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Marriage postponement and fertility decline in Iran:
accounting for socio-economic and cultural changes in time and space

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I, Fatemeh Torabi, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

This thesis examines the patterns and determinants of the marriage postponement and fertility decline experienced by Iranian women during the last two decades of the twentieth century. The thesis accounts for temporal changes in the socio-economic context of marriage and childbearing (e.g. improvement in education, urbanisation, economic fluctuations, etc.) and examines the marriage timing and fertility patterns of the cohorts of women who contributed to the recent marriage and fertility changes in order to provide more insight into the demographic behaviour of women with specific life course experiences. A topic of specific interest is the variation between the ethnic groups in Iran.

The findings suggest that the recent marriage postponement was related to improvements in women's education and restrictions in the availability of suitable spouses (marriage market), with the former being the only factor contributing to the marriage delay of consecutive (1971-75 and 1976-80) birth cohorts. The recent decline in the probability of second and third conceptions was related to improvements in women's educational level, reductions in child mortality, and improvements in children's enrolment in education. The contribution of son preference to the probability of conception of a second child and the specific impact of urbanisation and industrialisation on the recent marriage and fertility changes were also notable. Different socio-economic factors were found responsible for the decline in the probability of a second conception across consecutive cohorts of women (those who became exposed to the risk of childbearing in 1986-90 and 1991-95), whereas cohort differences in the probability of a third conception was not generally related to socio-economic forces, probably reflecting a common preference for stopping at two children. The findings also highlight the role of cultural factors associated with ethnicity in shaping differential patterns of marriage timing and suggest that ethnic differences in fertility are strongly related to ethnic differences in socio-economic attributes.

Contents

Title **Page**

List of tables

Title **Page**

List of figures

Title **Page**

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Chapter 1

Introduction and background

1.1. Introduction

During the last two decades of the twentieth century, the mean age at marriage of Iranian women increased by over three years and their average number of children declined by more than four children per woman. The female singulate mean age at marriage (FSMAM) rose from 19.9 years in 1986 (Kazemipour 2004) to 23.0 in 2000 (calculated from the 2000 Iran Demographic and Health Survey) and the total

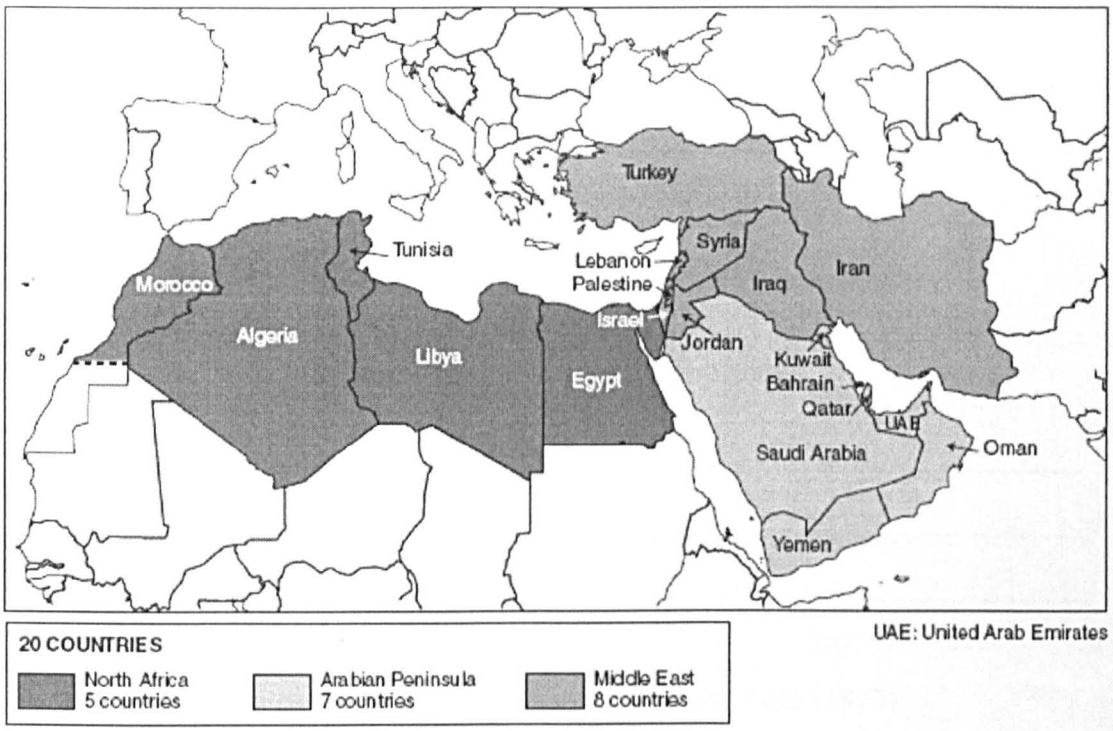
fertility rate (TFR) fell from 6.5 children per woman to 2.2 during the same period (Abbasi-Shavazi and McDonald 2006).

This chapter discusses how these remarkable changes in the marriage and fertility of Iranian women closely correspond with profound changes in the socio-economic and institutional context (Section 1.2). The chapter also highlights differentials in women's marriage timing and fertility by ethnic group in Iran and how these can be related to ethnic diversity in cultural and socio-economic attributes (Section 1.3). Based on the gaps in the existing literature, the research aims and questions are detailed (Section 1.4) and the structure of thesis is presented (Section 1.5).

1.2. Recent changes in the marriage timing and fertility of Iranian women and in the socio-economic context

The marriage postponement and fertility decline experienced by Iranian women is part of a general phenomenon which occurred in the Middle East and North African (MENA) region (Roudi-Fahimi and Kent 2007). Figure 1.1 displays the geographic distribution of countries in the MENA region. With a land area of 1,648,195 square kilometres and a population size of 69,515,000 (in 2005), Iran is the fourth largest and the third most populated country amongst the twenty MENA countries (Tabutin and Schoumaker 2005).

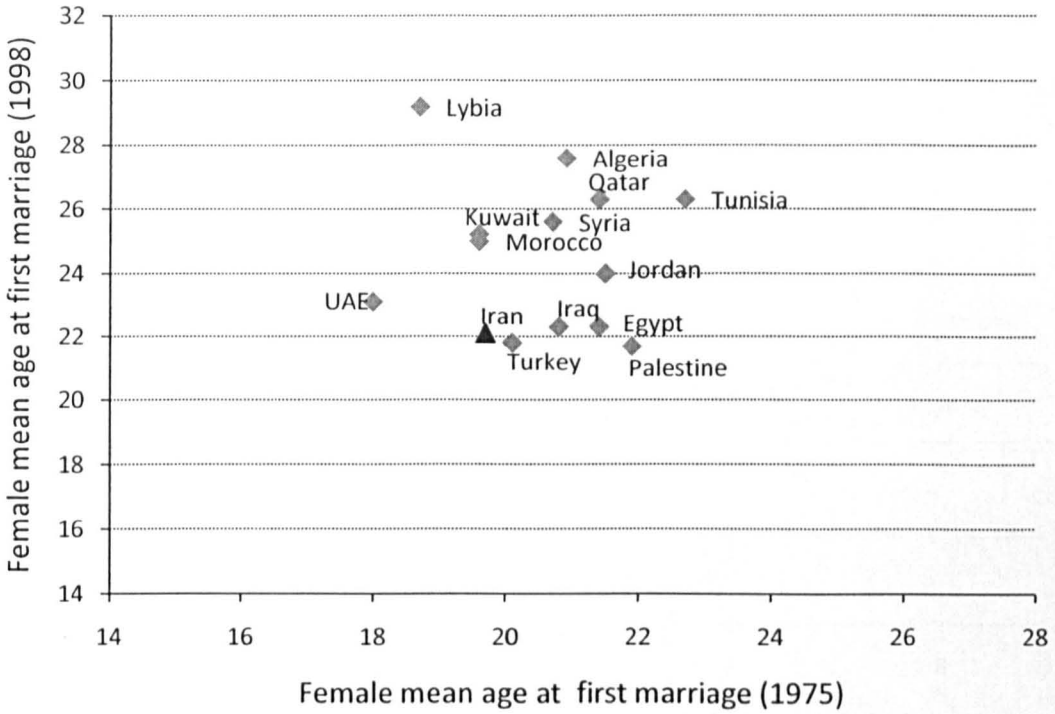
Figure 1.1. Geographic distribution of the 20 countries within the Middle East and North African (MENA) region and within the three sub-regions



Source: Tabutin and Schoumaker (2005: 507).

Women in the MENA region experienced a substantial marriage postponement over the last three decades of the twentieth century. As displayed in Figure 1.2, women's mean age at marriage ranged between 18 and 22 years in most MENA countries in the mid 1970s. By the late 1990s, the mean age at marriage ranged between 22 and around 26 or over. This suggests an average increase of around four years in the mean age at marriage of MENA women. Nevertheless, there is a sub-regional diversity in the extent of marriage delay. Some countries experienced a substantial rise (five years or over) in age at marriage (e.g. Algeria, Qatar, and Syria) while in other countries, changes in women's marriage timing was less pronounced (between two and three years) (e.g. Iran and Turkey) or negligible (e.g. Egypt and Palestine).

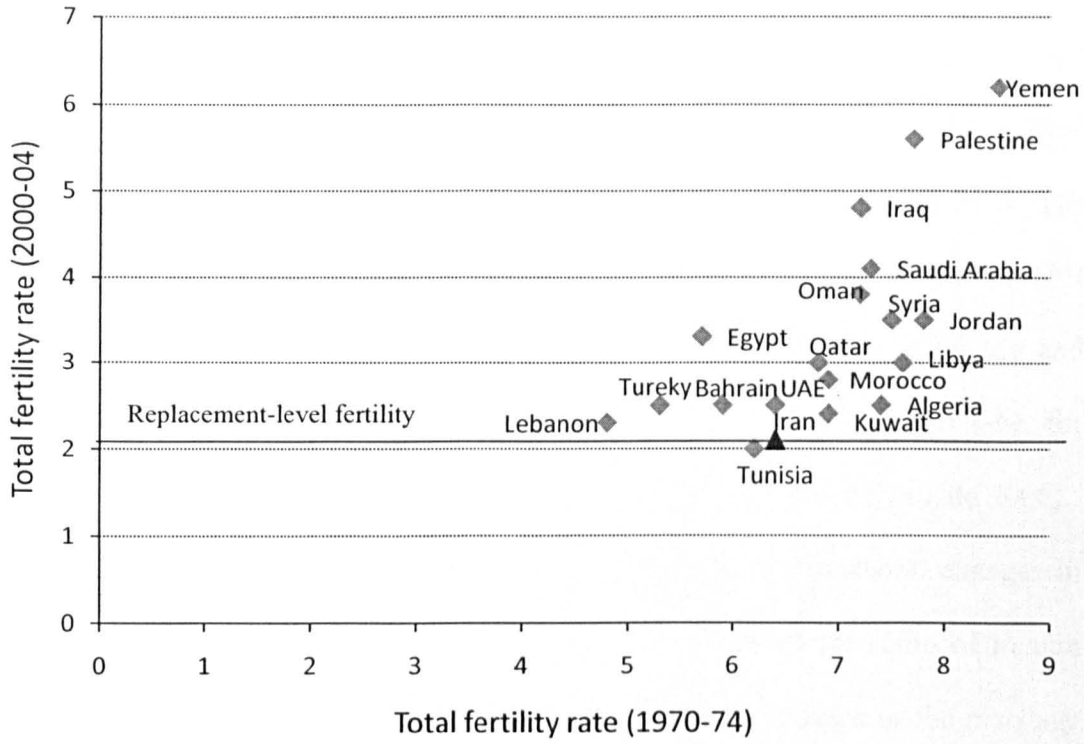
Figure 1.2. Female mean age at first marriage (FMAFM), 1975 and 1998, Middle East and North African (MENA) region



Source: data adapted from Tabutin and Schoumaker (2005: 596).
Note: UAE: United Arab Emirates

During the same period, the MENA region experienced a notable fertility decline. As shown in Figure 1.3, the TFR in MENA countries ranged between 6 and 8 children per woman in most countries in the early 1970s. By the early 2000s, the TFR ranged between 2 and 4 or over, suggesting an average fall of around four children per woman in TFR. The decline in fertility was not experienced to the same extent by different MENA countries. In some countries fertility remained high (e.g. Yemen and Palestine), whereas others reached replacement level fertility by the early 2000s (e.g. Iran and Tunisia).

Figure 1.3. Total Fertility rate (TFR), 1970-74 and 2000-04, Middle East and North African (MENA) region



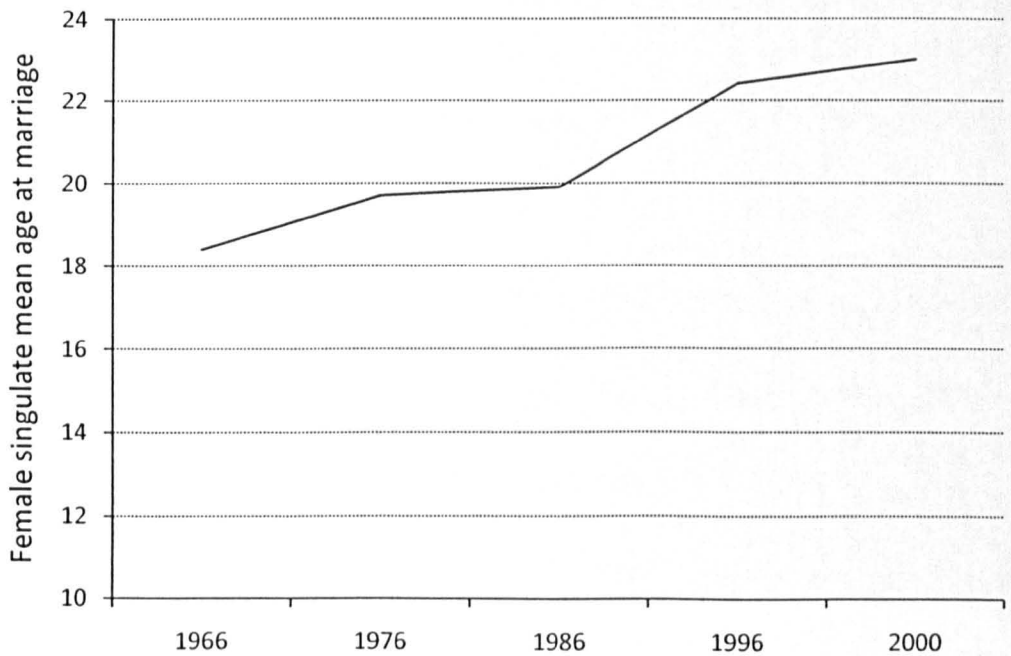
Source: data adapted from Tabutin and Schoumaker (2005: 598).
Note: UAE: United Arab Emirates

These marriage and fertility changes have been attributed to various socio-economic and institutional changes in the MENA region: a higher access to education, particularly for girls, an increase in women's paid work, a decline in mortality due to the introduction of modern medical services and public health interventions, a higher access to family planning services and an increase in contraceptive use, and legal reforms aimed at improving women's status, etc. (Rashed, Osman, and Roudi-Fahimi 2005; Tabutin and Schoumaker 2005). As Roudi-Fahimi and Kent (2007) pointed out, the recent social changes in the MENA countries undermined the strong values attached to the family and the traditional marriage and childbearing practices and led to a rise in the age at marriage and a fall in the fertility of women in the region.

The process of marriage and fertility change in Iran did not follow a constant trend (see Figures 1.4 and 1.5). The FSMAM increased from 18.4 years in 1966 to 19.7 in 1976 but remained relatively stable until the mid 1980s (19.9), before a substantial rise to 22.4 in 1996 and further to 23.0 by 2000. The TFR declined from 7.0 children per woman in 1966 to 6.1 in 1976 but rose to 7.0 again in 1980. The fertility decline recommenced in the mid 1980s and continued in the 1990s: the TFR dropped to 6.2 in 1986, reached 2.8 by 1996 and 2.2 by 2000. The recent ups and downs in fertility in Iran have been confirmed by a number of studies (see, for instance, Ladier-Fouladi 1997; Mirzaie 1998; Abbasi-Shavazi and McDonald 2006).

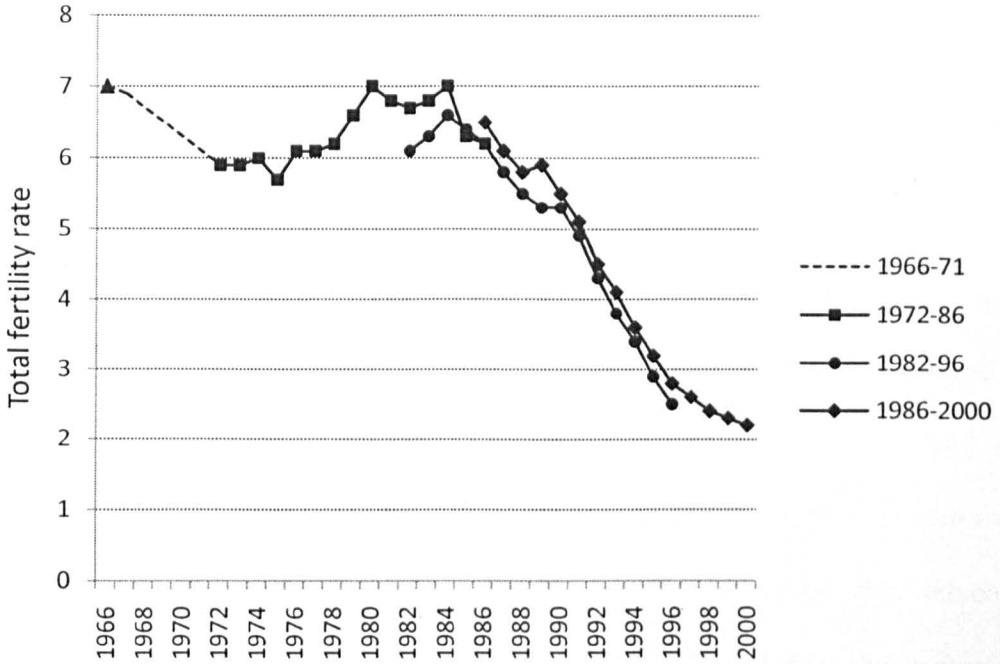
These marriage and fertility changes correspond with profound changes in the social, economic, and institutional context which modified the status of Iranian women and the characteristics and preferences of potential spouses or the marriage market. These changes are summarised in Table 1.1 and discussed in detail in this section.

Figure 1.4. Female singulate mean age at marriage (FSMAM), 1966-2000, Iran



Source: data for years between 1966 and 1996 adapted from Kazemipour (2004: 114) and for the year 2000 calculated from the 2000 Iran Demographic and Health Survey.

Figure 1.5. Total Fertility rate (TFR), 1966-2000, Iran



Source: data for the year 1966 adapted from Mirzaie (1998: 3) and for years between 1972 and 2000 from Abbasi-Shavazi and McDonald (2006: 223).
Note: the dotted line between years 1967 and 1971 is not based on any estimation and only shows the fertility trend. The estimations of TFR for years 1972-86 are own children estimates based on the 1986 census, whereas those for years 1982-96 and 1986-2000 from the 1996 census and the 2000 Iran Demographic and Health Survey, respectively.

Table 1.1. Changes in the marriage timing and fertility of Iranian women and in the socio-economic and institutional context

Moderate marriage postponement and fertility decline before 1979	Stability in marriage and moderate rise in fertility until the mid 1980s	Substantial marriage postponement and fertility decline since the mid 1980s
-Implementation of programmes aimed at improving women's status -Increase in access to education -Substantial male-female and rural-urban differences in access to education (in favour of men and urban residents) -Implementation of an anti-natalist policy	-Islamic revolution -Advent of war with Iraq and economic downturn -Introduction of a universal rationing system -Implementation of a pro-natalist policy	-End of war and economic improvement -Substantial rise in education -Rise in urban population -Diminished male-female and rural-urban differences in access to education -Notable fall in child mortality -Implementation of an anti-natalist policy

Moderate marriage postponement and fertility decline before 1979: These demographic changes were accompanied by the establishment of the first national family planning programme and implementation of various programmes aimed at improving women's status in the society.

In 1967, Iranian parliament passed the Family Protection Law, aimed at improving women's status. The access of Iranian women to education considerably increased over the following decade. Between the mid 1960s and the mid 1970s, literacy doubled amongst Iranian women; from 17.9 per cent literate women in 1966 to 35.6 per cent in 1976 (Abbasi-Shavazi 2000). However, this educational improvement did not translate into higher economic participation: the proportion of women participating in the labour force (either employed or in search of employment) was 12.5 and 12.9 per cent in 1966 and 1976, respectively (Statistical Centre of Iran 2007). In addition, the male-female and rural-urban differences in access to education remained substantial. In 1976, the proportion of literate men was 58.8 per cent and the literacy level was much higher amongst urban men and women (74.4% and 55.7%, respectively) than men and women who lived in rural areas (43.6% and 17.4%, respectively) (Abbasi-Shavazi 2000). Furthermore, the country still experienced a high rate of child mortality. Out of 1000 live births in the mid 1970s, 112 did not survive to see their first birthday (Aghajanian 1994).

The year of 1967 also marked the establishment of the first national family planning programme in Iran. This programme was launched just after the results of the 1966 census revealed a high annual population growth (3.1%) which caused concern amongst the government about its potential negative implications on the economic development (Aghajanian 1991). Family planning education was introduced in the high school and university curricula and a huge media campaign

was designed to promote family planning in the society (Aghajanian 1994). The results of the 1976-77 Iran Fertility Survey (IFS) revealed that at the peak of family planning activities nearly one-third of women aged 15-49 used contraception with urban and higher educated women being much more likely to use contraception (Aghajanian 1994).

Stability in marriage and moderate rise in fertility until the mid 1980s: This period corresponds with the Islamic Revolution (1979) and the advent of the eight-year war with Iraq (1980) which marked significant changes in Iranian society.

After the revolution, the family formation was emphasised as a basic Islamic virtue and the state adopted policies in favour of marriage and childbearing (Abbasi-Shavazi et al. 2002). The marriage policies were implemented by lowering the minimum legal age at marriage (after the revolution, the minimum age at marriage was reduced from 18 to 13 for girls and from 20 to 15 for boys) (Kazemipour 2004) and by offering some economic incentives for marriage (presenting wedding gifts and dowry) (Abbasi-Shavazi et al. 2009).

Soon after the revolution, the family planning programme was suspended by the government. As pointed out by Abbasi-Shavzi et al. (2002), the war itself increased the importance of high fertility as higher population size was regarded as advantageous. The rising casualties of the war also encouraged childbearing, particularly amongst middle-aged couples who anticipated the loss of their children. In addition, the Revolution (1979) and the Iraq invasion to Iran (1980) which led to an eight-year war between the two countries resulted in an economic depression in Iran in the 1980s. As pointed out by Salehi-Isfahani (2009), the 1980s economic decline was related to the post-revolutionary chaos (disruptions in property rights, widespread worker unrest, weakened management in public and private enterprises,

etc.), the 1980-88 war with Iraq which caused major damages to productive infrastructures and disrupted oil production and export, and the oil price collapse of 1986. As a result, by 1988 the average gross domestic product (GDP) fell to around half of its 1977 level. However, a universal rationing system was introduced which distributed food and consumer goods based on a per capita basis and resulted in a higher share for larger families.

