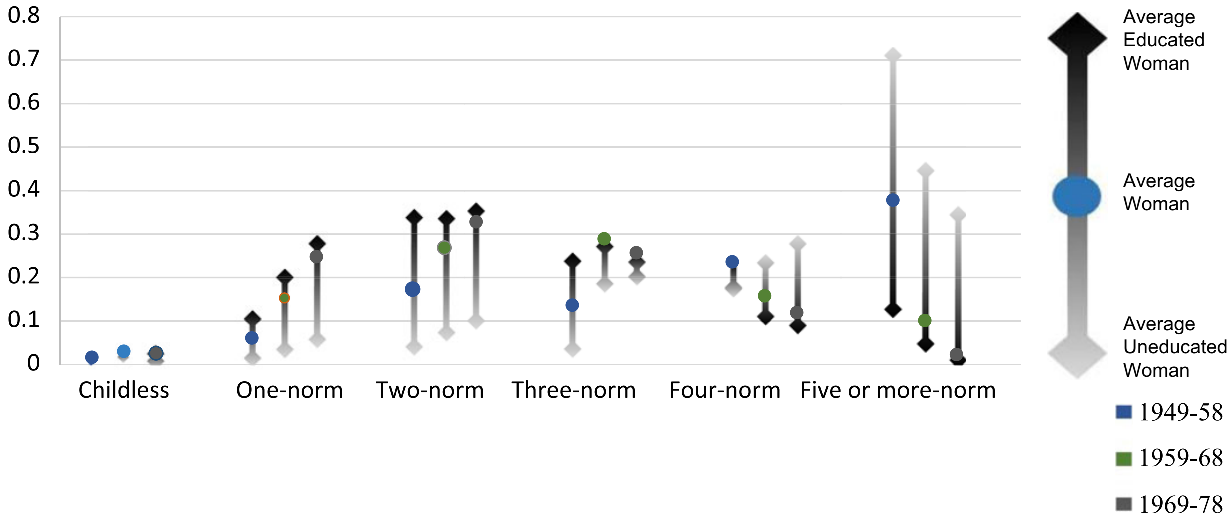

Figure 5. Predicted probabilities from multinomial logistic regression for women.

increased over time. This result shows that the women with higher parities who were much more alike according to their selected background characteristics in the past now are more diverse. The second part shows the relative heterogeneity scores of women according to the background characteristics of their husbands. The most remarkable change can be observed for husbands in the one-norm cluster who become less diverse over time. On the other hand, the relative heterogeneity of the husbands of higher parity clusters increased especially for the last cohort. In the third and last part, the heterogeneity of the clusters can be seen over the years according to the background of marriage characteristics. These results show that for childless women and women in one-norm cluster, marriage constructions become less diverse with time and for two-norm and three-norm clusters, homogeneity increased.

In the last part, we employed multinomial logistic regression to determine cluster membership with the same variables used in distance analysis. Separate analyses were made for women's education and childhood place of residence in order to see the variation in fertility associated with education and urbanization, which are the most important social changes in the period under review. Supplementary Table 1 shows the predicted probabilities calculated from the multinomial logistic regression model and marginal effects at group-specific means for education and childhood place of residence, as well as the interaction between those elements. The predictions show the probability of being in each cluster for ideal types, e.g., the probability of an average-educated woman raised in an urban area. Figure 5 summarizes the predicted probabilities of clusters for the cohort overall (colored dots), as well as two ideal types; average women with at least primary education (dark diamonds) and average women with less than primary education (light diamonds). It is evident that for ever-married women, childlessness remained quite rare in Turkey throughout the years. Childlessness also does not differ with the educational background of women, while the remaining clusters show clear patterns. The share of one-norm increased in Turkey among the cohorts and educated women who grew up in urban areas increasingly prefer one child or longer spacing of births after the first child. For educated women, having only one child, or longer spacing after the first birth is becoming an alternative to the two-norm. The predicted probability of two-norm cluster has also increased in years, especially among women who grew up in rural areas. Although the two-norm was already a settled behavior among educated women from urban areas, it has become more commonplace among women from rural backgrounds in recent cohorts.

Contrary to the previous two clusters, the three-norm category remained relatively stable among the cohorts, but the educational difference in the three-norm category diminished over time. Education has no significant effect on the three-norm category for women from urban areas

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and the effect of education remained stable for the women who grew up in rural areas. The decreasing share of higher parities seem to coincide with an increase in the share of the three-norm category, especially for rural women. Although there was only a small decrease in the share of the four-norm category, educational difference became more significant throughout the years and shares of the four-norm category increased for urban-raised women with less than primary education. Contrary to the three-norm category, the educational background of women became more determinant of the four-norm category over time. There were two striking results in the five or more-norm category, including the difference in fertility between uneducated and educated women, and the decrease in size of the category as a whole, which decreased by 30% with a stable difference between women according to educational background. Although the change of size in the five or more-norm cluster for educated women was relatively small, the decrease in rural uneducated women can be related to an increase in the three and four-norm categories, and the decrease of share of five or more-norm cluster in educated rural women can be related to an increase in the two-norm.