Substantial marriage postponement and fertility decline since the mid 1980s: During this period, Iranian men and women experienced considerable changes in the socio-economic environment: a major improvement in access to education, an ongoing process of urbanisation, a shift in population policy, and an economic recovery after a period of war accompanied by a rise in material aspirations.

In the mid 1980s the country witnessed persistent economic hardship and higher educated and urbanised population constituted a higher share in the population of Iran. In 1986, 54.3 per cent of the population lived in urban areas (Amani 2001). At the same time, rural and urban areas became more similar in terms of access to education and health services (Abbasi-Shavazi et al. 2002). In 1986, the proportion of literate men and women was, respectively, 80.5 and 65.2 per cent in urban and 60.1 and 36.0 per cent in rural areas (71.0% and 51.0% in total) (Abbasi-Shavazi 2000). The implementation of health services throughout the country led to a considerable decline in child mortality. The infant mortality rate (IMR) declined from 112 deaths per 1000 live births in the mid 1970s to 68 by the mid 1980s (Aghajanian 1994).

The rise in the age at marriage and fall in the number of children continued in the 1990s. During this period, the country became more urbanised, access to education further improved, and child mortality considerably declined. By 1996,

61.3 per cent of the population of Iran lived in urban areas (Amani 2001) and the proportion of literate men and women reached, respectively, 89.6 and 81.7 per cent in urban and 76.7 and 62.4 per cent in rural areas (84.7% and 74.2% in total) (Abbasi-Shavazi 2000). The considerable improvement in the educational attainment of Iranian women during the post-revolutionary period was in part due to the spread of education throughout the country, particularly in rural areas and deprived regions (Abbasi-Shavazi 2000). This ensured the access of Iranian women to education regardless of their socio-economic background. Moreover, sex segregation in Iranian schools after the Revolution removed the cultural and religious sensitivities for girls' education (Abbasi-Shavazi and McDonald 2008). The Islamic atmosphere in the universities can also be regarded as a factor contributing to the substantial rise in the attendance of Iranian girls in universities. Girls constituted around 52 per cent of those admitted to government universities[1] in 1998 and 60 per cent in 2001 (Shadi-Talab 2001). Examples of such an Islamic environment are the compulsory dress rules for women[2], which in an Islamic context is considered to reduce the risk of harassment when women appear in public (see Abbasi-Shavazi et al. 2002) as well as the sex segregated dormitories in all universities.

Despite this remarkable educational improvement, Iranian women became less economically active over the post-revolutionary period as domesticity and motherhood were emphasised as the main roles of women (Abbasi-Shavazi and McDonald 2008). The proportion of women participating in the labour force declined from 12.9 per cent in 1976 to 8.2 and 9.1 per cent in 1986 and 1996,

[1] In addition to government universities, private universities (such as the Free-Islamic University) also exist in all provinces of Iran.

[2] It is called *Hijab* which is covering the head with headscarf and wearing long-sleeve mid-length or long cloths.

respectively (Statistical Centre of Iran 2007)[1]. Abbasi-Shavazi et al. (2002: 37) suggest that this discrepancy is also due to "cultural factors which preclude women's employment in such areas as construction, sales, and even food preparation and hotel industry". The decline in child mortality continued in the 1990s; by the early 2000s, the IMR reached 32 deaths per 1000 live births (Roudi-Fahimi and Kent 2007).

The 1990s also witnessed an improvement in economic conditions. After the war, the state made serious efforts towards improving the economic status of the country. The post-war economic reforms focused on economic growth and reconstruction (Salehi-Isfahani and Marku Forthcoming) and as a result by the early 2000s the economic growth recovered the losses in the 1980s and the average GDP was back to its peak level in the 1970s (Salehi-Isfahani 2009). This economic growth, however, was accompanied by a rise in material aspirations. In a study of knowledge, attitudes, and socio-cultural behaviour in Iran, Mohseni (2000) shows that around 80 per cent of the Iranians agreed that *all people are after money* and around 90 per cent expressed the opinion that *wealth is partially or totally important in life.*

The expectations of a higher living standard had implications for marriage and having children, perhaps viewing the quality rather than the quantity of children as paramount, in other words investigating in children with educational achievements that ensure a successful future. A study in four provinces of Iran[2] (Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2003) suggests a strong agreement on the value of the quality of children and the view that a large family size is an economic disadvantage. Specifically, more than 85 per cent of women

[1] There is no information about the pattern of these changes by motherhood status or the number of children.
[2] These provinces include Gilan, West Azerbaijan, Sistan-and-Baluchistan, and Yazd.

agreed with such statements as *parents cannot properly raise many children* and *having many children creates financial pressure on the family.*

During the 1990s, Iran experienced a major improvement in education and a higher access to mass media and means of communication throughout the country and in both rural and urban areas (see Abbasi-Shavazi et al. 2002). The heightened economic values in Iranian society can, therefore, be related to these changes and to the economic growth that happened during this period. Thornton et al. (1994: 104) pointed out that "With more consumer goods available and more money with which to purchase them, consumption aspirations apparently expand along with economic resources, preventing income from outpacing consumption aspirations".

The 1990s also witnessed a shift in the population policy. An annual population growth of 3.8 per cent, revealed by the 1986 census, promoted population as a topic for policy intervention and resulted in the launch of the second national family planning programme in 1989 (Aghajanian 1994). This programme had the goals of increasing the birth intervals to 3-4 years, limiting the number of children to 3, and discouraging pregnancy amongst women younger than 18 and older than 35 years (Aghajanian 1994). It did not, however, support marriage postponement. In fact, marriage was encouraged during the whole post-revolutionary period, while pre-marriage and extra martial relationships were, and continue to be, legally condemned.

Although the second phase of fertility decline (the mid 1980s) happened before the official establishment of family planning programme (1989), this programme was probably responsible for the sharp decline in the 1990s by providing widespread family planning services to the population demanding such services. As shown in Table 1.2, nearly two-third of women used contraception by the late 1990s.

Modern methods became much more widely adopted; by 2000, 56 per cent of Iranian women used modern contraception. The rural-urban gap in contraceptive use also decreased over time; by 2000, contraception was practiced by 77 per cent of urban and 67 per cent of rural women.

Table 1.2. Contraceptive prevalence rate (%) amongst married women aged 15-49 by rural-urban area and type of method, 1976-2000, Iran

Year	Urban			Rural			total		
	M	T	All	M	T	All	M	T	All
1976	34	21	54	15	5	20	24	13	37
1989	33	31	64	21	10	31	30	19	49
1997	55	23	78	57	9	66	55	18	73
2000	55	22	77	57	10	67	56	18	74

Source: Abbasi-Shavazi et al. (2002: 34).
Note: M: Modern methods, T: Traditional methods.

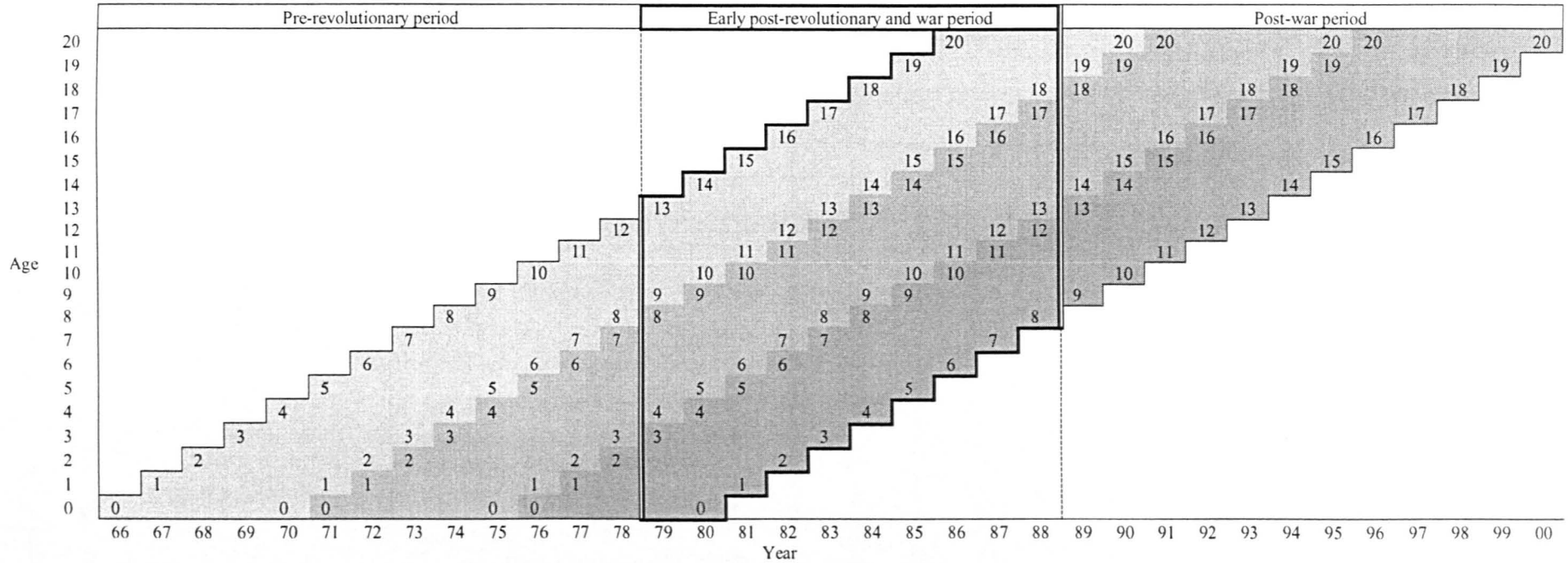
These socio-economic changes influenced different cohorts of Iranian women at different points of their life course. In other words, women who were at higher risk of marriage or childbearing during the 1990s experienced a different socio-economic context compared with those who were exposed to these risks during the 1970s or in the early 1980s. This point is more obvious when the marriage of consecutive birth cohorts is studied in relation to their life course experience. Figure 1.6 helps to illustrate this argument. Consider three cohorts of women born during 1966-70, 1971-75, and 1976-80. The marriage timings of these cohorts are distinct: 68.1 per cent of the 1966-70 birth cohort married by the age of 20, compared with 56.9 and 43.3 per cent of those born during 1971-75 and 1976-80, respectively[1]. Although nearly half women married by the age of 20, the younger birth cohorts experienced considerable marriage postponement. These cohorts were exposed to

[1] These figures are based on the Kaplan-Meier survival estimates of transition to first marriage calculated from the 2000 Iran Demographic and Health Survey.

specific socio-economic environments at different points of their life course, shown in the top row of Figure 1.6.

By the late 1980s, the majority of women born during 1966-70 were already married (aged 20 or over), whereas those born between 1971 and 1975 were at marriageable ages (14-18) and those born during 1976-80 were still quite young (9-13). Therefore, the oldest birth cohort was exposed to marriage mainly during the early post-revolutionary and war period (1979-88) and the youngest cohort mostly during the post-war period (1989-2000). The youngest birth cohort was exposed to marriage mainly in the 1990s, when more young men and women were engaged in education, the country was in economic recovery after the war, and people desired higher economic requirements before they married. These social and ideational changes are likely to have changed women's status and influenced the characteristics and preferences of potential spouses or the marriage market.

Figure 1.6. Life course experience of the 1966-70, 1971-75, and 1976-80 birth cohorts of Iranian women (until the age of 20)

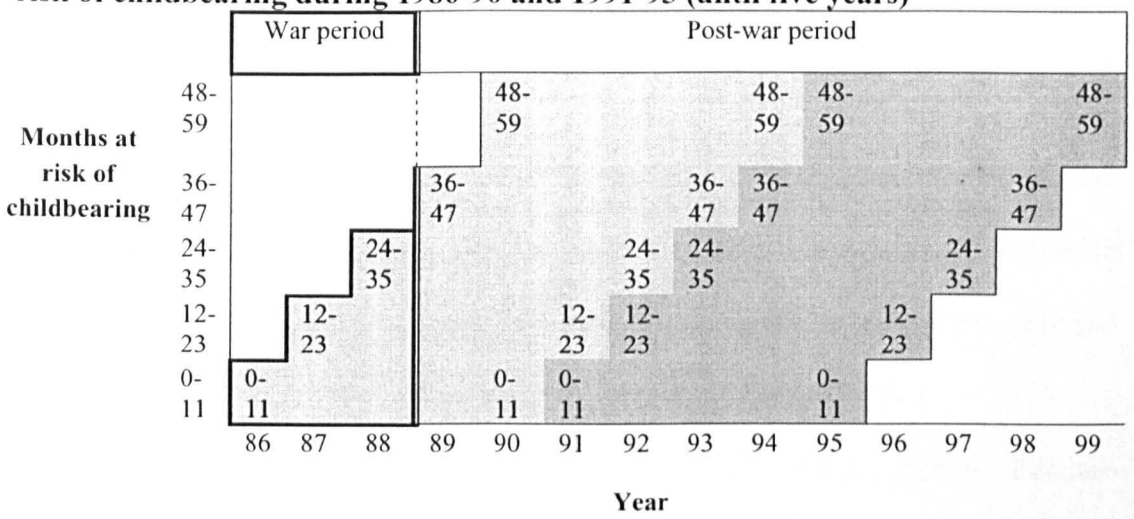


The childbearing of Iranian women can also be studied in relation to changes in the socio-economic context. It is useful to compare women who became exposed to the risk of second birth (gave birth to their first child) during 1986-90 with those who became exposed to this risk between 1991 and 1995. These cohorts experienced distinct fertility patterns: 83.1 per cent of women in the 1986-90 cohort conceived their second child within 51 months (gave birth within five years)[1], compared with 67.4 per cent of the 1991-95 cohort[2]. These cohorts were exposed to the risk of childbearing at points of time with different socio-economic and policy environments (see Figure 1.7). The 1986-90 cohort was at this risk between the mid 1980s and the mid 1990s, whereas the 1991-95 cohort experienced the whole period of exposure in the 1990s. A substantial improvement in women's education and children's higher enrolment in education during the post-war period is likely to have increased the costs and reduced the benefits of childbearing in particular for the latter cohort. The widespread availability of contraception during the 1990s is likely to have facilitated more control over the number and spacing of children for women who were at the risk of childbearing during this period.

[1] Considering the average period of gestation as nine months, conception in 51 months is equal to giving birth within five years.

[2] These figures are based on the Kaplan-Meier survival estimates of second conception calculated from the 2000 Iran Demographic and Health Survey.

Figure 1.7. Life course experience of Iranian women who were exposed to the risk of childbearing during 1986-90 and 1991-95 (until five years)



These specific life course experiences, which have resulted from the profound socio-economic changes in Iranian society, have not explicitly been taken into account to date in studying the recent rise in the age at marriage of Iranian women and fall in the number of their children. In other words, it is not clear to what extent this marriage postponement can be related to changes in women's status or changes in the characteristics and preferences of potential spouses over time. Similarly, the effect of changes in women's status and in the benefits and costs of childbearing on the recent fertility decline have not been determined. The recent marriage and fertility changes in Iran should be studied in relation to changes in the social and policy context and the effect of different socio-economic factors over time.

1.3. Ethnic patterns of women's marriage timing and fertility: the socio-economic and cultural context

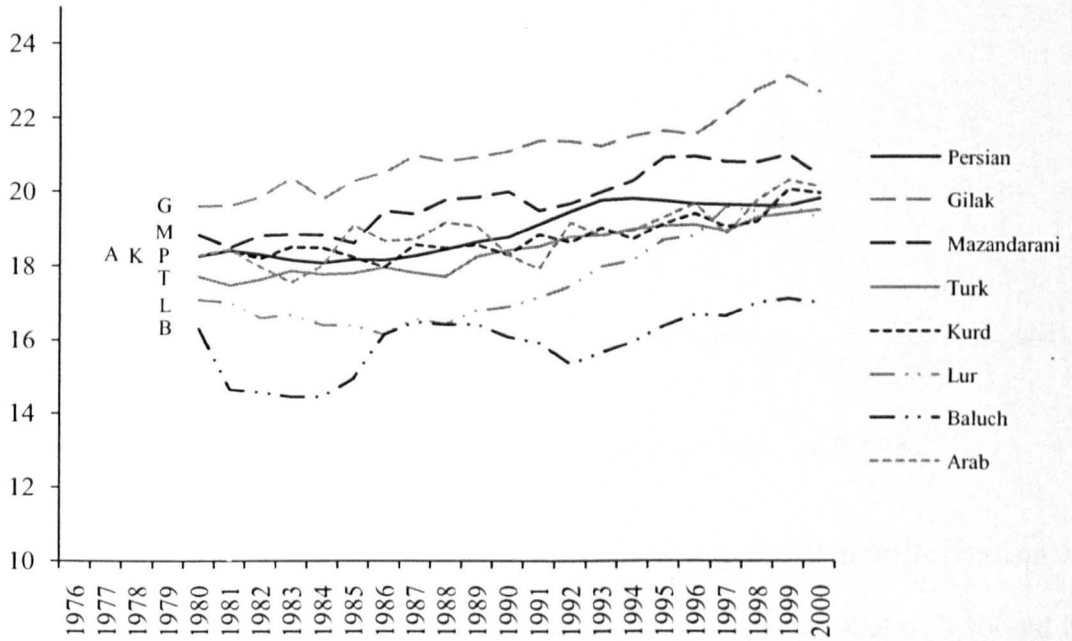
The marriage and fertility patterns witnessed in Iran are a combination of ethnic differences in the timing of women's marriage and their childbearing experience. Several studies suggest that ethnicity has an effect on the age at marriage of Iranian women and the number of their children (Kazemipour 2004; Abbasi-Shavazi and Sadeghi 2005; Mahmoudian 2005; Abbasi-Shavazi and Sadeghi 2006).

The population of Iran consists of numerous ethnic groups. Persians constitute nearly half of the population and the Turk, Kurd, Lur, Arab, Baluch, Gilak, Mazandarani, and few other groups constitute the remainder of the population (Abbasi-Shavazi and Jones 2001). Iranian ethnic groups are distinct in terms of language, religion, and their geographic distribution. While Persians mainly populate the central parts of the country, other groups mostly live in the borders[1]. The Kurd, Lur, Baluch, Gilak and Mazandarani groups originate from Indo-Europeans (Aryans) and their languages are specific branches of the old Persian language (Afshar-Sistani 1987). The Gilak and Mazandarani groups mainly reside in the north, Kurds in the west and the north west, Lurs in the south west and the Baluch group in south east of the country. Turks mainly live in the north west of Iran and their language is a branch of Turkish language influenced by Azeri, the language of the local population of Azerbaijan before the great migration of Turks to this area in the eleventh century (Atabaki 1993). Arabs speak Arabic and populate parts of south and south west of the country. These ethnic groups adhere to different sects of Islam with the Lur, Gilak, Mazandarani, and Turk groups and the majority of the Arab group being Shiite, and most Kurds and the Baluch group being Sunni Muslims.

[1] The geographic distribution of ethnic groups is shown in Figure 3.1.

Ethnic disparity in women's marriage timing is shown in Figure 1.8. The mean age at first marriage of the ethnic groups was diverse in the mid 1970s (between 16 and 20 years). During the 1990s a convergence is observed, with different ethnic groups stabilising their level at different paces. During the 1990s, the age at marriage of all ethnic groups increased and the marriage timing of most ethnic groups converged but two groups exhibited considerable differences. Specifically, the marriage timing of the Persian, Turk, Kurd, Arab, Lur, and Mazandarani groups converged at around 20 years but Gilak women still married later (22 years) and Baluch women married earlier (17 years).

Figure 1.8. Trend (5-year moving average) of female mean age at first marriage (FMAFM) by ethnic group, 1976-2000, Iran

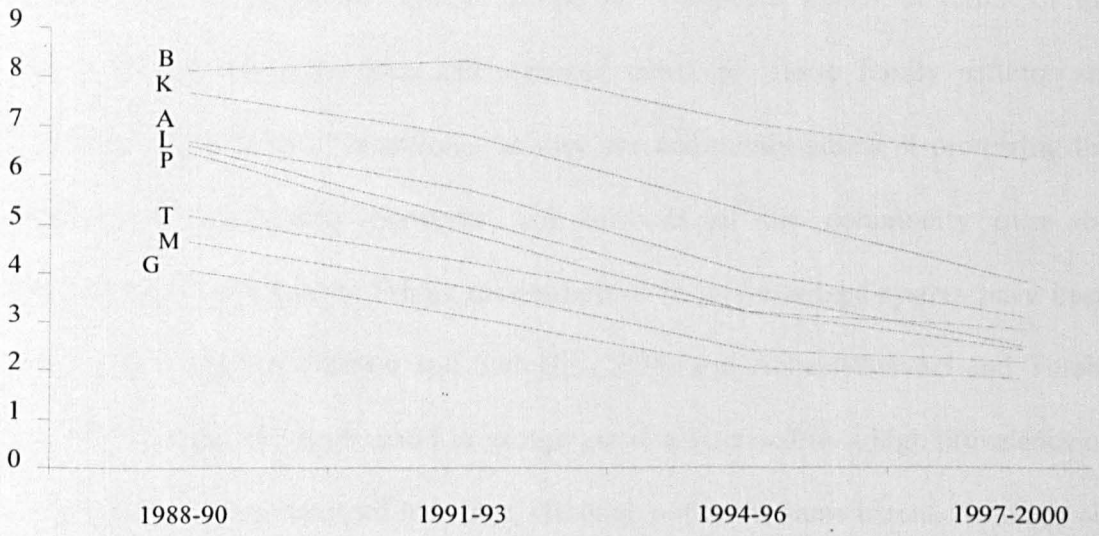


Source: data for calculation of mean age at first marriage was adapted from the 2001 national survey of Socio-Economic Characteristics of Households in Iran (SECHI) (for more information regarding this survey, refer to Section 3.2).
Note: Mean age at first marriage has been calculated directly from the respondents' reported age at first marriage in SECHI.

Figure 1.9 displays changes in the fertility level of ethnic groups between the late 1980s and the late 1990s. The fertility level of ethnic groups was diverse in the late 1980s (a total fertility rate of 4-8 children per woman). During the 1990s, the

fertility of all ethnic groups declined and the fertility level of most groups converged in the late 1990s: specifically, the TFR of the Mazandarani, Turk, Lur, Arab, and Persian groups converged to 2-3 children per woman. However, despite experiencing a sharp fertility decline, the TFR of Kurds was still 4. Gilak and Baluch women remained the two groups with the lowest and highest fertility during the whole period.

Figure 1.9. Trend of the total fertility rate (TFR) by ethnic group, 1988-2000, Iran



Source: Abbasi-Shavazi and Sadeghi (2006: 42).
Note: B: Baluch, K: Kurd, A: Arab, L: Lur, P: Persian, T: Turk, M: Mazandarani, and G: Gilak.

Ethnic differences in women's marriage timing and fertility levels can be related to ethnic diversity in the cultural and socio-economic attributes. It should be pointed out that there is a limited literature on ethnic family patterns in Iran, making it impossible to comprehensively compare ethnic groups in terms of different aspects of marriage and fertility practices. From this limited literature (Harris 1977; Nik-Kholgh 1979; Afshar-Sistani 1987; Askari-Khaneghah and Kamali 1995;

Kazempour 1996; Nik-Kholgh and Nouri 1998)[1], it appears that marriage and childbearing has traditionally been important amongst all Iranian ethnic groups. Childbearing has been so important that infertility and, in some cases, not having a son have been considered to lead to polygyny. There have been special celebrations for both marriage and childbearing throughout the country. The birth of a son has resulted in more satisfaction and accompanied by special festivities in nearly all ethnic groups.

Nevertheless, there are ethnic differences in these family patterns. In order to highlight these differences, ethnic groups are compared below in terms of the prevalence of consanguineous and arranged marriage. These family patterns are generally regarded to be traditional as they are commonly aimed at protecting the kinship and community networks and interests of the community over the preferences of individuals. Ethnic dissimilarities in this marriage system have been suggested by Abbasi-Shavazi and Sadeghi (2005) and Abbasi-Shavazi and Torabi (2007a). The Baluch, Arab, and Lur groups are characterised by a high prevalence of consanguineous and arranged marriage, although not to the same extent. Amongst all marriages in these groups, more than half are between relatives (Baluch: 83.2%, Arab: 66.9%, and Lur: 57.4%) (Abbasi-Shavazi and Torabi 2007a) and more than 70 per cent arranged by others, mainly by parents (Baluch: 84.6%, Arab: 86.2%, and Lur: 73.4%) (Abbasi-Shavazi and Sadeghi 2005). These marriage patterns are less frequent amongst other ethnic groups, particularly the Mazandarani and Gilak groups with nearly one out of every five marriages amongst the Gilak group being consanguineous (Abbasi-Shavazi and Torabi 2007a) and more than half of them

[1] These are mostly sociological-anthropological studies that have described specific family characteristics amongst specific ethnic groups. For instance, the studies conducted by Harris (1977), Askari-Khaneghah and Kamali (1995), and Kazempour (1996) relate to Kurds, Turkmans, and Arabs, respectively. Afshar-Sistani (1987) presents a comprehensive study of several Iranian ethnic groups.

based on women's own mate selection (Abbasi-Shavazi and Sadeghi 2005). Consanguinity and arranged marriage practices result in shortening the process of mate selection and, thus, can explain the earlier marriage of some ethnic groups. Lower age at marriage can, in turn, increase the period of exposure to the risk of childbearing, particularly in Iran where childbearing is experienced within marriage (Abbasi-Shavazi and McDonald 2008).

In addition, changes in the socio-economic context of different ethnic groups over time might have affected their marriage timing and fertility. A study conducted by Erfani (2005) shows differences in the pace of development between 1986 and 1996 at the provincial level[1]. According to this study, Persians mainly lived in moderately developed or highly developed areas during this period. The Gilak, Mazandarani, and Arab groups enjoyed a moderate development. Kurds, Turks, and Lurs generally lived in less developed areas in 1986 and moderately developed areas in 1996. The Baluch group lived in less developed areas during the whole period.

There is some evidence on ethnic differences in child mortality and the prevalence of contraception. To our knowledge, there is no information regarding changes in either child mortality or contraceptive use amongst Iranian ethnic groups over time. A study conducted by Abbasi-Shavazi and Sadeghi (2006) shows ethnic patterns of infant mortality and contraceptive use in 2001. There is a notable ethnic variation in infant mortality. The infant mortality rate (IMR) is lower amongst the Gilak and Mazandarani groups (21 and 26 deaths per 1000 live births, respectively) and higher in the Baluch and Kurd groups (93 and 88 deaths per 1000 live births, respectively). IMR is between 33 and 46 deaths per 1000 live births amongst other groups (Persians, Turks, Arabs, and Lurs; from the lowest to the highest). Except for

[1] This study used cluster analysis of several indicators of development in order to classify Iranian provinces to "less developed", "moderate developed", and "developed" in 1986 and 1996.

Baluch women with a contraceptive prevalence rate (CPR) of 35.8 per cent, contraceptive is practiced at similar rates amongst other ethnic groups (76-81%).

Therefore, ethnic differences in women's marriage timing and fertility levels can be related to both cultural differences regarding family patterns and socio-economic attributes. The ethnic group with the lowest age at marriage and highest fertility (the Baluch group) also lives in the least developed areas, has the lowest prevalence of contraception, and adheres to the most traditional family system (as indicated by women's less freedom in mate selection and higher consanguinity). The picture is not so clear for other groups. For instance, despite being less developed than Persians, Gilak women have later marriage and lower fertility which can be related to their less traditional cultural family patterns. Compared with other groups, the Lur, Arab, and Baluch groups adhere to a more traditional family system. Yet, Lur and Arab women have experienced later marriage and lower fertility than Baluch women which can partly be attributed to their less traditional family system and partly to their greater progress in development and higher use of contraception. Ethnic difference in marriage timing can also be related to the availability of marriageable men in areas where they live or their adaptation to this availability. As pointed out by Ni-Bhrolchain (2001), preferences for the characteristics of partner (such as age) are more flexible than is commonly assumed by demographers and sociologists.

The extent of domination of cultural factors related to ethnicity by socio-economic factors has been examined by Abbasi-Shavazi and Sadeghi (2005 and 2006). Using data from the 2001 national survey of Socio-Economic Characteristics of Household in Iran and applying multiple classification analysis, they found that the magnitude of the effect of ethnicity on women's age at marriage is reduced by

25.7 per cent after accounting for a number of characteristics of women (age, education, employment status, and place of residence). They found a more substantial reduction in the effect of ethnicity on the mean number of children ever born (60.0%) after controlling for a number of socio-economic and demographic characteristics of parents and household (e.g. urban residency, women's education, socio-economic status of the household, child mortality, etc.). Nevertheless, the effect of ethnicity (as a cultural indicator) remained statistically significant throughout both analyses. Using the same data and applying multiple regression analysis to a different set of explanatory variables, Mahmoudian (2005) found that the effect of ethnicity and some other characteristics of women (e.g. education and economic activity) remained statistically significant. These studies suggest that both ethnicity and socio-economic characteristics have influenced the marriage timing and fertility of Iranian women. However, these studies did not examine the role of ethnicity on the marriage timing and fertility levels by accounting for ethnic diversity in socio-economic changes over time, nor explored ethnic differences in relation to these influences.

1.4. Research aims and questions

This thesis aims to shed more light on the patterns and determinants of the recent marriage postponement and fertility decline in Iran, by accounting for the role of ethnicity and changes in the socio-economic context over time. This aim is met by addressing the following questions:

1. How have changes in the socio-economic context influenced the recent marriage postponement and fertility decline?

2. What is the role of ethnicity in the marriage timing and fertility behaviour, after accounting for changes in the socio-economic context?

3. Have changes in the socio-economic context influenced the marriage timing and fertility behaviour of different ethnic groups in similar ways?

4. How have ethnic group and socio-economic context change influenced the marriage timing and fertility behaviour of the different cohorts who have contributed to the recent marriage postponement and fertility decline?

This research provides not only a substantive contribution to the demographic literature in Iran by providing more insight into the nature of the recent marriage and fertility changes, but also a methodological contribution by incorporating socio-economic and cultural changes in time and geographic space with individual-level measures. The thesis, in particular, investigates the cultural sensitivity of different ethnic groups to socio-economic influences which is crucial for a full understanding of the demographic change which occurred in Iran in a short period of time and the implications of the role of ethnicity for shaping demographic processes in the Iran of tomorrow. It will specifically enable policy makers to take account of ethnicity for the population forecast and to design specific programmes for different ethnic groups to reach marriage and family goals. By examining the marriage timing and the fertility patterns of the cohorts of women who contributed to the recent marriage and fertility changes in Iran, this study will also provide more insight into the role of the timing of important socio-economic changes in Iranian society and on the specific influence of those changes on the demographic response of cohorts with distinct life course experiences. The next section presents the content of this thesis.

1.5. Structure of thesis

Chapter 1 discussed recent changes in the marriage timing and fertility of Iranian women with a special focus on changes in the socio-economic context of marriage and fertility over time and the role of ethnicity. Building on the existing literature, the research aim was also presented in this chapter.

Chapter 2 presents the theoretical framework for studying the contribution of the individual- and contextual-level determinants of women's marriage and childbearing, allowing the marriage and fertility responses to vary according to women's life course experience and by their ethnicity.

Chapter 3 presents the research methodology. This study applies a discrete time hazard model to the 2000 Iran Demographic and Health Survey and a range of time-varying district-level contextual information derived from two rounds of Iranian censuses. The data and methods applied facilitate the introduction of time-varying variables in order to capture the effect of temporal changes in the context of marriage and childbearing. The analysis addresses the lack of information on women's ethnicity in the data sources applied by introducing geographic regions as proxies for ethnicity and discuss the limitations. The analysis also accounts for unobserved heterogeneity (unmeasured characteristics of women) to control for the omitted variables and to obtain accurate estimations of hazard rates.

Chapter 4 presents first part of the marriage analysis and addresses the research questions 1-3 (see Section 1.4). The chapter examines the correlates of marriage postponement in Iran (Question 1), the role of ethnicity after accounting for ethnic diversity in socio-economic changes (Question 2), and ethnic-specific patterns of the socio-economic influences (Question 3).

Chapter 5 presents second part of the marriage analysis and addresses the fourth research question (see Section 1.4). The chapter analyses the marriage timing of consecutive birth cohorts of women who contributed to the recent marriage delay by accounting for their life course experience.

Chapter 6 presents the fertility results. The chapter examines the correlates of fertility decline in Iran (Question 1), the role of ethnicity after accounting for ethnic diversity in socio-economic changes (Question 2), and ethnic-specific responses on fertility to the socio-economic forces (Question 3). The chapter also examines the fertility of consecutive cohorts of women who experienced fertility decline in relation to their life course experience (Question 4).

Chapter 7 concludes the thesis and discusses research limitations.

Chapter 2

Theoretical framework

2.1. Introduction

This chapter presents the theoretical framework for studying the role of changes in the socio-economic and cultural context in explaining marriage postponement (Section 2.2) and fertility decline (Section 2.3) in Iran. The framework specifically allows the marriage and fertility responses to vary according to women's life course experience and by their ethnicity.

2.2. Determinants of marriage

According to the economic theory of marriage proposed by Becker (1973 and 1974), individuals marry when their utility is maximised, that is when the benefits from marriage are greater than those from remaining single. As women's educational attainment and participation in the labour market increases, their utility from marriage reduces and so does their willingness to get married. Therefore, women's higher education and economic status are related to marriage postponement by increasing the opportunity costs of marriage.

There are other ways in which women's education influences their marriage timing. For example, education exposes women to new ideas by providing access to a wider *information network,* going beyond the family and the local environment (Thornton et al. 1994). Education can change preferences regarding the marriage timing and the optimal spouse characteristics, leading to marriage postponement. In addition, women's higher educational level is likely to postpone their marriage by extending the time they are enrolled in education and delaying transition to adulthood roles (such as marriage) to higher ages (Santow and Bracher 1994; Blossfeld 1995; Pollard and Wu 1998; Raymo 2003). In the specific context of Iran, previous studies (Kazemipour 2004; Mahmoudian 2005) have found a positive association between women's age at marriage and their educational attainment and paid employment.

Other studies have highlighted the demand and supply side of the marriage market in determining women's marriage timing (Elm and Hirschman 1979; Stycos 1983; Teachman, Polonko, and Leigh 1987; Oppenheimer 1988; McLaughlin, Lichter, and Johnston 1993; Santow and Bracher 1994; Oppenheimer and Lew 1995; Sweeney 2002). Oppenheimer (1988: 573) pointed out that "people do not wish to

marry just anyone-they want to mate assortatively". A greater availability of suitable men increases women's probability of marriage. For instance, an unfavourable sex ratio (an unbalanced pool of marriageable men compared with marriageable women) delays marriage (Stycos 1983; McLaughlin, Lichter, and Johnston 1993). The economic status of the spouse supply also affects women's marriage timing; even in societies where women have a great participation in the labour market, the economic status of men remains important in marriage formation (Teachman, Polonko, and Leigh 1987; Santow and Bracher 1994; Sweeney 2002). In addition, men's higher educational attainment can delay their marriage by postponing transition to adulthood roles such as permanent and full time employment[1] and by modifying their preferences regarding marriage timing and spouse characteristics.

The process of socio-economic development also influences women's marriage timing by changing their status in the society and by modifying the availability of suitable partners in the area (marriage market). Urbanisation and industrialisation can result in women's marriage postponement by raising their access to education and non-familial paid work and by reducing the cultural restrictions for women's engagement in socio-economic activities (Elm and Hirschman 1979; Abdelrahman and Morgan 1987; Santow and Bracher 1994). Urbanisation and industrialisation and the migration of young men from rural to urban and industrial areas can also result in a shortage of marriageable men in rural areas. According to Doroudi-Ahi (2004), rural women in Iran have suffered from a lower availability of marriageable men. In other words, the process of development could introduce different influences on women's marriage timing either by providing

[1] The economic status of the spouse supply is important in family formation as men are the main income earners in Iranian society. In addition, the majority of Iranian households are nuclear. Specifically, 79.2 and 82.3 per cent of Iranian households were nuclear in 1986 and 1996, respectively, and the rural-urban differences were minor (Ladier-Fouladi 2002).

a favourable marriage market, resulting in an earlier marriage in more developed areas, and by improving women's status, leading to marriage postponement in those areas.

In addition, several studies have suggested that the individual's behaviour is guided and influenced by the pre-existing cultural setting (see, for instance, Lesthaeghe 1983; Thornton and Fricke 1987; Lesthaeghe and Surkyn 1988; Thornton and Lin 1994; Abbasi-Shavazi et al. 2009). Culture is defined as "the set of shared attitudes, values, goals, and practices that characterises an institution, organisation or group" (Wikipedia 2010). Culture has been suggested to influence demographic behaviours by directing the individual's aspirations and preferences and conditioning the means to achieve them (Lesthaeghe 1983; Lesthaeghe and Surkyn 1988). In a comparative study of family change in the West, China, and South Asia, Thornton and Fricke (1987) showed that although several aspects of family change are similar in diverse cultural settings, the developmental patterns differ across these settings because of significant pre-existing differences in different aspects of family structure (e.g. in the autonomy of children in selecting their future spouse and the rate of marriage with relatives).

Therefore, there is no reason to expect that socio-economic forces influence the marriage timing in similar ways in culturally diverse settings (such as ethnic groups). Cultural distinction indeed characterises ethnic groups where an ethnic group (or ethnicity) is defined as "a group of people whose members identify with each other, through a common heritage, consisting of a common language, a common culture (often including a shared religion) and a tradition of common ancestry" (Wikipedia 2010). In other words, the cultural values and norms associated with ethnicity can be expected to mediate the contribution of socio-economic forces

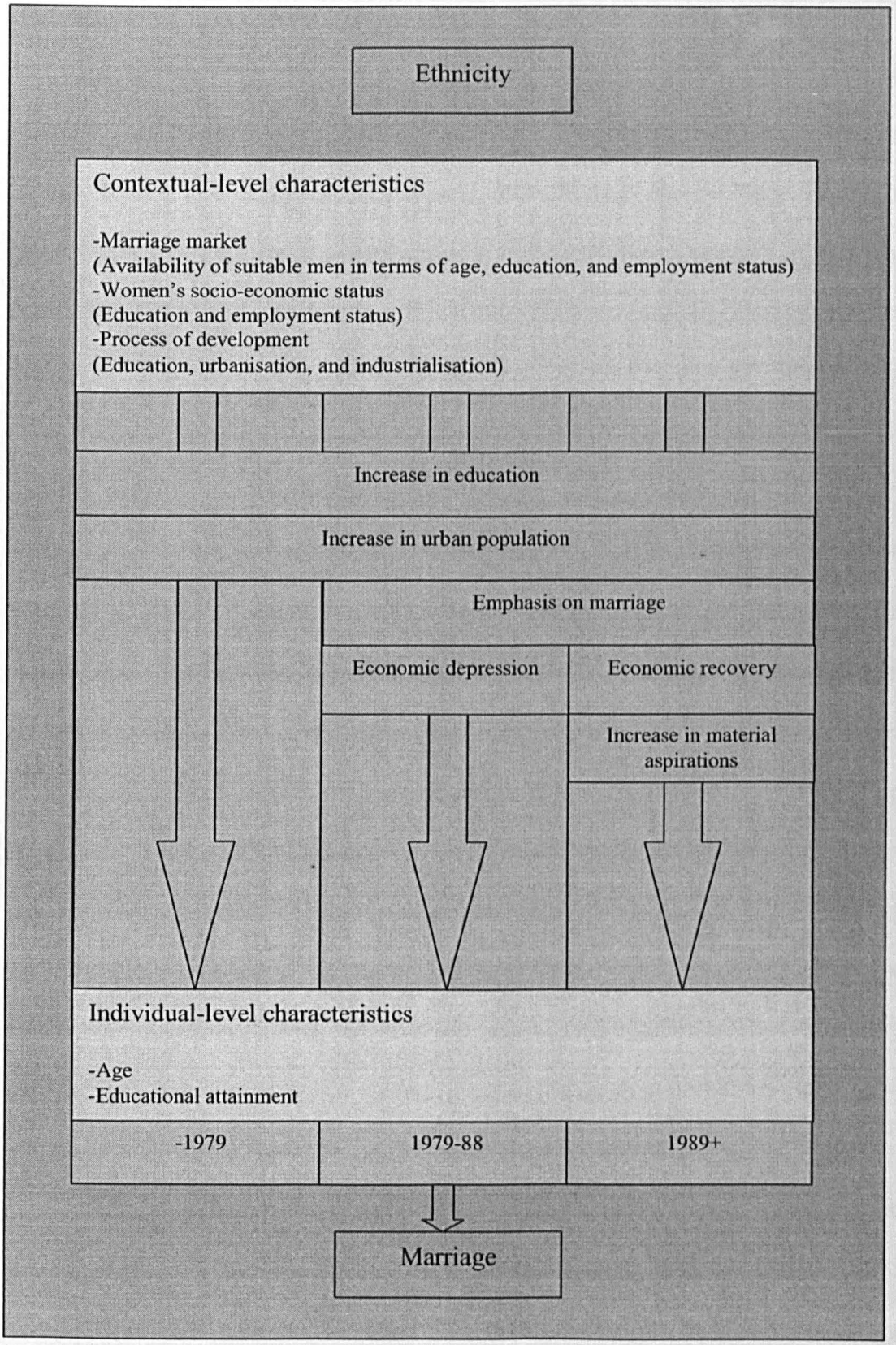
(e.g. women's socio-economic status, availability of suitable men, or process of development) to the individual's demographic behaviour (e.g. marriage).

For instance, in a more traditional context, where arranged and consanguineous marriage is common (e.g. the Baluch group), women's higher educational attainment or their economic activity and even the suitability of spouse (e.g. in terms of economic status) might have limited contribution to their marriage decisions because of their low autonomy in mate selection. In addition, women's roles are not defined similarly in different settings. Amongst Baluch women, for instance, housekeeping is regarded as the main duty of women (see Abbasi-Shavazi et al. 2004). In this context, even an increase in access to education or in the opportunity for paid work outside home may not result in notable changes in women's marriage timing.

Figure 2.1 illustrates the conceptual framework that will be used for studying the contribution of women's characteristics and changes in the socio-economic context to women's marriage timing. The analysis, specifically, accounts for women's life course experience and allows for ethnic-specific marriage responses to the socio-economic forces at the individual and contextual levels.

In life course studies, as pointed out by Thornton and Lin (1994), the role of individual changes across the life span and the community and societal forces in shaping the individual's behaviour are analysed. In addition to changes in the characteristics of individuals (e.g. age), the emerging changes in the socio-economic environment in which individuals live (either temporary changes such as wars and economic fluctuations or longer term changes related to urbanisation, industrialisation, and the expansion of formal education) are assumed to influence the behaviour of individuals.

Figure 2.1. Ethnic-specific multi-level influences on women's transition to first marriage in Iran



Note: the time periods (-1979, 1979-88, and 1989+) shows different periods of social change in Iranian society.

In this study, temporal changes in the socio-economic context are represented by changes in the marriage market, women's socio-economic status, and process of development, each category represented by several variables (for a detailed list, see Chapter 4). The framework also accounts for the impact of women's individual characteristics such as age and educational attainment on their marriage timing. In addition to a direct influence on transition to first marriage, changes in different contextual factors can influence the contribution of other social and economic forces at the individual and contextual levels due to the interaction of these factors. This point is more obvious when the life course experience of consecutive birth cohorts is studied.

For instance, differences in access of Iranian men and women to educational attainment during different periods of social change might have influenced the marriage timing of cohorts born during 1966-70, 1971-75, and 1976-80 in different ways. As noted earlier (see Section 1.2), the younger birth cohorts experienced marriage postponement within specific socio-economic environments. Women born before 1975 (the first two birth cohorts) were affected by the early post-revolutionary and war period (1979-88) during the prime marriageable ages when the country experienced an economic depression, whereas those born during 1976-80 were exposed to marriage during the post-war period (1989-2000) when the country experienced an improvement in economy and a change in expectations (see Figure 1.6, for the specific life course experience of these birth cohorts).

First consider the role of men's education. An increase in access to education for men during the 1990s could have led to later marriage by increasing the period of enrolment in education and delaying the transition to full time and permanent employment. The rise in material aspiration during the post-war period could have

led to a higher emphasis on men's economic suitability and modified men's perception regarding the marriage requirements (e.g. wedding ceremony, housing, etc.). On the other hand, women's higher access to education could have led to the marriage postponement of the younger cohorts by changing their perception regarding women's societal and family roles and by affecting their spouse preferences.

2.3. Determinants of fertility

According to the demographic transition theory (Thompson 1929; Notestein 1953), the process of modernisation and socio-economic development results in lower mortality and after some lag period, lower fertility. According to this theory, various forces in modern societies (including urbanisation and industrialisation) result in fertility decline by creating a new way of life in which large family size is not as rewarding as it was in the pre-industrial societies. The erosion of familial modes of production reduced the economic benefits of children and the cost of children increased as formal education became widespread. The advent of non-familial institutions and new forms of investment reduced the reliance of families on their children as sources of security in old age and in hazardous situations. Demographic transition theory attributes fertility decline to changes in the economics of children in macro-economic terms.

The same theme has been applied within a micro-economic framework to explain fertility decline (Becker 1988). According to this approach, fertility decisions are considered to be rational and made based on the satisfaction obtained from childbearing in comparison with consumption of various goods and services as well as alternative opportunities for women (e.g. educational attainment and work outside

home). Women's higher education and economic status can, therefore, reduce the demand for children by introducing competing opportunities to motherhood and increasing the opportunity costs of childbearing and rearing.