Conclusion and Discussion

In Turkey, changes in fertility patterns go hand-in-hand with other significant social changes. Examining the heterogeneity of fertility pathways reveals trends that, when considered together with current levels of fertility and mortality, indicate Turkey is in the final stages of demographic transition. Growing urbanization and an increase in education levels for women in Turkey have led to a shift in the cultural structure of the population and as cities become more and more cosmopolitan spaces, women's participation in the public sphere has also increased. Both of these changes have increased women's opportunities to communicate with each other, however, the increase is greater for educated and urban-raised women. Based on this perspective, we examined the fertility trajectories of women cohorts in Turkey between 1949 and 1978 and the change in these trajectories in light of Turkey's changing societal structures and fertility decline.

This study has some data-based limitations, the first of which is that we only analyzed the experience of ever-married women. Although, it does not affect the results significantly because the survey included various types of legal and non-legal cohabitations, such as religious marriages, and the percentage of never-married women in the 40-49 age group is between 1 and 4% (HUIPS 2019). Furthermore, births for never-married women are very rare in Turkey. For instance, there are no births reported by never-married women age 40-49 in the last two waves of the TDHS. Therefore, there may be only a small underestimation of childless women in the analysis. The second limitation of the study is that women aged 40-49 were used as a proxy of completed fertility. Although in 2019, births to mothers over the age of 40 accounted for only 3% of all births (TurkStat 2020), and the age specific fertility rate of the 40-44 age group was less than 0.015 in surveys (HUIPS 2019), with the spread of assisted reproductive techniques and the overall postponement of fertility, the higher parity clusters may be underestimated. We excluded women married more than once (4% to 5% in the respective cohorts) from the distance and multinomial logistic regression analysis since we need husband characteristics for these two analyses. Another limitation of this study was the chosen framework to interpret fertility trajectories. In order to make a consistent comparison for the three surveys covering a 20-year period, we used only certain variables to interpret the background similarities of women. The study also focused on the properties of women before their childbearing period as determinant factors and overlooked some valuable perspectives like occupational status of women and economic status of the couple during or before the childbearing period. However, the employment status of women did not change significantly in Turkey over the period in question, and there is no available data on wealth status of women before their reproductive periods. Since the study focused on pre-fertility similarities and differences of women, ignoring these dimensions did not create major deficiencies.

Interpreting the results of combined analyses is essential to understanding changes in fertility structure. When the cohort fertility of the demographic transition period in Turkey is considered, it can be seen that childlessness has never been a preferred choice for ever-married women. The absence of a distinctive structure for childless women and their spouses in terms of mother tongue, childhood place of residence and education shows that childlessness is mainly caused by infertility. As seen with the two-child ideal in Europe, having two children in Turkey has always been the highest preference for educated women who grew up in the city. The increase in overall urban populations and increasing education levels for women in Turkey have subsequently led to a numerical growth of women with two-norm fertility behavior. Although the impact of growing up in the city was evident for the earlier cohorts, the main determinant for all cohorts was education level. These results indicate that the effect of urbanization in the heterogeneous structure of fertility has been replaced by the effect of education. The decline of share in the five or more-norm cluster has caused the four-norm cluster to become a transitional phase of fertility decline, especially for uneducated women.

Among all fertility trajectory changes, the change that gave the most clues about future fertility can be found in the one-norm cluster. In particular, when the increase of educated women's preference in having a single child, or in extending the time between the first and the second child is considered together with the high and increasing homogeneity in background characteristics, it is evident that this fertility behavior is willingly chosen. It can also be stated that women whose fertility is not very high at the beginning of the transition period prefer one-norm trajectory as a new fertility behavior. The similarity of women in king-child and two-norm clusters shows that lower parity fertility trajectories started to be preferred more by group of women with certain characteristics. The higher fertility behaviors in Turkey became less dependent on ethnic-based, educational or residential properties. In the meantime, the decline of share in the higher parity fertility trajectories when following the cohorts over time led to various changes in clusters characterized by lower fertility. The choice of three children comes to the fore especially among educated women who grew up in rural areas. This group is the best candidate to become the preferred behavior among women with reduced fertility since it is the highest parity cluster level where background of women and spouses are relatively homogeneous.

In conclusion, the heterogeneous nature of fertility in Turkey during the demographic transition shaped the transition process and it can be predicted that such heterogeneity will also shape the post-transition fertility. The changes occurred not only in final parity of women but also in timing of the births and clusters analysis provided insight to the tempo changes of the clustered fertility behaviors. The increase in urban population has led to the behavior of having two children became a norm, spacing or even stopping after the first child is an increasingly preferred choice among educated women who grew up in the city. By contrast, for women who grew up in rural areas and uneducated women, a soft transition was observed from higher parities to three-norm. In future cohorts, one-norm can be expected to replace the current two-norm, voluntary childlessness in urban and educated women will increase to significant levels.

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Conflicts of Interest. The authors have no conflicts of interest to declare.

Ethical Approval. This research was conducted in accord with prevailing ethical principles. Data used for the study are publicly available in open access.

Author Contributions. This study builds upon the ongoing PhD thesis of Faruk Keskin to be submitted to Hacettepe University Institute of Population Studies, Department of Demography under the supervision of Assoc. Prof. Dr. Alanur Çavlin.

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