There are also other ways in which women's education can influence their fertility behaviour. Education can change individuals' attitudes towards gender roles and modify their traditional outlook and ability to accept new ideas (Caldwell 1982; Cleland and Wilson 1987; Cleland and Rodriguez 1988). Higher educated women can have different views regarding contraceptive use and the quality of children, leading to a lower number of children. Higher education can also influence fertility by extending the period of school enrolment. The probability of childbearing can be lower for women enrolled in education due to difficulties resulting from the concomitant roles of being a student and a mother. In Iran, women with higher educational attainment and those who work outside home bear fewer children (Abbasi-Shavazi and Sadeghi 2006).

In addition to these socio-economic factors, the proximate determinants of fertility such as women's age, age at marriage, contraceptive use, etc. influence fertility (Bongaarts 1978). For instance, women's age at marriage reflects the length of exposure to the risk of childbearing, particularly in countries such as Iran where childbearing is restricted to marriage. Early marriage increases the length of exposure and the probability of early first birth and shorter subsequent birth intervals, leading to a higher risk of childbearing (Marini and Hodsdon 1981). Marini (1981) specified other ways in which women's higher age at marriage can result in their lower fertility, e.g. by reducing their fecundity or by increasing contraception efficacy due to the maturity and more responsible approaches that come with age. Rodriguez et al. (1983) and Trussell et al. (1985) suggested that the

length of previous birth interval influences fertility; in that shorter birth intervals are associated with shorter subsequent intervals and vice versa. Rodriguez et al. (1983) suggested that this factor can be a proxy for biological factors such as breastfeeding and contraceptive use. Trussell et al. (1985) found that the length of preceding birth interval remains important after controlling for contraceptive use and breastfeeding and emphasised that this factor can reflect the role of the efficacy and length of contraceptive use as well as the underlying fecundity.

Experiencing child mortality and sex preference are other factors affecting fertility which are discussed in this and the following paragraph. The effect of child mortality can be through the *biological* and *behavioural* mechanisms (Preston 1987). The example of the biological influence of child mortality on fertility can be the termination of breastfeeding after the death of an infant. The behavioural mechanism operates through *replacement* and *insurance*. Replacement is parents' response to the death of their child by giving birth to another child, whereas insurance relates to parents' general perception regarding child survival in the society which influences their fertility decision. We have already mentioned that the recent fertility decline in Iran has been accompanied by a substantial fall in child mortality (see Section 1.3.2), which could be related to these mechanisms.

Sex preference is defined by the society's gender system. Son preference has been reported in patriarchal societies, where sons are considered as the major source of the social, economic, and cultural utilities but daughters are regarded as an economic burden (Arnold, Choe, and Roy 1998; Aly and Shields 1991; Rahman and DaVanzo 1993). Even in some more economically developed Asian countries such as China and Korea, where children are not as economically beneficial for their parents as they would be in less economically developed countries, sex preference

still affects parity progression, suggesting a social aspect to sex preference (Qian 1997; Larsen, Chung, and Das Gupta 1998). To our best knowledge, the impact of sex preference on fertility has not been examined in the context of Iran.

The impact of the cultural setting (as indicated by ethnicity) on demographic behaviours has been discussed in the previous section. The role of culture in shaping fertility behaviour was highlighted after a regional pattern of fertility decline was observed both in the developed and developing countries (see Cleland 1985; Coale and Watkins 1986). These regions corresponded with cultural settings (indicated by language, ethnicity, and religion) and there were weak associations between the fertility decline and socio-economic measures (Lesthaeghe 1983; Cleland 1985; Coale and Watkins 1986; Cleland and Wilson 1987; Watkins 1987; Lesthaeghe and Surkyn 1988; Bongaarts and Watkins 1996).

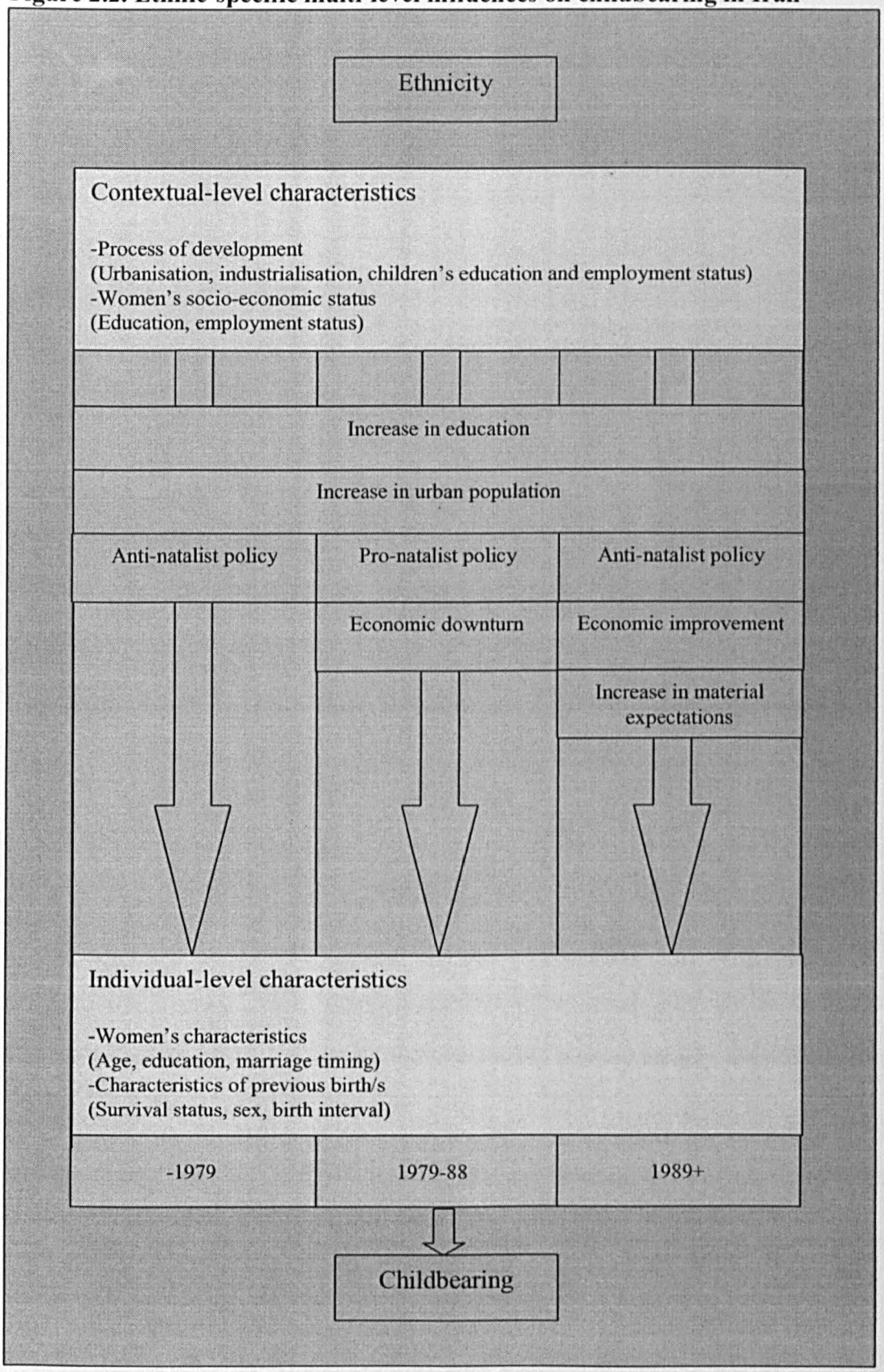
Cultural values and norms can influence demographic behaviours by directing the preferences of individuals and conditioning the means to achieve them (Lesthaeghe 1983; Lesthaeghe and Surkyn 1988). Therefore, individuals with different cultures (indicated e.g. by specific ethnic groups) can be expected to react differently to new ideas. For instance, the idea of birth control and the methods of fulfilling this idea are differently viewed in different cultures: the *moral acceptability of the principle of control,* the *feasibility of birth control,* and the *acceptability of particular methods* are not the same in all cultures (Cleland and Wilson 1987). In Iran, we have already noticed that fertility is partly explained by individual- and household-level socio-economic and demographic factors and partly by ethnicity (as a cultural indicator) (see Section 1.3.3). In this study, the cultural values and norms associated with ethnicity are expected to mediate the socio-

economic influences and result in specific fertility responses amongst different ethnic groups to the social, economic, and demographic forces.

Figure 2.2 illustrates the conceptual framework for studying the contribution of the individual-level characteristics and changes in the socio-economic context to women's fertility. The individual-level factors include women's characteristics (age, education, marriage timing, and contraception availability) and some features of previous birth/s (sex and survival status of child/children and previous birth interval). The analysis will account for temporal changes in the socio-economic context of childbearing and allow for ethnic-specific fertility responses to the socio-economic forces at the individual and contextual levels.

Temporal changes in the socio-economic context are represented by changes in women's socio-economic status and process of development, each category represented by several variables (for a detailed list, see Chapter 6). This way, women's life course experience is explicitly included in the analysis of their childbearing. In addition, changes in one contextual factor can influence the contribution of other factors at the individual and contextual levels. This is more obvious when the life course experience of cohorts who were at the risk of childbearing during different periods of social change is studied. For instance, access to education could have made different impacts on the fertility behaviour of women who were at the risk of childbearing during the post-war period (1990s) compared with those who were exposed to this risk during other periods of social change in Iran. Women's higher access to education during the 1990s could have influenced their fertility by changing their perception regarding women's societal and family roles as well as the number and quality of children. Women's higher education could have also increased the acceptance and efficient use of contraception.

Figure 2.2. Ethnic-specific multi-level influences on childbearing in Iran



Note: the time periods (-1979, 1979-88, and 1989+) shows different periods of social change in Iranian society.

Chapter 3

Methodology

3.1. Introduction

As discussed in Chapter 1, the substantial marriage postponement (around three years) and fertility decline (over four children per woman) experienced by Iranian women during the last two decades of the twentieth century closely correspond with profound changes in the socio-economic context (e.g. improvement in education, urbanisation, economic fluctuations, etc.) (see Section 1.2). Chapter 1 also highlighted ethnic patterns of women's marriage timing and childbearing and how these patterns can be related to ethnic diversity in the cultural and socio-economic characteristics (see Section 1.3). However, the existing demographic literature in Iran has not studied the recent marriage postponement and fertility decline by taking

temporal changes in the socio-economic context into account. In addition, previous studies have not examined the role of ethnicity by accounting for ethnic diversity in socio-economic changes over time, nor explored ethnic patterns in response to these influences. In order to address these gaps, this thesis aims to investigate the patterns and determinants of the recent marriage and fertility changes after accounting for the role of ethnicity and changes in the socio-economic context over time (see Section 1.4). The conceptual framework, introduced in Chapter 2, allows the marriage and fertility responses to vary according to women's life course experience and by their ethnicity.

This chapter introduces the data (Section 3.2) and method (Section 3.3) used to address the aim of thesis. Due to the absence of longitudinal surveys in Iran, this study uses two rounds of Iranian censuses (1986 and 1996) to obtain information about changes in the socio-economic context over time. This information is linked to the information about the characteristics of women at the individual level which are derived from the 2000 Iran Demographic and Health Survey (IDHS). The chapter discusses how the lack of information on women's ethnic group in the main data sources is addressed by introducing geographic regions, derived from the 2001 national survey of Socio-Economic Characteristics of Household in Iran (SECHI), as proxies for ethnicity. The chapter argues the limitation of this approach in measuring ethnicity per se. and in distinguishing the cultural influences associated with ethnicity from the geographic influences. However, this is the only way to account for the multi-ethnic composition of the population of Iran in analysing the recent marriage and fertility changes in the country.

The chapter also introduces the main method of analysis: the discrete time hazard model. This method allows introducing the time-varying contextual-level

variables, created from two rounds of censuses, in the analysis. The chapter argues that although an ideal way to deal with the multi-level structure of the data set would be using the multi-level time to event method, but the thesis applies pgmhaz in STATA to estimate hazard rates because it accounts for the unobserved heterogeneity (unmeasured characteristics of women). There is a debate in the literature about the implications of not accounting for this heterogeneity in the analysis. This research addresses this concern and adds to the methodological literature. The chapter also illustrates the measures of the quantum and tempo of fertility which are used to present the results in more detail (Section 3.3.2) and the way the time-varying contextual-level data are constructed for selected sample of women in the marriage and fertility analyses (Section 3.3.3).

3.2.Data

A range of data sources are used in this study: the 2000 Iran Demographic and Health Survey (IDHS), district-level data from the 1986 and 1996 Iranian censuses, and the 2001 national survey of Socio-Economic Characteristics of Household in Iran (SECHI).

As described in the Iran Demographic and Health Survey (IDHS) report (Iran Ministry of Health and Medical Education 2002), the IDHS was conducted under the auspices of the Iran Ministry of Health and Medical Education in collaboration with the Statistical Centre of Iran in the first month of autumn (September-October) in the year 2000 and collected data at the individual and household levels. The principal objective of IDHS was to determine the demographic, health, and social indicators, at both the provincial and national levels, for the Islamic Republic of Iran. The

survey contains information about fertility, family planning, morbidity and mortality, household amenities, and child health.

The data collection method was direct interviews performed by trained interviewers who visited selected households and completed the IDHS questionnaire. The survey method was Probability Proportional to Size sampling. Each cluster included 10 ordinary residential households and the number of clusters was 200 in the rural and 200 in the urban areas of the 28 provinces of Iran and the city of Tehran. A total of 113,957 households were visited by the interviewers and members of 111,626 households were successfully interviewed. The response rate was very high (97.9%). The information was collected for a total of 269,914 men and 266,710 women and the average household size for the selected sample was 4.6.

The information about marital and reproductive behaviour was collected for all ever-married women aged 10-49 in the household, comprising a total of 90,740 women. The questionnaire was designed in two main sections including a general questionnaire for the demographic characteristics of all members of the household (including 88,918 never-married women), and another questionnaire for ever-married women of reproductive age. The general questionnaire includes questions regarding the age, current place of residence, current educational attainment, current employment status, and marital status of household members. The other questionnaire includes questions about the age at first marriage, the date of birth and survival status of children, women's current contraceptive use, and sets of questions identifying the breastfeeding practice, abstinence, and post-partum amenorrhea only for pregnancies ended during the two-year period preceding the survey.

In addition, the district "Shahrestan" level data from the 1986 and 1996 Iranian censuses are merged to the individual-level data set derived from the IDHS

(according to women's district of residence) in order to account for changes in the socio-economic setting over time[1]. Iran was divided into 24 provinces in 1986, 26 in 1996, and 28 in 2000. During the same period, the number of districts increased from over 190 in 1986 to around 250 in 1996, and more than 270 in 2000. For the districts created after 1986 the value of the indicators were calculated based on the geographical structure of 1986 as the new district were nested in the old administrative structure. For instance, the district of Babolsar in the province of Mazandaran was part of the district of Babol at the time of the 1986 census. Therefore, the 1996 census contains information for Babolsar but the 1986 census does not. The 1986 information for Babolsar (the new district) is derived from Babol (the original district). The same approach is applied for those districts added to the geographic administrative structure after 1996; the information regarding the 1986 and 1996 censuses for these districts are derived from the original districts which the new districts were divided from.

It should be pointed out that due to the lack of retrospective information regarding the respondents' place of residence in the IDHS, their district of residence at the time of survey is considered as their place of residence during the period of study. Although this place could vary over time, the flow of migration between districts has not been large. Between 1986 and 1996, 9.1 per cent of the population of Iran migrated to another district and only 5.4 per cent migrated to another province (Statistical Centre of Iran 2007).

As neither the IDHS, nor the censuses collected information on language or ethnicity, the 2001 national survey of Socio-Economic Characteristics of Household

[1] The study also used the provincial-level information from the censuses. In the final analyses, however, the district-level variables were generally found to provide much better fit, both in terms of the significance and the direction of the effect. The results presented in the thesis, therefore, only include those which applied district-level contextual information.

in Iran (SECHI) is used in order to identify regions inhabited by different ethnic groups. The SECHI was conducted in 2001 by the Statistical Centre of Iran and aimed at collecting comparable information about socio-economic status of rural and urban households throughout the country. The sample consists of approximately 6960 households in 232 clusters; 139 from urban and 93 from rural areas. The data collection method was direct interviews and the survey method was single-stage cluster sampling (Statistical Centre of Iran 2001). As mentioned earlier, the intra-province migration flow has been quite low in Iran and no other data source is available to identify the geographic distribution of ethnic groups over the period of study and account for changes in this distribution over time. Thus, the SECHI is used to derive the proportion of inhabitants of provinces speaking each language (as an indicator of ethnicity) and group provinces with similar language together.

Geographic region has also been used as proxies for ethnicity in other demographic studies in Iran, due to the unavailability of data on language/ethnic groups. For instance, Abbasi-Shavazi and Hosseini (2008) used a number of Iranian provinces (Semnan, East Azerbaijan, West Azerbaijan, Kurdistan, and Sistan-and-Baluchistan) as proxies for their ethnic inhabitants (Persian, Turk, Turk and Kurd, Kurd, and Baluch, respectively) in order to study ethnic fertility differentials in Iran, using Iranian censuses and the 2000IDHS. The only reason provided for this selection was the *population composition* of these provinces; however they did not provide any further explanation about this composition.

Using geographic region as a proxy for ethnicity, however, has limitations in measuring ethnicity per se. and in distinguishing the cultural influences associated with ethnicity from the geographic influences. In other words, ethnic differences can also be related to geographic differences. Nevertheless, due to the lack of

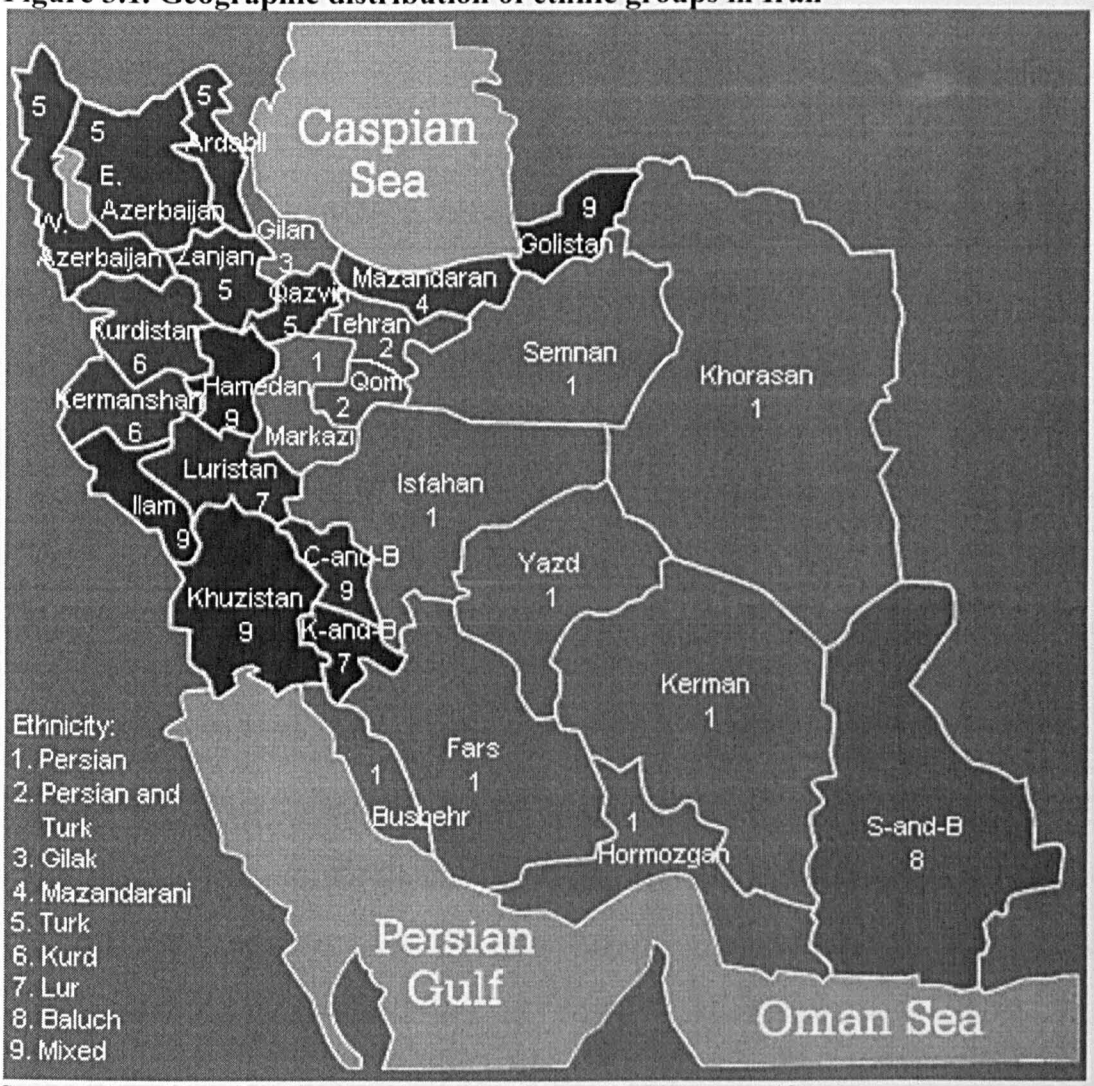
information about respondents' language or ethnic group in the IDHS and given the multi-ethnic composition of the population of Iran, which makes the study of ethnic patterns of changes in women's marriage timing and childbearing behavior important, the thesis uses geographic regions as proxies for their inhabitant ethnic groups. The distribution of provinces of Iran by language is displayed in Table 3.1. In this study, the provinces where at least 75 per cent of residents speak a single language are identified as a region predominated by that language group (as an indicator of ethnic group). There are, however, some exceptions to this general rule. The provinces of Sistan-and-Baluchistan and Qazvin are selected although their major ethnic group constitutes 65-75 per cent of residents of these provinces. In addition, the two neighbouring provinces of Tehran and Qom are selected as one region because they are similar in terms of language; approximately half and 40 per cent of the population of these provinces consist of people speaking Persian and Turkish, respectively.

Table 3.1. Distribution (%) of language by province, Iran, 2001

Province	Major language/s	percentage
Khorasan	Persian	87.1
Semnan	Persian	94.3
Markazi	Persian	85.8
Isfahan	Persian	80.7
Yazd	Persian	100.0
Kerman	Persian	94.6
Fars	Persian	77.3
Bushehr	Persian	94.5
Hormozgan	Persian	97.8
Gilan	Gilaki	87.9
Mazandaran	Mazandarani	84.7
East Azerbaijan	Turkish	99.0
West Azerbaijan	Turkish	74.7
Ardabil	Turkish	100.0
Zanjan	Turkish	99.0
Qazvin	Turkish	64.8
Kurdistan	Kurdish	100.0
Kermanshah	Kurdish	82.2
Luristan	Luri	98.4
Kohgiluyeh-and-Boyerahmad	Luri	100.0
Sistan-and-Baluchistan	Baluchi	65.6
Tehran	Persian	49.9
	Turkish	37.2
Qom	Persian	50.6
	Turkish	43.8
Golistan	Mazandarani	41.1
	Turkaman	22.6
	Persian	18.5
Hamedan	Luri	36.7
	Turkish	35.6
	Persian	25.4
Ilam	Kurdish	56.8
	Luri	43.2
Charmaha-and-Bakhtiari	Luri	53.1
	Turkish	44.9
Kuzistan	Arabic	47.1
	Luri	25.9
	Persian	23.7

The selected regions are referred by their major ethnic inhabitants; for instance, Persian-predominated region, Gilak-predominated region, etc. As shown in Figure 3.1, the selected ethnic-predominated regions include (1) Persian-predominated region, consisting of the provinces of Khorasan, Semnan, Markazi, Isfahan, Yazd, Kerman, Fars, Bushehr, and Hormozgan, mostly located in central parts of the country; (2) Gilak-predominated region, including the province of Gilan in the North of Iran; (3) Mazandarani-predominated region, including the province of Mazandaran in the North; (4) Turkish-predominated region which consists of the provinces of East Azerbaijan, West Azerbaijan, Ardabil, Zanjan, and Qazvin located in the North West of Iran; (5) Kurdish-predominated region which includes the provinces of Kurdistan and Kermanshah in the West; (6) Luri-predominated region, consisting of the provinces of Luristan and Kohgiluyeh-and-Boyerahmad in the West; (7) Baluchi-predominated region which includes the province of Sistan-and-Baluchistan in South East of the country; (8) Persian-and-Turk predominated region, consisting of the two provinces of Tehran and Qom. There are also five provinces whose population consist of different ethnic groups with nearly identical proportions and are identified as being provinces of mixed ethnicities. They include Golistan, Hamedan, Ilam, Charmahal-and-Bakhtiari, and Khuzistan.

Figure 3.1. Geographic distribution of ethnic groups in Iran



Source: adapted from http://www.mahgasht.org/Images/Map/iran-map.gif.
Note: C-and-B: Charmahal-and-Bakhtiari, K-and-B: Kohgiluyeh-and-Boyerahmad, S-and-B: Sistan-and-Baluchistan.

3.3.Methods

This section describes the main method of analysis (discrete time hazard model) (Section 3.3.1), the measures of the quantum and tempo of fertility which are applied in order to present the results in more detail (Section 3.3.2), and the way the time-varying contextual-level variables are constructed for the selected sample (Section 3.3.3).

3.3.1. Discrete time hazard model

The discrete time hazard model is used to analyse women's marriage timing and fertility. The events of interest are women's transition to first marriage and conception leading to a birth, considered as nine months prior to a child's date of birth. The discrete time hazard rate (Allison 1982) is defined as:

$$P_{it} = \Pr[T_i = t \mid T_i \geq t, x_{it}] \qquad (1)$$

where T_i is a discrete random variable representing the time at which the end of the spell occurs. x_{it} is a vector of regressor variable (covariate) which could be either fixed or time-varying. In discrete time hazard model, the baseline hazard is not parameterised. In other words, no assumption regarding the functional form of the effect of length of time is made. The length of time is broken into k categories and during each category the risk of marriage is assumed to be constant for individuals with identical values for the covariates.

The time variable for analysing transition to first marriage is years since the initial exposure to the risk of first marriage (the age of 10[1]) until first marriage (for ever-married women) or the date of survey (for censored observations or never-married women). Thus, this model allows for including censored observation in the analysis. The date of marriage cannot be presented in more detail as IDHS provides women's age at the time of marriage in years. Different categories of the time

[1] The age of 10 is used as the initial exposure to the risk of first marriage because the question of marital status has been administered from women aged 10 and above and only few women married before the age of 10 (according to IDHS, only 0.4 per cent of women married before the age of 10).

variables in the marriage analysis are presented in detail in Chapters 4 and 5 (see Sections 4.1 and 5.1).

In the fertility analysis, the time variable is months since the initial exposure to the risk of conception of $(n+1)th$ birth which is the birth of *nth* child until the conception (for those who continued childbearing) or the date of survey (for censored observations or those who did not continue childbearing). The analysis includes conceptions leading to a live birth until the date of survey (2000) as IDHS does not provide any information regarding the duration of pregnancy for those women being pregnant at the time of survey. Furthermore, pregnancies ended by induced abortion or miscarriage are not incorporated due to the lack of information. Different categories of the time variable in the fertility analysis are presented in detail in Chapter 6 (see Section 6.1).

In order to estimate the hazard, the discrete time hazard model is applied using the logistic regression function. As Jenkins (1995) pointed out, if the data is organised in a person-month/year format, the model likelihood has exactly the same format as a standard binary logit regression model. Using this function, the hazard rate is defined as:

$$P_{it} = 1/[1+\exp(-\alpha_t - \beta' x_{it})] \qquad (2)$$

which can be written in logit form:

$$\log[P_{it}/(1-P_{it})] = \alpha_t + \beta' x_{it} \qquad (3)$$

where α_t allows the hazard to vary with time. This specification facilitates the introduction of time-varying covariates in the model because x_{it} can include both time-varying and fixed covariates. In this study, women's educational attainment (in both the marriage and fertility analyses), women's age (in the fertility analysis), and all the district-level contextual variables (in both the marriage and fertility analyses) are introduced as time-varying covariates. The construction of time-varying contextual covariates is illustrated in Section 3.4 and the way the two covariates of education and age are introduced as time-varying covariates are discussed in the result chapters where the measures included in the analysis are introduced in detail (Sections 4.2 and 6.2).

Both the marriage and fertility analyses account for the heterogeneity amongst women included in the analysis due to their unobservable characteristics. Failing to account for unobserved heterogeneity in modelling of time to event can lead to overestimation of hazard rates at lower durations and an underestimation of them at higher durations (Lancaster 1979; Allison 1984; Jenkins 1997). In other words, individuals who are more likely to experience the event because of their unobservable characteristics are eliminated from the risk set earlier, so that higher durations are increasingly composed of women who are unlikely to experience the event because of their unobservable characteristics.

Failing to account for unobserved heterogeneity will also bias the regressor parameter estimates. Some authors (Heckman and Singer 1982; Blossfeld and Rohwer 1995) argue that the disadvantage of accounting for unobserved heterogeneity in the model is that the parameter estimates can be sensitive to the

assumed parametric form of the error term. However, it has been suggested that with a flexible specification of the duration variable (in this study, between 6-9 duration dummies in different analyses), this misspecification can be avoided.

In this study, the effect of the omitted covariates (e.g. women's family background characteristics and the history of their pre-marital work experience in the marriage analysis and some proximate determinants of fertility in the fertility analysis[1]) is hoped to be captured by accounting for unobserved heterogeneity in modelling. Previous studies (McDonald and Egger 1990; Baschieri and Hinde 2007) suggest that the unobserved heterogeneity in the analysis of birth interval can capture the effect of unmeasured proximate determinants of fertility such as fecundity and the frequency of sexual intercourse.

In this study, the models are estimated with and without accounting for unobserved heterogeneity and the implications of the introduction of unobserved heterogeneity are discussed. In the model which takes unobserved heterogeneity into account, the hazard rate is defined as:

$$\log[P_{it}/(1-P_{it})] = \alpha_t + \beta' x_{it} + \varepsilon_i \qquad (4)$$

where ε_i is the unobserved heterogeneity term.

The models are estimated using **pgmhaz** in STATA, which is proposed by Jenkins (1997). To apply this command and also to include time-varying covariates, the data is re-organised in person-year (the marriage analysis) and person-month (the fertility analysis) format. This command estimates, by maximum likelihood, two

[1]The variables included in the analysis are introduced in chapters presenting the results (Chapters 4-6).

discrete time proportional hazard models one of which incorporates a gamma mixture distribution to summarise the individual unobserved heterogeneity. The two models estimated are (1) the Prentice and Gloecker (1978) model and (2) the Prentice and Gloecker (1978) model incorporating a gamma mixture distribution to summarise the unobserved individual heterogeneity, as proposed by Meyer (1990).

There are some computational difficulties and limitations in using pgmhaz. Firstly, as pointed out by Jenkins (1997:11), pgmhaz and specifically the estimation of Model 2, which incorporates the unobserved heterogeneity term, can be slow "partly because the maximisation procedure uses numerical derivatives, and also partly because re-organised data sets can be relatively large. Models with fully non-parametric baseline hazard function specifications also take significantly longer to estimate than models with parsimonious parametric baseline specifications". Therefore, estimating models with non-parametric baseline hazard function using the large sample size of the IDHS can result in extremely slow procedure in this research. Secondly, convergence can be difficult, as the log-likelihood function for Model 2 is not globally concave. Thirdly, pgmhaz does not allow us to account for the multi-level structure of the data (an ideal way to deal with the multi-level structure of the data set would be using the multi-level time to event method); there are possibilities of intra-household correlation (resulting from collecting data from all eligible women in the household), intra-cluster correlation (resulting from the sampling method) [1], and intra-district correlation (resulting from the district-level

[1] It should be pointed out that other demographic studies in Iran which used the 2000 IDHS (and also the 2002 IFTS which used the sampling framework of the IDHS and re-interviewed half of women in four selected provinces of Iran who had been interviewed in the IDHS) have not specified the multi-level structure of the data and the way they have addressed this issue when applying multivariate methods (e.g. see Abbasi-Shavazi et al. 2004; Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2008; Abbasi-Shavazi and Hosseini 2008; Abbasi-Shavazi et al. 2009).

contextual information included in the analysis, although inclusion of the variable of geographic region can partly capture this effect).

However, as mentioned earlier, accounting for the unobserved heterogeneity with the use of pgmhaz has specific advantages. Firstly, it allows us to account for the omitted variables in the IDHS, which can potentially be important determinants of transition to marriage and childbearing, and give us the unique opportunity to examine whether these measures had a significant impact, after accounting for other factors, on the substantial marriage postponement and the phenomenon fertility decline of Iranian women over the last two decades of the twentieth century. Secondly, it enables us to determine whether the unmeasured characteristics have similar or different implications for the marriage and fertility analyses in the context of Iran. Thirdly, it can result in accurate estimations of hazard rates.

3.3.2. Quantum and tempo of fertility

Rodriguez and Hobcraft (1980) developed the measures of the quantum and tempo of fertility in order to illustrate the results of life table analysis of birth intervals. In this thesis, these measures are applied to present the results in more detail. The next section discusses that progression from marriage to first birth is not analysed in this thesis. Therefore, *Quantum* (denoted by Q) is represented by the proportion of births that are followed by a subsequent conception within 51 months. This measure is a direct estimate of the proportion of women giving birth within 60 months or five years which was originally applied by Rodriguez and Hobcraft (1980), called *Quintum*. The *trimean* (denoted by T) is the average interval between the birth of a child and conception of the subsequent child. The trimean, introduced by Tukey (1978), is

$$T = (q_1 + 2q_2 + q_3)/4 \qquad (5)$$

where q_1, q_2 and q_3 are the durations by which, respectively, 25, 50, and 75 per cent of births are followed by a subsequent conception within 51 months. By including the first and third quartiles, the trimean reflects asymmetries in the distribution. Therefore, the advantage of trimean over median is that it contains more information regarding the shape of the distribution.

3.3.3. Constructing time-varying contextual-level variables

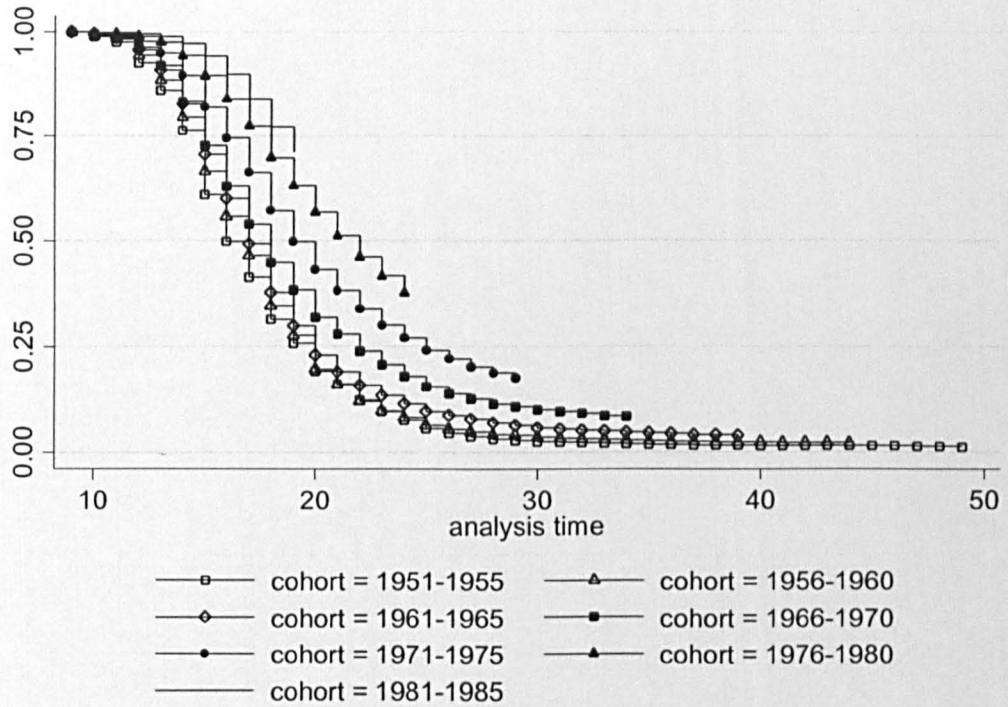
In order to account for temporal changes in the socio-economic context of marriage and fertility, a number of time-varying district-level variables are constructed and included in the analysis. This section illustrates how two rounds of Iranian censuses are used to derive contextual variables for the samples selected for the marriage and fertility analyses.

Marriage analysis: Using the Kaplan-Meier survival estimates of transition to first marriage, it is highlighted that the increase in age at marriage has been experienced by cohorts of women born after 1966 (see Figure 3.2). Therefore, all women born between 1966 and 1980 are selected, which results in obtaining a sample of three birth cohorts of 1966-70, 1971-75, and 1976-80[1]. According to the K-M estimates, 68.1 per cent of the 1966-70 cohort was married by the age of 20 compared with 56.9 and 43.3 per cent of the 1971-75 and 1976-80 cohorts,

[1] Despite experiencing marriage postponement, the 1981-85 birth cohort is not selected because of a short period of exposure to the risk of first marriage for the youngest women in this cohort (those born in 1985) which is only 15 years.

respectively. This method has already been used to identify the birth cohorts of women with distinct marriage patterns and life course experiences (see Section 1.2).

Figure 3.2. Kaplan-Meier Survival estimates of women's transition to first marriage by birth cohort



The district-level contextual covariates are constructed using the 1986 and 1996 censuses. For any woman of a given age, we assign the characteristics of their context using the census which corresponds more closely to that age. For instance, the contextual variables for the youngest birth cohort (1976-80) at ages less than 15 are derived from the 1986 and at higher ages from the 1996 census because they correspond more closely to these censuses (see Figure 3.3). Based on the same logic and as shown in Table 3.2, the contextual variables for women born between 1966 and 1970 at ages 10-24 are derived from the 1986, and those for ages 25-34 from the

1996 census. For the 1971-75 birth cohort, these variables at ages 10-19 are derived from the 1986 and at higher ages from the 1996 census[1].

[1] Another approach in constructing time-varying district-level variables would be defining these variables as weighted averages of the 1986 and 1996 values with the weights depending on the proximity to these dates, although given the specific social and economic conditions in Iran in the mid 1980s (see Section 1.2), 1986 does not seem as an appropriate base year.

Figure 3.3. Correspondence of age of women born between 1966 and 1980 to the 1986 and 1996 censuses

Year of birth	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1980															10	11	12	13	14	15	**16**	17	18	19	20
1979														10	11	12	13	14	15	16	**17**	18	19	20	21
1978													10	11	12	13	14	15	16	17	**18**	19	20	21	22
1977												10	11	12	13	14	15	16	17	18	**19**	20	21	22	23
1976											**10**	11	12	13	14	15	16	17	18	19	**20**	21	22	23	24
1975										10	**11**	12	13	14	15	16	17	18	19	20	**21**	22	23	24	25
1974									10	11	**12**	13	14	15	16	17	18	19	20	21	**22**	23	24	25	26
1973								10	11	12	**13**	14	15	16	17	18	19	20	21	22	**23**	24	25	26	27
1972							10	11	12	13	**14**	15	16	17	18	19	20	21	22	23	**24**	25	26	27	28
1971						10	11	12	13	14	**15**	16	17	18	19	20	21	22	23	24	**25**	26	27	28	29
1970					10	11	12	13	14	15	**16**	17	18	19	20	21	22	23	24	25	**26**	27	28	29	30
1969				10	11	12	13	14	15	16	**17**	18	19	20	21	22	23	24	25	26	**27**	28	29	30	31
1968			10	11	12	13	14	15	16	17	**18**	19	20	21	22	23	24	25	26	27	**28**	29	30	31	32
1967		10	11	12	13	14	15	16	17	18	**19**	20	21	22	23	24	25	26	27	28	**29**	30	31	32	33
1966	10	11	12	13	14	15	16	17	18	19	**20**	21	22	23	24	25	26	27	28	29	**30**	31	32	33	34

Year

Table 3.2. Correspondence of contextual-level variables to specific age groups of women in different birth cohorts

Birth cohort	Age group				
	10-14	15-19	20-24	25-29	30-34
1976-80	1986	1996	1996		
1971-75	1986	1986	1996	1996	
1966-70	1986*	1986	1986	1996	1996

* It should be pointed out that based on the aforementioned argument regarding the construction of contextual variables, these variables for the 1966-70 birth cohort at ages 10-14 should be derived from the 1976 census. However, due to unavailability of the results of the 1976 census at district level, these variables are also constructed using the 1986 census. This point should be born in mind when interpreting the results for these women

Fertility analysis: Figure 3.4 and Table 3.3 display the Kaplan-Meier survival estimates of 1st-4th conceptions for women who became exposed to the risk of childbearing in 5-year intervals between 1976 and 2000. They show that the probability of progression from marriage to first conception has been relatively constant over time. However, a very recent postponement of the first birth within marriage is observed. The percentage of women who did not conceive their first child until 15th months after their marriage increased from 72-75 per cent amongst women who married before 1996 to 79 per cent for the 1996-00 marriage cohort. This is consistent with the recent rise in the use of contraception amongst Iranian married women before the birth of their first child. Using data from the 2002 Iran Fertility Transition Survey (IFTS)[1], Abbasi-Shavazi et al. (2009) showed that the contraceptive use in the interval between marriage and first birth increased from 4.3 per cent amongst the 1976-80 marriage cohort to 20.3 per cent for the 1996-00 cohort.

In contrast to this initial postponement, there is an increase in the proportion of women who conceived their first child between the 2nd and 5th year of their marriage. The percentage of married women who did not become pregnant within 51 months from the date of their marriage reduced from 21 per cent amongst the 1976-80 marriage cohort to only 12 per cent for the 1996-00 cohort. The determinants of this reduction should be investigated in the future studies; one reason can be a reduction in involuntary childlessness or infertility in the early years after marriage probably due to improvements in infertility treatment. Abbasi-Shavazi et al. (2008) discuss how the legitimisation of Assisted Reproductive Technologies (ART) using donor gametes and embryos in Iran, as the only Muslim country, has helped many

[1] This survey collected data from women aged 15-49 years in four selected provinces of Gilan, Sistan-and-Baluchistan, West Azerbaijan, and Yazd.

Iranian infertile women to become mothers. Whatever has led to changes in the timing of first conceptions, according to these findings, the unprecedented reduction in the number of children of Iranian women since the mid 1980s is not explained by changes in progression to first birth.

Figure 3.4 and Table 3.3 show a substantial postponement of the second, third, and fourth births for the cohorts of women who were at the risk of childbearing after 1985. Specifically, no more than 10 per cent of women who became exposed to the risk of second birth (gave birth to their first child) before 1986 did not conceive their second child within 51 months, compared with 16 and 33 per cent of those who became exposed to this risk in 1986-90 and 1991-95, respectively. Amongst the latest cohort (1996-2000), 60 per cent of women did not conceive their second child within 51 months, although this cohort had less time for progression compared with other cohorts. The same pattern is observed for the third and fourth conceptions, although the magnitude of the reduction is more pronounced: half of women who became exposed to the risk of third or fourth birth during 1991-95 did not conceive within 51 months, compared with less than 15 per cent of those who became exposed to these risks before 1986. This is consistent with the findings of Hosseini-Chavoshi, McDonald, and Abbasi-Shavazi (2006); using data from the 2000 IDHS and examining synthetic parity progression ratios, they found reductions in the proportion of women progressing to the parities higher than one between the mid 1980s and 1999, with this reduction being much more pronounced for parities higher than two.

Figure 3.4. Kaplan-Meier Survival estimates of 1st-4th conceptions for cohorts of women who became exposed to the risk of pregnancy in 5-year intervals

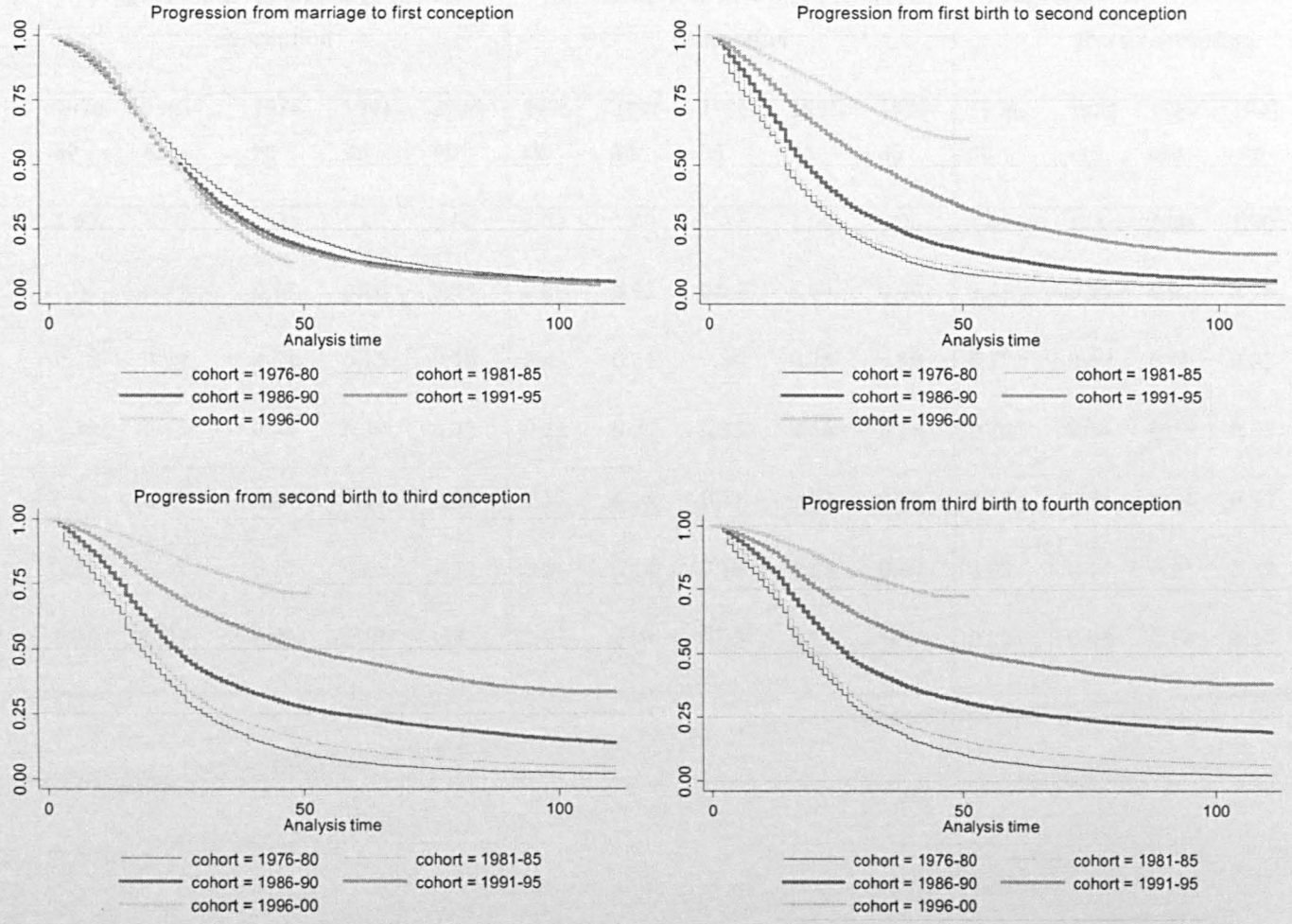


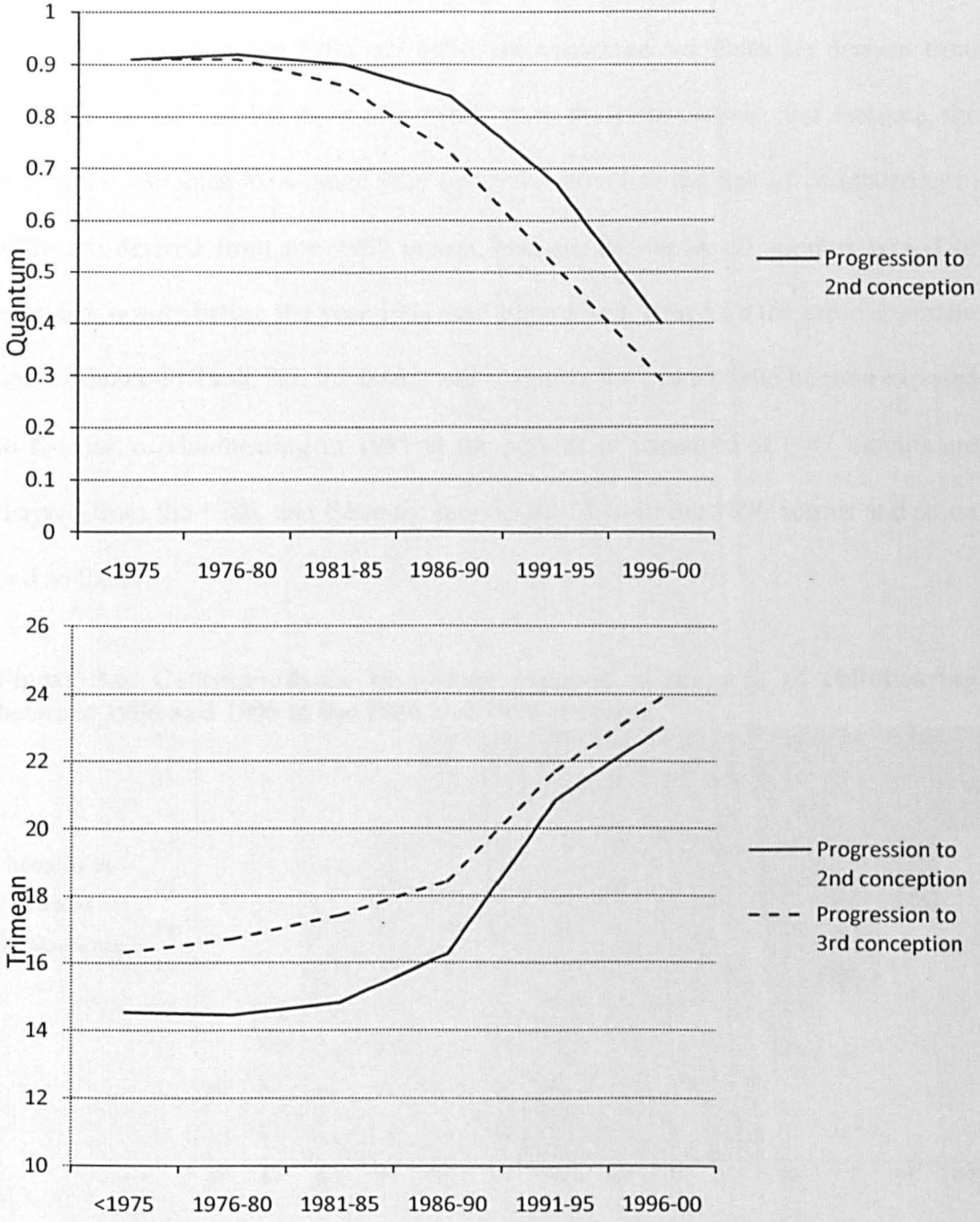
Table 3.3. Kaplan-Meier survivor estimates of 1st -4th conceptions for cohorts of women who became exposed to the risk of pregnancy in 5-year intervals

Time	Progression from marriage to first conception					Progression from first birth to second conception					Progression from second birth to third conception					Progression from third birth to fourth conception				
	1976-80	1981-85	1986-90	1991-95	1996-00	1976-80	1981-85	1986-90	1991-95	1996-00	1976-80	1981-85	1986-90	1991-95	1996-00	1976-80	1981-85	1986-90	1991-95	1996-00
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3	0.96	0.96	0.97	0.98	0.99	0.89	0.93	0.95	0.97	0.99	0.91	0.95	0.97	0.98	0.99	0.93	0.95	0.97	0.98	0.99
15	0.75	0.72	0.74	0.75	0.79	0.48	0.51	0.59	0.75	0.89	0.57	0.62	0.70	0.83	0.93	0.60	0.63	0.73	0.84	0.92
27	0.50	0.45	0.46	0.44	0.43	0.23	0.25	0.35	0.56	0.76	0.29	0.34	0.45	0.67	0.83	0.31	0.34	0.48	0.67	0.82
39	0.33	0.27	0.27	0.25	0.20	0.12	0.15	0.23	0.43	0.64	0.15	0.21	0.34	0.57	0.75	0.17	0.21	0.37	0.56	0.75
51	0.21	0.18	0.17	0.16	0.12	0.08	0.10	0.16	0.33	0.60	0.09	0.14	0.27	0.49	0.71	0.09	0.15	0.30	0.50	0.72
111	0.05	0.05	0.05	0.03	NA	0.03	0.04	0.05	0.15	NA	0.02	0.05	0.14	0.34	NA	0.02	0.06	0.19	0.38	NA

The decline in the proportion of women who continued childbearing after the birth of their first child since the mid 1980s could have resulted from a reduction in the proportion of women who continued childbearing (quantum) and an increase in birth intervals (tempo). Figure 3.5 displays changes in the quantum and tempo of progression to second and third conceptions over time. As shown in this figure, the quantum declined from around 90 per cent before the mid 1980s to 50-70 per cent for women who became exposed to the risk of second or third births during 1991-95. Over the same period, the Trimean (average birth-conception interval) of progression to second and third conceptions increased from 14-16 to 21-22 months. This suggests that the decline in the second and third births after the mid 1980s is related to substantial changes in both the quantum and tempo of fertility.

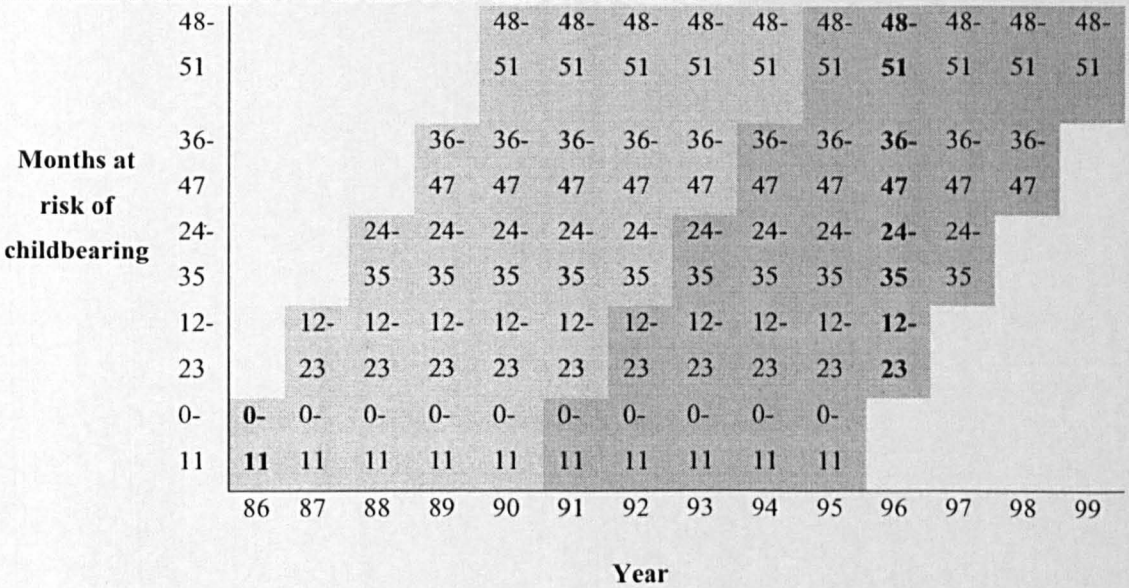
Therefore, the cohorts of women who became exposed to the risk of second or third births (those who gave birth to their first or second child) during 1986-90 and 1991-95 are selected for the fertility analysis because of substantial changes in both the quantum and tempo of progression to second and third conceptions amongst these cohorts and the similarity of changes in the third and fourth conceptions (see Figure 3.4). The fertility behaviour of these women is followed until 51 months because a considerable proportion of women conceived their second or third birth within this period (see Table 3.3). Although the fertility decline was also experienced by women who became exposed to the risk of childbearing during 1996-2000, this cohort is not selected because of a short period of exposure (less than five years for the majority of the cohort).

Figure 3.5. Quantum and trimean of progression to 2nd and 3rd conceptions by cohorts of women who became exposed to the risk of childbearing in 5-year intervals



In the fertility analysis, the time-varying district-level variables are constructed using the 1986 and 1996 censuses. For any time when the risk of conception was between 1986 and 1990, the contextual variables are derived from the 1986 census and for those after 1991, from the 1996 census[1]. For instance, the contextual variables for women who became exposed to the risk of childbearing in 1986 are derived from the 1986 census because the whole 51 months period of exposure occurs before the year 1991 (see Figure 3.6). Based on the same argument and as shown in Table 3.7, the contextual variables for women who became exposed to the risk of childbearing in 1987 at the periods of exposure of 0-47 months are derived from the 1986, and those for months 48-51 from the 1996 census and so on and so forth.

Figure 3.6. Correspondence of women exposed to the risk of childbearing between 1986 and 1995 to the 1986 and 1996 censuses



[1]As mentioned for the marriage analysis, another approach in constructing time-varying district-level variables would be defining these variables as weighted averages of the 1986 and 1996 values with the weights depending on the proximity to these dates. Although, as previously mentioned, the specific social and economic conditions in Iran in the mid 1980s (see Section 1.2) makes using 1986 as the base year unfeasible.

Table 3.4. Correspondence of contextual-level variables to specific years that women became exposed to the risk of childbearing

Year became exposed to the risk	Cohort (in terms of exposure to the risk)	Months at risk				
		0-11	12-23	24-35	36-47	48-51
1986	1986-90	1986	1986	1986	1986	1986
1987	1986-90	1986	1986	1986	1986	1996
1988	1986-90	1986	1986	1986	1996	1996
1989	1986-90	1986	1986	1996	1996	1996
1990	1986-90	1986	1996	1996	1996	1996
1991	1991-95	1996	1996	1996	1996	1996
1992	1991-95	1996	1996	1996	1996	1996
1993	1991-95	1996	1996	1996	1996	1996
1994	1991-95	1996	1996	1996	1996	1996
1995	1991-95	1996	1996	1996	1996	1996

Chapter 4

Transition to first marriage

4.1. Introduction

Chapter 1 discussed how the recent postponement in the marriage of Iranian women closely corresponded with profound changes in the socio-economic context (see Section 1.2). Chapter 1 also highlighted ethnic patterns of women's marriage timing and how these patterns can be related to ethnic diversity in the cultural and socio-economic attributes (see Section 1.3). Based on the gaps in the literature, the research aim and questions were introduced (see Section 1.4). The first three research questions are investigated in this chapter. The chapter, specifically, examines the correlates of the recent marriage postponement (individual-level

factors and changes in the socio-economic context over time) in Iran (Question 1), the role of ethnicity after accounting for ethnic diversity in socio-economic attributes at the individual and contextual levels (Question 2), and ethnic-specific patterns of the socio-economic influences on the probability of marriage (Question 3). The conceptual framework, illustrated in Chapter 2, allows women's marriage timing to vary according to their life course experiences and by their ethnicity (see Section 2.2).

The data and method, introduced in Chapter 3, allow us to operationalise the conceptual framework by creating and including time-varying contextual-level information in the marriage analysis (see Sections 3.2 and 3.3). Specifically, while the individual-level information is derived from the 2000 IDHS, the 1986 and 1996 censuses provide the contextual-level variables and the discrete time hazard model allows including the time-varying covariates in the analysis. It has also been mentioned that the lack of information on women's ethnic group in the IDHS and the censuses is addressed by introducing geographic regions as proxies for ethnicity. The geographic distribution of ethnic groups is derived using the 2001 SECHI. Finally, the sample was introduced: women born between 1966 and 1980 who experienced a substantial marriage postponement (see Section 3.4.1).

This chapter introduces the measures included in the marriage analysis and presents their descriptive statistics (Section 4.2). Then, the main findings are illustrated in three sections: Firstly, the effect of different socio-economic and demographic factors on the probability of marriage is elaborated (Section 4.3.1). Secondly, ethnic differences in the probability of transition to first marriage are shown (Section 4.3.2). Thirdly, ethnic-specific marriage responses to the socio-economic factors are examined (Section 4.3.3). The findings of this chapter provide

more insight into the nature of the recent marriage postponement in Iran. By investigating the cultural sensitivity of different ethnic groups to socio-economic influences, the findings specifically help us to gain a full understanding of the role of ethnicity in shaping the process of transition to marriage in Iran. The results are discussed and concluded in the final section (Section 4.4).

4.2. Measures

The next two sections (Sections 4.2.1 and 4.2.2) introduce the individual- and contextual-level variables included in the analysis and present their descriptive statistics.

4.2.1. Individual-level variables

At the *individual level*, women's age, ethnicity, educational attainment, and birth cohort are included in the analysis[1]. Table 4.1 shows the distribution of all person-years included in the analysis for the important variables by ethnic-predominated region. Age is represented by the time variable or years since the initial exposure to the risk of first marriage (the age of 10) until marriage (for ever-married women) or the date of survey (for never-married women). The time variable is divided into several categories: 0-3, 4-7, 8-10, 11-14, 15-19, and 20-24 years. These durations correspond, respectively, with ages 10-13, 14-17, 18-20, 21-24, 25-29, and 30-34[2]. Women's ethnic group is represented by the predominant ethnicity in the region

[1] The analysis does not include any individual- or household-level measure of wealth or income because of the lack of information. The IDHS contains information about the household's possessions and amenities. However, this information relates to the time of survey and cannot be used to measure the economic status of the household over the period in which women were at the risk of marriage.

[2] Since the age of 13 is the lowest minimum legal age at first marriage for women during the past few decades (see Section 1.3), this age together with the preceding ages are grouped into one category. The durations between the ages 18 and 20 include narrower time intervals in order to capture changes in the proportion of marriage around its mean age where the risk of marriage is the highest.

where they live (for further information on selection of these regions, see Section 3.2). Women in the Persian-predominated region represent the largest component of the sample. Consistent with the K-M survival estimates, we expect to find a lower probability of marriage for the younger birth cohorts. Ethnic groups are not similar in terms of birth cohort. The age structure of women in the Baluch- and Lur-predominated regions is younger than other groups as indicated by a higher proportion of women belonging to the youngest birth cohort (43.5 and 43.6% in the Baluch- and Lur-predominated regions, respectively). At the other extreme, the Gilak- and Mazandarni-predominated regions have a relatively old age structure: the oldest birth cohort constituted, respectively, 31.8 and 31.0 per cent of these groups.

The analysis also accounts for women's educational attainment during the period in which they were at the risk of marriage. In other words, the variable of education is a time-varying covariate which has been constructed using the World Higher Education Systems data base (United Nations Educational, Scientific and Cultural Organization 2008). Using the official age intervals at different educational levels in Iran, women's education is adjusted according to their age[1]. The descriptive statistics shows that the level of education varies amongst ethnic groups. The prevalence of illiteracy is very high amongst women in the Balch-predominated region (42.4%). On the other hand, literacy is very common amongst women in the Persian-, Mazandarani-, and Gilak-predominated regions (only 9.6, 7.3, and 5.9% illiterate women, respectively). The same pattern is reflected in the ethnic patterns of

[1] For instance, consider a particular woman who married at the age of 19 but her educational attainment is reported as university education at the time of survey. This woman could not have gained university education during the years she has been exposed to the risk of marriage (ages 10-18). In this study, the educational attainment of this woman and women with similar situation is adjusted so that is represent their educational attainment during the period they were at the risk of marriage.

educational level: a lower proportion of women in the Baluch-predominated region attain higher educational levels.

The descriptive statistics of the individual-level variables are also presented in terms of women (not the total person-years) in Table 4.2. The table displays the distribution of the first person-year, for each woman included in the analysis. The distribution is similar to that presented in Table 4.1. However, the variable of educational attainment only contains the two categories of illiterate and primary school. The reason is that women could not have gained any higher educational level at the age of 10 which corresponds with the first person-year for all women.

Table 4.1. Distribution (%) of sample by individual-level variables and by ethnic-predominated region (all person-years included in the analysis)

Variable	Region (in terms of the predominant ethnicity)								
	P	G	M	T	K	L	B	P and T	Iran
Birth cohort									
1966-70	27.42	31.78	30.98	26.48	27.58	22.24	23.66	29.08	27.41
1971-75	31.64	32.06	34.31	32.69	34.38	34.30	32.71	34.28	33.08
1976-80	40.94	36.16	34.71	40.83	38.04	43.46	43.63	36.64	39.51
Educational attainment									
Illiterate	9.65	7.28	٥,٨٦	١٩.٦٣	22.73	13.84	42.45	٤.٧٥	12.13
Primary	50.91	42.70	45.23	47.91	48.97	47.29	34.05	٤٠.٣٧	46.84
Secondary	21.60	28.74	28.75	17.51	15.29	20.50	13.47	٢٧.٤٧	22.04
High school	14.70	17.89	16.04	12.43	10.86	15.37	8.08	٢١.٦٧	15.47
University	3.14	3.39	4.12	2.51	2.16	3.00	1.95	٥.٧3	3.51
Total number of person-years	205,728	24,745	٢٣,١٨٥	127,375	51,392	53,586	21,745	53,450	698,624
Share in the sample (%)	31.67	4.36	4.54	14.65	5.25	3.42	2.14	20.20	100.00

Note: P: Persian-predominated, G: Gilak-predominated, M: Mazandarani-predominated, T: Turk-predominated, K: Kurd-predominated, L: Lur-predominated, B: Baluch-predominated, P and T: Persian and Turk-predominated.

Table 4.2. Distribution (%) of sample by individual-level variables and by ethnic-predominated region (one person-year for each woman included in the analysis*)

Variable	Region** (in terms of the predominant ethnicity)								
	P	G	M	T	K	L	B	P and T	Iran
Birth cohort									
1966-70	28.31	30.33	30.20	26.77	27.70	24.34	24.68	29.34	27.90
1971-75	30.36	30.44	33.21	31.57	32.73	32.94	31.73	33.16	31.85
1976-80	41.33	39.23	36.59	41.66	39.57	42.72	43.59	37.50	40.25
Educational attainment* **									
Illiterate	10.85	7.99	5.67	21.98	25.13	17.81	48.85	5.92	13.91
Primary	89.15	92.01	94.33	78.02	74.87	82.19	51.15	94.08	86.09
Total number of women	18,987	2096	2084	11,683	4629	5193	2299	5283	64,844
Share in the sample (%)	29.28	3.23	3.21	18.02	7.14	8.01	3.54	8.15	100.00****

Note: *This table shows statistics of the first person-year for all women included in the analysis. **P: Persian-predominated, G: Gilak-predominated, M: Mazandarani-predominated, T: Turk-predominated, K: Kurd-predominated, L: Lur-predominated, B: Baluch-predominated, P and T: Persian and Turk-predominated. ***See text for more information on the categories of this variable. ****The sum of all the ethnic-predominated regions presented in the table and the region including populations with mixed ethnicities is 100.00.

4.2.2. Contextual-level variables

Marriage market characteristics: A number of variables are constructed to measure the spouse supply according to spousal preference in age, employment status, and education. These variables include a district-level sex ratio and ratios of the number of men who participate in the labour force (those who are either employed or are in search of employment), who are employed, and who are enrolled in education to the number of women in each marriage pool. A greater availability of economically active men and those who are not enrolled in education are assumed to increase women's probability of marriage.

Measures of marriage market for any 5-year age group[1] of women are calculated as the ratio of the average number of men (with a specific characteristic) in that age group and the higher age group to the number of women in that age group. For instance the sex ratio for 15-19 year-old women is calculated as the ratio of the average number of men in the 15-19 and 20-24 age groups to the number of women in the 15-19 age group. The reason for including two adjacent age groups of men is the recent decreasing gap between the male and female mean age at first marriage in Iran: between 1976 and 1996, this difference declined from 4.4 years to 3.2 (Kazemipour 2004). This way, the range of potential spouses is extended to men in the same age group as women as well as those in the higher age group[2]. In addition, these measures include all men and women regardless of their marital status because as indicated by Brien (1997) although never-married individuals are those who are eligible for marriage, the measures derived from census are meant to

[1] The reason for considering 5-year age groups is that the results of Iranian censuses have been presented this way.

[2] We also constructed these measures based on a different type of marriage pool, where for any age group of women, men in the higher age group are considered as the potential spouses. In the final analysis, however, the measures based on the first type of marriage pool (indicated in the text) better fit the model in terms of both the direction of the effect and its statistical significance.

capture the characteristics of this supply over a period of time. Moreover, there are just few socio-economic measures specified by marital status in the Iranian censuses.[1] As such, the value of the "sex ratio" in Iran in Table 4.3 means that for each woman, on average, 0.943 men in the age group of woman and the higher age group lived in the district of residence of woman over the period in which that woman was exposed to the risk of marriage (for ever-married women, the person-years between the age of 10 and the date of marriage and for never-married women, the person-years between the age of 10 and the date of survey).

Women's socio-economic status: The variables included in the analysis are the district-level proportions of literate women, women with post primary schooling, women with university education[2], women who participate in the labour force (those who are either employed or are in search of employment), and women who are employed. This will allow us to test the potential negative effect of women's higher socio-economic status in the area on the risk of marriage of women who live in that area.

The process of socio-economic development: The variables included in the analysis are the proportions of urban population and population who are employed in the agricultural and industrial sectors in each district[3]. Other measures include the district-level proportions of literate population, population with post-primary

[1] In order to account for the role of suitability of men in terms of their socio-economic status, we intended to construct measures of correspondence of men and women's educational level in each marriage pool. However, considering the person-year structure of the data set and construction of marriage pools based on 5-year age groups which do not correspond with the official age intervals of different educational levels in Iran (see United Nations Educational, Scientific, and Cultural Organization, 2008), we were not able to construct these measures.

[2] The proportions of women with post-primary schooling and university education refer to women with these educational levels amongst literate women.

[3] The analysis does not include any district-level measure of wealth or income because of the lack of information. Moreover, as mentioned in Chapter 3, the provincial-level contextual variables do not generally fit; both in terms of the significance and the direction of the effect (see Section 3.2).

schooling, and population with university education[1]. On one hand, living in more developed areas can be associated with lower risk of marriage by improving the status of women. Living in these areas, on the other hand, can contribute to a higher probability of marriage by providing a better economic status and higher income for potential spouses.

Ethnic disparity in the contextual factors is indicated in Table 4.3. Contextual variables are constructed as time-varying variables and their value represent changes in these variables over the period of study. Women in the Gilak- and Mazanadarani-predominated regions are highly advantaged in terms of education and socio-economic status. The former group live in highly agrarian areas and are most likely to be economically active. Specifically, participation in the labour market in the Gilak-predominated region is 2.5 times higher than the Mazandarani-predominated region with the second highest participation, and between four and five times greater than other groups. These two groups are quite similar in terms of other contextual factors. Women in the Persian-predominated region live in highly urbanised and industrialised areas. They also live in areas with relatively favourable supply of suitable spouses. Except for women's status, where women in the Lur-predominated region enjoy a better status, these women are relatively comparable with those in the Baluch-predominated region in other contextual factors. In addition, the availability of suitable men in areas where these two groups live is lower than areas of residence of other ethnic groups. Women's status and marriage market are quite similar in the Turk- and Kurd-predominated regions but the former live in more industrialised areas.

[1] The proportions of population with post-primary schooling and university education refer to the population with these educational levels amongst literate population.

Table 4.3. Descriptive statistics (mean and standard deviation) of contextual-level variables by ethnic-predominated region (all person-years included in the analysis)

Variable	Region (in terms of the predominant ethnicity)								
	P	G	M	T	K	L	B	P and T	Iran
Marriage-market characteristics									
Sex ratio	0.950	0.938	0.929	0.938	0.963	0.914	0.896	1.003	0.943
	(0.097)	(0.090)	(0.070)	(0.081)	(0.093)	(0.085)	(0.081)	(0.059)	(0.089)
Ratio of men participating in the labour force to women	0.470	0.498	0.458	0.505	0.522	0.403	0.436	0.484	0.473
	(0.217)	(0.197)	(0.205)	(0.192)	(0.211)	(0.195)	(0.149)	(0.222)	(0.209)
Ratio of employed men to women	0.380	0.352	0.359	0.414	0.386	0.290	0.295	0.411	0.371
	(0.220)	(0.184)	(0.197)	(0.194)	(0.205)	(0.180)	(0.183)	(0.220)	(0.208)
Ratio of men enrolled in education to women	0.400	0.379	0.404	0.370	0.383	0.445	0.326	0.456	0.401
	(0.231)	(0.239)	(0.225)	(0.211)	(0.239)	(0.228)	(0.169)	(0.225)	(0.229)
Women's socio-economic status									
Proportion of literate women	0.603	0.638	0.639	0.485	0.423	0.507	0.326	0.672	0.546
	(0.145)	(0.096)	(0.085)	(0.162)	(0.182)	(0.156)	(0.158)	(0.090)	(0.167)
Proportion of women with post-primary schooling	0.352	0.493	0.449	0.349	0.399	0.379	0.366	0.393	0.370
	(0.110)	(0.053)	(0.054)	(0.078)	(0.108)	(0.091)	(0.101)	(0.081)	(0.101)
Proportion of women with university education	0.026	0.028	0.030	0.024	0.026	0.023	0.026	0.022	0.025
	(0.016)	(0.015)	(0.014)	(0.011)	(0.014)	(0.012)	(0.014)	(0.018)	(0.015)
Proportion of women participating in the labour force	0.072	0.224	0.089	0.056	0.052	0.049	0.047	0.045	0.068
	(0.046)	(0.092)	(0.029)	(0.031)	(0.036)	(0.019)	(0.020)	(0.014)	(0.052)
Proportion of employed women	0.058	0.183	0.070	0.045	0.037	0.029	0.029	0.036	0.053
	(0.044)	(0.092)	(0.027)	(0.030)	(0.035)	(0.011)	(0.014)	(0.014)	(0.048)

Variable	P	G	M	T	K	L	B	P and T	Iran
The process of socio-economic development									
Proportion of urban population	0.525	0.421	0.411	0.470	0.488	0.412	0.454	0.670	0.490
	(0.217)	(0.183)	(0.079)	(0.173)	(0.218)	(0.161)	(0.298)	(0.222)	(0.209)
Proportion of population employed in agriculture	0.262	0.448	0.381	0.371	0.356	0.376	0.392	0.111	0.318
	(0.141)	(0.174)	(0.079)	(0.122)	(0.140)	(0.130)	(0.232)	(0.054)	(0.159)
Proportion of population employed in industry	0.132	0.112	0.104	0.135	0.063	0.050	0.049	0.228	0.115
	(0.092)	(0.054)	(0.032)	(0.079)	(0.036)	(0.034)	(0.018)	(0.043)	(0.082)
Proportion of literate population	0.681	0.706	0.708	0.596	0.550	0.611	0.425	0.739	0.640
	(0.122)	(0.078)	(0.069)	(0.130)	(0.147)	(0.124)	(0.140)	(0.070)	(0.135)
Proportion of population with post-primary schooling	0.400	0.501	0.486	0.366	0.420	0.432	0.452	0.417	0.408
	(0.091)	(0.044)	(0.041)	(0.072)	(0.064)	(0.054)	(0.044)	(0.066)	(0.082)
Proportion of population with university education	0.042	0.040	0.047	0.036	0.036	0.045	0.041	0.036	0.040
	(0.019)	(0.016)	(0.018)	(0.014)	(0.014)	(0.016)	(0.015)	(0.022)	(0.018)
Total number of person-years	205,728	24,745	٢٣,١٨٥	127,375	51,392	53,586	21,745	53,450	698,624

Note: P: Persian-predominated, G: Gilak-predominated, M: Mazandarani-predominated, T: Turk-predominated, K: Kurd-predominated, L: Lur-predominated, B: Baluch-predominated, P and T: Persian and Turk-predominated. For each variable, the first and second figures represent mean and standard deviation, respectively.

The descriptive statistics of the contextual-level variables are also presented in terms of women (not the total person-years) in Table 4.4. The table displays the distribution of the first person-year for each woman included in the analysis, which according to Table 3.2 has been derived from the 1986 census, and also the first person-year that has been derived from the 1996 census (for more information on the presentation of these statistics, see the note of Table 4.4). The first person-year corresponds with the age of 10, whereas the first person-year derived from the 1996 census corresponds with different ages according to women's birth cohort (see Table 3.2). Specifically, for the 1966-70 birth cohort, the first person-year that has been derived from the 1996 census corresponds with the age of 25 and for the 1971-75 and 1976-80 birth cohorts with the ages of 20 and 15, respectively.

Although the statistics presented in Table 4.4 relate to women rather than to the total person-years and help to gain insight on changes in the value of contextual variables over time, but have some shortcomings. Firstly, they only reflect changes in those contextual variables that measure the proportion of women/population with a specific characteristic because these measures do not relate to the specific age that the included person-year relates to. Therefore, these statistics do not reflect changes in the values of the measures of marriage market properly as the first person-year corresponds with the age of 10 and the first person-year derived from the 1996 census with the ages 15, 20, or 25 (according to women's birth cohort). Thus, the former group reflects measures of marriage market for men at the age groups of 10-14 and 15-19 but the later those of much older age groups and naturally they cannot be compared. Secondly, because the number of person-years that women contributed (were at the risk of marriage) differs, not all women reached the person-years derived from the 1996 census and, therefore, the person-years derived from the 1996

census does not necessarily relate to all women initially included in the analysis. On the other hand, the statistics presented in Table 4.3, although relate to the total person-years included in the analysis rather than women, but relate to the whole period of exposure to the risk of marriage. The same issue was noticed in describing the individual-level variables (see Section 4.2.1). For these reasons, in the remainder of this chapter, where the descriptive statistics are referred those derived from Tables 4.1 and 4.3 are meant.

After this relatively long, but necessary, explanation we turn to describing the content of Table 4.4. The ethnic patterns of distribution of the sample are generally similar to what presented in Table 4.3. There are, however, few points that worth mentioning. Firstly, different ethnic-predominated regions display a general improvement in the indicators of women's status and process of development. However, this progress has not happened to a similar extent in all the measures. For instance, the improvement in women's socio-economic status in the Persian-predominated region is reflected in an increase in the value of all the measures (although not to the same extent) but the process of development in this region is mostly seen in considerable increases in industrialisation and literate population. This pattern varies amongst other ethnic-predominated regions. Secondly, although women's economic participation in the Gilak-predominated region reduced over time, which can be related to the improvement in their educational attainment, these women still stand out in the country in terms of economic activity. Thirdly, as mentioned in the previous paragraph, changes in the measures of marriage market can reflect changes in these measures over time and changes related to the ages to which these measures relate. For instance, the general reduction in sex ratio over time can show the out-migration of men at older age groups, the considerable

increase in the value of the measures of economic activity can reflect higher economic participation of men as they move towards older age groups, and finally the reduction in the value of the measure of men's educational enrolment shows the reduction in the number of men staying in school as they become older.

Table 4.4. Descriptive statistics (mean and standard deviation) of contextual-level variables included in the analysis by ethnic-predominated region (one person-year for each woman included in the analysis*)

Variable	Region** (in terms of the predominant ethnicity)								
	P	G	M	T	K	L	B	P and T	Iran
Marriage-market characteristics									
Sex ratio	0.990	1.021	0.929	0.993	1.019	0.981	0.938	1.031	0.994
	(0.060)	(0.018)	(0.070)	(0.044)	(0.052)	(0. 042)	(0.031)	(0.024)	(0.052)
	0.903	0.836	0.855	0.874	0.929	0.836	0.877	0.959	0.879
	(0.126)	(0.074)	(0.057)	(0.087)	(0.114)	(0.068)	(0.100)	(0.089)	(0.103)
Ratio of men participating in the labour force to women	0.280	0.323	0.458	0.335	0.333	0.240	0.334	0.292	0.294
	(0.047)	(0.039)	(0.205)	(0.048)	(0.069)	(0.031)	(0.042)	(0.030)	(0.059)
	0.601	0.580	0.567	0.618	0.679	0.527	0.524	0.639	0.553
	(0.200)	(0.197)	(0.209)	(0.173)	(0.185)	(0.178)	(0.178)	(0.207)	(0.185)
Ratio of employed men to women	0.194	0.198	0.359	0.244	0.210	0.148	0.153	0.222	0.199
	(0.058)	(0.042)	(0.197)	(0.043)	(0.066)	(0.021)	(0.021)	(0.031)	(0.058)
	0.537	0.444	0.483	0.550	0.551	0.404	0.469	0.594	0.469
	(0.207)	(0.204)	(0.215)	(0.177)	(0.191)	(0.182)	(0.177)	(0.208)	(0.191)
Ratio of men enrolled in education to women	0.626	0.638	0.404	0.582	0.617	0.660	0.465	0.672	0.623
	(0.077)	(0.048)	(0.225)	(0.053)	(0.100)	(0.058)	(0.084)	(0.040)	(0.080)
	0.223	0.187	0.236	0.204	0.196	0.258	0.186	0.261	0.253
	(0.141)	(0.127)	(0.146)	(0.123)	(0.145)	(0.149)	(0.104)	(0.132)	(0.133)
Women's socio-economic status									
Proportion of literate women	0.533	0.587	0.586	0.397	0.321	0.408	0.251	0.621	0.467
	(0.118)	(0.064)	(0.026)	(0.113)	(0.124)	(0.088)	(0.115)	(0.048)	(0.139)

Variable	P	G	M	T	K	L	B	P and T	Iran
	0.752	0.749	0.764	0.667	0.631	0.690	0.500	0.795	0.709
	(0.071)	(0.049)	(0.019)	(0.076)	(0.087)	(0.068)	(0.103)	(0.035)	(0.091)
Proportion of women with post-primary schooling	0.340	0.486	0.434	0.358	0.439	0.382	0.387	0.370	0.369
	(0.114)	(0.052)	(0.049)	(0.072)	(0.089)	(0.091)	(0.104)	(0.074)	(0.101)
	0.376	0.506	0.481	0.329	0.311	0.360	0.309	0.441	0.368
	(0.100)	(0.051)	(0.050)	(0.084)	(0.092)	(0.090)	(0.072)	(0.074)	(0.101)
Proportion of women with university education	0.020	0.021	0.022	0.019	0.023	0.018	0.022	0.017	0.019
	(0.011)	(0.011)	(0.007)	(0.008)	(0.012)	(0.004)	(0.009)	(0.012)	(0.010)
	0.040	0.043	0.047	0.034	0.031	0.034	0.036	0.033	0.037
	(0.017)	(0.013)	(0.012)	(0.011)	(0.016)	(0.014)	(0.017)	(0.022)	(0.017)
Proportion of women participating in the labour force	0.063	0.240	0.088	0.044	0.036	0.039	0.045	0.041	0.057
	(0.034)	(0.096)	(0.032)	(0.016)	(0.015)	(0.006)	(0.021)	(0.012)	(0.047)
	0.092	0.188	0.092	0.081	0.086	0.068	0.049	0.054	0.087
	(0.060)	(0.072)	(0.020)	(0.041)	(0.045)	(0.019)	(0.017)	(0.016)	(0.053)
Proportion of employed women	0.047	0.195	0.068	0.032	0.023	0.024	0.024	0.030	0.042
	(0.031)	(0.099)	(0.029)	(0.013)	(0.009)	(0.006)	(0.012)	(0.008)	(0.041)
	0.082	0.153	0.074	0.071	0.069	0.040	0.038	0.051	0.074
	(0.057)	(0.069)	(0.019)	(0.039)	(0.048)	(0.010)	(0.014)	(0.015)	(0.051)
The process of socio-economic development									
Proportion of urban population	0.666	0.421	0.391	0.447	0.460	0.370	0.440	0.653	0.466
	(0.054)	(0.183)	(0.069)	(0.169)	(0. 228)	(0.157)	(0.308)	(0.216)	(0.208)

Variable	P	G	M	T	K	L	B	P and T	Iran
	0.569	0.481	0.456	0.518	0.538	0.476	0.487	0.730	0.540
	(0.214)	(0.191)	(0.084)	(0.173)	(0.194)	(0.148)	(0.273)	(0.227)	(0.208)
Proportion of population employed in agriculture	0.492	0.448	0.410	0.391	0.379	0.425	0.424	0.124	0.337
	(0.042)	(0.174)	(0.060)	(0.117)	(0.133)	(0.119)	(0.251)	(0.048)	(0.161)
	0.243	0.374	0.314	0.330	0.308	0.293	0.320	0.081	0.277
	(0.142)	(0.165)	(0.079)	(0.123)	(0.145)	(0.102)	(0.161)	(0.052)	(0.150)
Proportion of population employed in industry	0.033	0.112	0.095	0.115	0.050	0.043	0.042	0.215	0.103
	(0.011)	(0.054)	(0.030)	(0.067)	(0.019)	(0.031)	(0.011)	(0.036)	(0.075)
	0.152	0.148	0.124	0.176	0.090	0.062	0.062	0.261	0.144
	(0.097)	(0.060)	(0.026)	(0.086)	(0.048)	(0.038)	(0.022)	(0.042)	(0.089)
Proportion of literate population	0.394	0.706	0.665	0.525	0.467	0.533	0.357	0.700	0.576
	(0.172)	(0.078)	(0.025)	(0.091)	(0.104)	(0.071)	(0.102)	(0.035)	(0.115)
	0.802	0.794	0.808	0.743	0.718	0.755	0.582	0.836	0.770
	(0.061)	(0.043)	(0.018)	(0.055)	(0.062)	(0.057)	(0.083)	(0.029)	(0. 072)
Proportion of population with post-primary schooling	0.479	0.501	0.476	0.360	0.426	0.427	0.459	0.394	0.397
	(0.168)	(0.044)	(0.037)	(0.073)	(0.060)	(0.050)	(0.047)	(0.056)	(0.082)
	0.434	0.518	0.510	0.375	0.403	0.434	0.431	0.469	0.426
	(0.079)	(0.044)	(0.040)	(0.070)	(0.071)	(0.059)	(0.033)	(0.059)	(0.077)
Proportion of population with university education	0.096	0.040	0.037	0.031	0.031	0.037	0.037	0.031	0.033
	(0.042)	(0.016)	(0.008)	(0.011)	(0.011)	(0.007)	(0.012)	(0.017)	(0.012)
	0.058	0.057	0.069	0.048	0.047	0.063	0.050	0.047	0.054
	(0.020)	(0.013)	(0.015)	(0.012)	(0.015)	(0.013)	(0.017)	(0.027)	(0.018)

	P	G	M	T	K	L	B	P and T	Iran
Total number of women	18,987	2096	2084	11,683	4629	5193	2299	5283	64,844
	11,392	1335	1212	7093	2854	2992	1205	2818	38,549

Note:* The first two rows for each variable present the mean and standard deviation, respectively, of the first person-year for all women included in the analysis which has been derived from the 1986 census and the second two rows (shaded) present the same statistics for the first person-year that has been derived from the 1996 (for more information, see the text). **P: Persian-predominated, G: Gilak-predominated, M: Mazandarani-predominated, T: Turk-predominated, K: Kurd-predominated, L: Lur-predominated, B: Baluch-predominated, P and T: Persian and Turk-predominated. For each variable, the first and second figures represent mean and standard deviation, respectively.

4.3. Results

This section discusses the role of different individual- and contextual-level factors on the probability of transition to first marriage (Section 4.3.1), the contribution of ethnicity after accounting for different socio-economic factors (Section 4.3.2), and the specific influence of these factors on the marriage timing of different ethnic-predominated regions (Section 4.3.3).

The findings presented in Sections 4.3.1 and 4.3.2 are based on Table 4.5 which estimates three discrete time hazard models for duration of transition to first marriage. Model 1 includes duration (time since the age of 10) and ethnic-predominated region. Model 2 includes all the individual-level characteristics and Model 3 also adds the contextual-level covariates. This modeling strategy enables us to explore the role of different individual- and contextual-level covariates on women's transition to first marriage and to assess changes in the role of ethnicity after accounting for the socio-economic factors. It specifically allows us to test whether accounting for these factors explains ethnic differences in women's marriage timing. The modelling does not directly account for the cultural aspects of family structure related to ethnicity (e.g. autonomy in mate selection or consanguineous marriage) due to data limitation. However, the remaining ethnic differences in women's transition to first marriage after accounting for all the socio-economic variables are assumed to be explained by their distinct cultural values and norms, especially after accounting for the unobserved heterogeneity amongst women to control for the effect of the omitted variables.

Amongst all the contextual variables, those variables that provide the best fit to the model are selected. The results suggest that the unobserved heterogeneity should be taken into account as the gamma variance coefficients are statistically

significant in Models 2 and 3 ($p<0.0001$) (see Table 4.5). This suggests the importance of the unmeasured characteristics of women (e.g. family background characteristics and pre-marital work experience) in their marriage timing[1]. In Model 1, where the gamma variance coefficient is not statistically significant, the results of models with and without unobserved heterogeneity are similar. Therefore, only the results of models which account for the unobserved heterogeneity are presented. The results of likelihood ratio test (Kirkwood and Sterne 2003) provides strong evidence ($p<0.0001$) that each nested model performs better.

In addition, the specific influences of different socio-economic forces on the probability of marriage of ethnic groups (Section 4.3.3) are examined by introducing interaction terms between the covariate of ethnicity (indicated by ethnic predominate-region) and other individual and contextual factors. These results are presented in the Appendix, Table A (due to length of the table) and summarised in Table 4.7. These results are based on the model without unobserved heterogeneity, not due to non-significance of the gamma variance coefficient, but because of the software limitations in estimating the model with unobserved heterogeneity (see Section 3.3.1). More specifically, the large sample size and several categories of the indicator of ethnicity (exactly 9 categories) which needs to be interacted with other covariates results in an extremely slow procedure. Using an Intel Pentium PC with 3.0 GB RAM, running Stata 10.0 for Windows Vista, estimation of the non-parametric baseline model of pgmhaz without unobserved heterogeneity took one hour (8 iteration, each one more than 7 minutes). Estimation of the model with

[1] The value of the gamma variance coefficient also suggests that as additional sources of measured heterogeneity increase, the unobserved heterogeneity also increases in magnitude (compare Models 2 and 3). This can be related to the combined influence of the included covariates.

unobserved heterogeneity term takes considerably longer time[1]. In addition, there are usually difficulties in convergence in the model with unobserved heterogeneity. Thus, the Model presented in the Appendix, Table A and summarised in Table 4.7 dose not account for the unobserved heterogeneity amongst women included in the analysis due to the software unfeasibility.

The next section presents the role of different socio-economic and demographic determinants of marriage.

4.3.1. The role of socio-economic and demographic factors

The role of birth cohort: consistent with the results of K-M survival estimates, belonging to a younger birth cohort reduces the hazards of marriage in all model specifications (see Table 4.5). After all the factors are included (Model 3), the change in odds of marriage $(100\times[(\exp(b_t)-1)])$ of women born between 1971 and 1975 and those born during 1976-80 are respectively 34.4 and 54.0 per cent lower than that of women born between 1966 and 1970.

The role of educational attainment: A higher educational attainment generally reduces the probability of marriage. In the final model, the odds of marriage of women graduated from primary school, secondary school, high school, and university are, respectively, 43.0, 60.3, 68.6, and 65.0 per cent lower than that of illiterates[2]. The lowest probability of marriage for women with high school degree

[1] In the cohort analysis of marriage (Chapter 5) and using the same computer system, estimation of the model with unobserved heterogeneity term and interactions between the covariate of birth cohort (which in that analysis includes only two categories) and the individual and contextual covariates took more than 11 days (72 iterations, each one around four hours).

[2] The differences between the risks of marriage of women with different educational levels are statistically significant at 1%.

indicates that the negative effect of higher educational attainment on the risk of marriage does not extend from pre-university to university education[1]

The role of marriage market: A higher proportion of employed men in each marriage pool increases the hazards of marriage whereas a higher proportion of men enrolled in education reduces the hazards. The availability of suitable men in terms of age is not found to increase the hazards of marriage, suggesting the flexibility of marriage market. In other words, the age preference in Iran seems to be more flexible than the preference for other favourable characteristics of the spouse supply.

The role of women's socio-economic status: women living in areas where women have a higher socio-economic status (higher post-primary schooling and participation in the labour force) are less likely to get married. Higher prevalence of literate women in the area is not found to reduce the hazards of marriage. The reason can be the spread of literacy amongst all women regardless of their socio-economic background which has been pursued since the Islamic Revolution. Given that more than half of women were literate (see Table 4.3), it is expected that women's literacy does not necessarily reflect their higher status in the society.

The role of the process of socio-economic development: Higher urbanisation and industrialisation in the area increases the probability of marriage. Considering that women's socio-economic status and the availability of suitable men in terms of age, employment, and educational enrolment have been accounted for, the higher probability of marriage of women who live in industrial and urban areas can be related to men's better occupational opportunities or their higher income in these

[1] This point should be born in mind that not all the effect of university education has been reflected for the sample as the youngest birth cohort (1976-80) was relatively young at the time of survey (20-24) and some women still had the opportunity of completing university education.

areas. Alternatively, this could be explained by the catching up on development in rural areas due to the ongoing investment in public services.

In what follows, ethnic differences in women's transition to first marriage are discussed (Section 4.3.2). Then, ethnic patterns of the contribution of different socio-economic factors are presented (Section 4.3.3).

Table 4.5. Parameter estimates of discrete time hazard models for duration of women's transition to first marriage

Covariate	Model 1 (Duration + ethnicity)	Model 2 (Model 1+ Individual covariates)	Model 3 (Model 2+ contextual covariates)
Duration (years since the age of 10)			
0-3 (corresponds with ages 10-13)	0	0	0
4-7 (corresponds with ages 14-17)	1.967	2.218	1.941
	(100.60)**	(102.99)**	(80.99)**
8-10 (corresponds with ages 18-20)	2.406	2.957	2.660
	(120.45)**	(101.64)**	(82.06)**
11-14 (corresponds with ages 21-24)	2.313	2.995	2.631
	(108.45)**	(75.14)**	(60.47)**
15-19 (corresponds with ages 25-29)	2.137	2.930	2.676
	(78.46)**	(52.12)**	(44.19)**
20-24 (corresponds with ages 30-34)	1.524	2.404	2.277
	(22.87)**	(26.04)**	(23.40)**
Region (in terms of the predominant ethnicity)			
Persian-predominated	0	0	0
Gilak-predominated	-0.154	-0.215	0.147
	(-5.62)**	(-6.27)**	(2.96)*
Mazandarani-predominated	0.010	0.022	0.235
	(0.38)	(0.66)	(5.60)**
Turk-predominated	-0.022	-0.114	-0.197
	(-1.55)	(-6.44)**	(-8.80)*
Kurd-predominated	-0.058	-0.232	-0.185
	(-2.96)**	(-9.30)**	(-5.95)**
Lur-predominated	0.018	0.085	0.406
	(0.97)	(3.56)**	(13.36)**
Baluch-predominated	0.317	0.261	0.421
	(12.63)**	(7.93)**	(9.79)**
Persian and Turk-predominated	0.219	0.298	0.294
	(12.32)**	(10.89)*	(12.99)**
Mixed	-0.068	-0.113	0.008
	(-4.96)**	(-6.51)**	(0.41)

Covariate	Model 1	Model 2	Model 3
Birth cohort			
1966-70		0	0
1971-75		-0.353	-0.421
		(-23.17)**	(-23.18)**
1976-80		-0.719	-0.777
		(-43.64)**	(-35.64)**
Educational attainment			
Illiterate		0	0
Primary		- 0.420	-0.563
		(-23.00)**	(-25.82)**
Secondary		- 0.721	-0.924
		(-33.04)**	(-35.91)**
High school		-0.844	-1.158
		(-34.33)**	(-38.55)**
University		- 0.680	-1.051
		(-18.41)**	(-24.08)**
Marriage-market characteristics			
Sex ratio			-0.115
			(-0.78)
Ratio of employed men to women			0.889
			(7.04)**
Ratio of men enrolled in education to women			-0.920
			(-7.32)**
Women's socio-economic status			
Proportion of literate women			0.108
			(1.58)
Proportion of women with post-primary schooling			-0.537
			(-5.99)**
Proportion of women participating in the labour force			-1.624
			(-9.01)**
The process of socio-economic development			
Proportion of urban population			0.420
			(8.14)**
Proportion of population employed in industry			1.401
			(11.92)**

Covariate	Model 1	Model 2	Model 3
Constant	-4.441	-3.696	-3.191
	(-228.31)**	(-136.52)**	(-34.56)**
Gamma variance	0.000002	0. 475	0.940
	(0.13)	(17.80)**	(27.73)**
Log likelihood	-156568.10	-153887.01	-152959.92

Note: Absolute value of z statistics in the parentheses. * Significant at 5%, ** significant at 1%.

4.3.2. Ethnic differences in women's transition to first marriage

Table 4.6 shows the contribution of the individual- and contextual-level factors to the odds of marriage of ethnic-predominated regions in comparison with the Persian-predominated region[1]. Before accounting for these factors (Model 1), women in the Baluch-predominated region have the highest odds (37.3 per cent higher than women in the Persian-dominated region) and women in the Gilak-predominated region have the lowest odds of marriage (14.3 per cent lower than women in the Persian-predominated region). The probability of marriage of the Mazandarani-, Lur-, and Turk-predominated regions hardly differs from that of the Persian-predominated region. Accounting for all the individual and contextual factors (Model 3) does not remove ethnic differences in the probability of marriage but clearly changes the ethnic patterns of transition to first marriage. Table 4.6 also suggests that the pattern of the influence of different factors varies by ethnicity. The following section explores the patterns of the influence of the individual and contextual factors on the marriage timing of different ethnic groups (Section 4.3.3).

[1] Persian-predominated region has been selected as the baseline group because this ethnic-predominated region comprises the largest component of the sample (see Table 4.1) and also has the largest share in the population of Iran.

Table 4.6. Odds ratio (%) of marriage of different ethnic-predominated regions by model specification, Persian-predominated as the baseline group

Region (in terms of the predominant ethnicity)	Model 1 (Duration + ethnicity)	Model 2 (Model 1+ Individual factors)	Model 3 (Model 2 + contextual factors)
Gilak-predominated	-14.27	-19.35	15.83
Mazandarani-predominated	*1.00*	*2.22*	26.41
Turk-predominated	*-2.18*	-10.77	-17.88
Kurd-predominated	-5.63	-20.70	-16.89
Lur-predominated	*1.82*	8.87	50.08
Baluch-predominated	37.30	29.82	52.35
Persian and Turk-predominated	24.48	34.18	10.96

Note: In this table, the results of Table 4.5 have been used. The odds ratio has been calculated using $(100 \times [\exp(b_t) - 1])$ where b is a vector of parameter estimates of the covariate of ethnicity. The odds ratio represented in *Italic* have been derived from non-statistically-significant coefficients.

4.3.3. Ethnic patterns of the contribution of socio-economic and demographic factors

The contribution of the socio-economic and demographic factors to the marriage timing of ethnic groups is assessed by including interaction terms between the covariate of ethnicity (ethnic-predominated region) and other individual- and contextual-level covariates (see Appendix, Table A). This allows the effect of different socio-economic factors at the individual and contextual levels to vary by ethnicity. The results of Table A is summarised in Table 4.7 and are used to explain the similarity of the impact of different covariates on the probability of marriage of women in the Lur- and Baluch-predominated regions, the Gilak- and Mazandarani-predominated regions, and the Turk- and Kurd-predominated regions. These pairs are the most similar ethnic groups in terms of cultural family patterns and socio-economic attributes (see Section 1.3). Comparing the correlates of marriage between

the ethnic groups in each pair enables us to gain more insight into the role of culture and socio-economic forces in determining the marriage timing of ethnic groups.

Transition to marriage amongst women in Baluch- and Lur-predominated regions: Compared with other ethnic groups, Lur and Baluch women adhere to a more traditional family system but Lur women have experienced a remarkably later marriage than Baluch women (see Section 1.3). This difference can partly be attributed to the better educational attainment and socio-economic status of Lur women (as shown in Tables 4.1 and 4.3) and partly to their less traditional family patterns.

As indicated in Table 4.6 (Model 3), adjusting for all the individual and contextual factors results in comparable odds of marriage in the Lur- and Baluch-predominated regions (around 50% higher odds of marriage than the Persian-predominated region). However the interaction coefficients shown in Table 4.7 clearly suggest different patterns of the influence of these factors. First consider the role of women's birth cohort. Although women in the Lur- and Baluch-predominated regions are similar in terms of birth cohort, this factor does not influence the probability of their marriage in similar ways. Younger birth cohorts experience lower hazards of marriage in the former group but there is no evidence of the influence of this factor on the probability of marriage of the latter.

Women's educational attainment is higher in the Lur-predominated region but the impact of this factor is generally similar between the two groups (except for the primary-school educational attainment which only influences the marriage timing of women in the Lur-predominated region). The two groups are similar in the contextual factors (the indicators of marriage market, women's socio-economic status, and process of development) but not in their effects. Except for the indicator

of men's employment which does not influence the marriage timing of either group, other contextual covariates influence one group but not the other. In addition, the probability of transition to first marriage in the Baluch-predominated region is only influenced by women's educational attainment. This shows firstly more resistance in this region towards the socio-economic influences and secondly the important role of education in women's marriage timing. The persistently higher age at marriage of Baluch women can, therefore, be explained by their low access to education.

Transition to marriage amongst women in Gilak- and Mazandarani-predominated regions: Compared with other ethnicities, Gilak and Mazandarani women have less traditional family patterns. Yet, Gilak women have experienced later marriage than Mazandarani women despite their comparable socio-economic and demographic attributes. These marriage patterns can be related to differences of the two groups in the contribution of socio-economic factors which can partly be driven by their cultural differences (less traditional family patterns amongst the Gilak group).

The interaction coefficients presented in Table 4.7 suggest that some socio-economic factors similarly influence the probability of marriage of women in the Gilak- and Mazandarani-predominated regions but others does not. Both regions are similar in the following factors and in their influences: women's birth cohort, primary and secondary school educational attainments, and the indicators of men's employment status, men's enrolment in education, and urbanisation. It should be mentioned that the influence of some factors are not in the expected direction, e.g. primary and secondary school educational attainments increase the probability of marriage in both ethnic-predominated region. The reason for such findings, although interesting, are beyond the scope of this research and can be investigated in future

anthropological-demographic research. The Gilak- and Mazandarani-predominated regions are similar in other individual and contextual factors but not in their influences. These factors include women's high school and university educational attainments, sex ratio, and the indicators of industrialisation and women's literacy and post-primary schooling in the area.

The indicator of women's economic activity is the only covariate that neither its value nor its influence is similar between the two regions. Specifically, women's participation in the labour market is notably higher in the Gilak-predominated region (see Table 4.3) and higher female participants in the labour market reduces the probability of marriage of women in this region not those in the Mazandarani-predominated region. Although Gilak women are more likely to participate in the labour market because they live in highly agrarian areas but they also show less traditional family patterns (suggested by their lower arranged and consanguineous marriage) and are highly autonomous in family decision making (for more information on the latter, see the comparative study of fertility and family patterns in four selected provinces of Iran conducted by Abbasi-Shavazi et al. 2004). The persistently later marriage of Gilak women in Iran can, therefore, be related to their higher status.

Transition to marriage amongst women in Turk- and Kurd-predominated regions: Turks and Kurds have experienced similar changes in their marriage timing within comparable socio-economic and cultural family patterns. As indicated in Table 4.6 (Model 3), adjusting for all the individual and contextual factors results in comparable odds of marriage in the Turk- and Kurd-predominated regions (17-18% lower odds of marriage than the Persian-predominated region). The interaction coefficients shown in Table 4.7 suggest that similar socio-economic attributes of

women in these two regions has generally resulted in similar influences on their marriage timing. The only covariates that despite being similar between the Turk- and Kurd-predominated regions show dissimilar influences on the probability of their marriage are the indicators of men's employment status, men's enrolment in education, and women's literacy in the area. Women in the Kurd-predominated regions are more flexible to the marriage market characteristics as their marriage timing is not generally influenced by these characteristics. The two regions are similar in other individual- and contextual-level factors and in their influences, except for the indicator of industrialisation which has a higher value in the Turk-predominated region (see Table 4.3) and reduces the probability of marriage only in this region.

Table 4.7. Interaction results between the indicator of ethnicity and the socio-economic and demographic covariates

Covariate	Region (in terms of the predominant ethnicity)						
	P	G	M	T	K	L	B
Birth cohort							
1966-70	0	0	0	0	0	0	0
1971-75	0	0.112	0.120	0.003	-0.070	-0.125*	-0.010
1976-80	0	0.269*	0.309*	-0.070	-0.007	-0.348**	-0.049
Educational attainment							
Illiterate	0	0	0	0	0	0	0
Primary	0	0.257*	0.679**	-0.076	-0.025	-0.214**	-0.111
Secondary	0	0.278*	0.693**	0.033	0.121	-0.197*	-0.248*
High school	0	0.116	0.630**	-0.008	-0.088	-0.334**	-0.238*
University	0	-0.453*	0.260	0.019	0.006	-0.169	-0.112
Marriage-market characteristics							
Sex ratio	0	-3.494**	-1.962	-1.722**	-1.182*	-1.821*	0.195
Ratio of employed men to women	0	1.367	0.250	0.991*	0.429	0.772	-1.227
Ratio of men enrolled in education to women	0	1.115	-0.203	0.739*	0.383	1.257*	-1.657
Women's socio-economic status							
Proportion of literate women	0	-2.415*	-0.091	-0.164	-0.664*	-0.919*	0.122
Proportion of women with post-primary schooling	0	4.263**	-0.807	-0.011	-0.295	1.366*	-0.186
Proportion of women participating in the labour force	0	-1.811*	-1.292	-0.436	-0.795	10.188**	-1.823
The process of development							
Proportion of urban population	0	-0.814	-0.148	0.232	0.353	-2.809**	0.347

Covariate	P	G	M	T	K	L	B
Proportion of population employed in industry	0	1.470*	-0.837	-0.730*	0.168	8.021**	-2.132

Note: the full results of the discrete time hazard model for duration of transition to first marriage with the interaction terms between the covariate of ethnic-predominated region and different individual- and contextual-level factors is presented in the Appendix, Table A. P: Persian-predominated, G: Gilak-predominated, M: Mazandarani-predominated, T: Turk-predominated, K: Kurd-predominated, L: Lur-predominated, B: Baluch-predominated, P and T: Persian and Turk-predominated. Absolute value of z statistics in the parentheses. * Significant at 5%, ** significant at 1%.

4.4. Discussion

This chapter investigated the first three research questions by examining the correlates of the recent marriage postponement in Iran (amongst women born between 1966 and 1980) (Question 1), the role of ethnicity after accounting for ethnic diversity in socio-economic attributes at the individual and contextual levels (Question 2), and ethnic-specific patterns of the socio-economic influences (Question 3). This section summarises the findings in response to each question.

The results suggest that the recent marriage postponement of Iranian women can partly be explained by improvements in women's education. Women's higher educational attainment, at both the individual and contextual levels, was found to reduce the probability of marriage. At the contextual level, the findings suggest that living in areas with higher availability of employed men increases the probability of marriage, whereas higher availability of men enrolled in education was found to reduce this probability. The age preference was found to be the most flexible characteristic of the spouse supply during the period of study as its effect on the probability of marriage is not statistically significant.

Furthermore, living in urban and industrial areas was found to increase the probability of marriage. The ongoing processes of urbanisation and industrialisation, therefore, do not explain the recent rise in the age at marriage of Iranian women. Although living in areas where a higher number of women participate in the labour force was found to reduce the risk of marriage, the recent substantial rise in the age at marriage of Iranian women is unlikely to be explained by this factor due to women's low economic participation.

Turning to the second and third research questions, the findings suggest that adjusting for all the socio-economic factors at the individual and contextual levels

does not remove ethnic patterns of the probability of marriage, but clearly changes this pattern. The results also provide evidence of ethnic patterns of the contribution of the socio-economic and demographic factors.

In some cases, the findings show comparable responses on the marriage timing of ethnic groups to changes in their socio-economic setting. For instance, the probability of marriage of women in the Gilak- and Mazandarani-predominated regions, Turk- and Kurd-predominated regions, and Lur- and Baluch-predominated regions has been similarly influenced by women's birth cohort, women's educational attainment, and availability of employed men in the areas, respectively. The result section provides more examples on such influences. In other cases, the findings show ethnic-specific marriage responses to similar changes in the socio-economic setting, suggesting cultural sensitivity to the individual and contextual influences. The Lur- and Baluch-predominated regions, Gilak- and Mazandarni-predominated regions, Turk- and Kurd-predominated regions are, respectively, similar in terms of women's birth cohort, availability of suitable men in terms of age, and availability of employed men. These similarities, however, have not resulted in similar responses in terms of transition to first marriage.

The findings also suggest that the religious dissimilarity of ethnic groups (in terms of adherence to different sects of Islam) is unlikely to have made a major contribution to their marriage patterns. More specifically, the Turk-predominated region mainly consists of Shiite and the Kurd-predominated region mostly of Sunni Muslims, yet the individual and contextual influences have been very similar between the two groups. On the other hand, the Gilak- and Mazandarani-predominated regions contain Shiite Muslims but they have demonstrated quite dissimilar patterns in terms of the contribution of the socio-economic factors. In

contrast, the Lur-predominated region consists of Shiite and the Baluch-predominated region mainly of Sunni Muslims and they have responded differently within similar socio-economic settings.

Chapter 5

Transition to first marriage: cohort analysis

5.1. Introduction

As discussed in Chapter 1, the recent marriage postponement in Iran was experienced by three cohorts of women born during 1966-70, 1971-75, and 1976-80 (see Section 1.2). These birth cohorts display distinct life course experiences; in that they experienced profound socio-economic changes happened in Iranian society at different points of their life cycle (see Section 1.2). However, the existing demographic literature has not studied the process of marriage postponement in Iran by analysing the marriage timing of consecutive birth cohorts who contributed to this delay and by accounting for differences in their life course experience, perhaps in

part due to the lack of longitudinal surveys. The sharp delay in the marriage of consecutive birth cohorts can be related to changes in the context of marriage and in the effect of socio-economic forces over time. The fourth research question (see Section 1.4) is based on this literature gap and addressed in this chapter. The chapter, specifically, examines cohort-specific responses on transition to first marriage to women's individual-level characteristics and changes in the socio-economic context (women's status, marriage market, and process of development) over time.

The conceptual framework introduced in Chapter 2 accounts for temporal changes in the context of marriage and allows the marriage timing of different birth cohorts to be analysed in relation to their life course experience and socio-economic change (see Section 2.2). The data (the 2000 IDHS and the 1986 and 1996 Iranian censuses) and method (discrete time hazard model), illustrated in Chapter 3, facilitate including time-varying contextual-level variables in the analysis and allows us to operationalise the conceptual framework (see Sections 3.2 and 3.3). The analysis also accounts for the heterogeneity amongst women included in the analysis due to their unobservable characteristics. The discrete time hazard model of transition to first marriage includes an unobserved heterogeneity term in order to control for the omitted variables and to correct the hazard rates.

This chapter does not analyse the marriage timing of all the three birth cohorts who contributed to the recent marriage postponement. In fact, the chapter only analyses transition to first marriage amongst the 1971-75 and 1976-80 birth cohorts. The reason is the limitation in deriving the contextual-level information at ages 10-14 for the 1966-70 cohort from the appropriate census (1976). Therefore, the contextual information for this cohort and the 1971-75 cohort at this age interval has been derived from one census (1986) (see Section 3.3.2, Table 3.2). This would

cause a problem in the cohort analysis of marriage because the duration of exposure to the risk of transition to first marriage is considered to end at the age of 20 for all birth cohorts in order to avoid any selection bias resulting from different durations in which consecutive cohorts were at the risk of marriage[1]. This would result in similarity of the 1966-70 and 1971-75 birth cohorts in the contextual variables included in the analysis (see Appendix, Table B).

The analysis is, therefore, restricted to the 1971-75 and 1976-80 birth cohorts, who were mainly exposed to the risk of marriage between the mid 1980s and 2000. These two cohorts experienced socio-economic changes at different points of their life cycle. Women born in 1971-75 were at marriageable ages (14-18) in the late 1980s, whereas those born during 1976-80 were much younger (9-13 year old). The younger birth cohort was exposed to marriage much later through the 1990s during a period of education expansion for both men and women and of economic recovery after the war; a period which might have kicked start the ideational change in the society.

The measures included in the marriage analysis were introduced in Chapter 4 (see Section 4.2). The individual-level variables include women's age and educational attainment. At the contextual level, the measures representing marriage market characteristics, women's socio-economic status, and process of development are incorporated. In this chapter, first the descriptive statistics of these measures are presented by women's birth cohort (Section 5.2). Then, the findings are illustrated (Section 5.3). By examining the contribution of different determinants of marriage to the marriage timing of the 1971-75 and 1976-80 birth cohorts, the findings of this

[1] Given that the duration of exposure to the risk of transition to first marriage ends with the date of marriage (for ever-married women) or the date of IDHS (for never-married women), the maximum duration for the oldest cohort (1966-70) would be 20-24 years and for the youngest cohort (1976-80), 10-14 years.

chapter shed some light on the impact of the timing of socio-economic changes in Iranian society on the marriage response of cohorts with different life course experiences. The findings also highlight the role of including the unobserved heterogeneity (unmeasured characteristics of women) in the marriage analysis and discusses whether including the unobserved heterogeneity term in the model changes the estimated hazard rates of transition to first marriage. The results are discussed and concluded in the final section (Section 5.4).

5.2. Measures

At the *individual level*, women's age, ethnicity, and educational attainment are included in the analysis. Table 5.1 shows the distribution of all person-years included in the analysis for the important variables by women's birth cohort. Age is represented by the time variable or years since the initial exposure to the risk of first marriage (the age of 10) until marriage (for ever-married women) or the date of survey (for never-married women). The time variable is divided into the categories of 0-2, 3-5, 6-7, 8, 9, and 10 years. These durations correspond, respectively, with ages 10-12, 13-15, 16-17, 18, 19, and 20. Women's ethnic group is represented by the predominant ethnicity in the region where they live (for further information on selection of these regions, see Section 3.2). The ethnic distribution did not change between the two cohorts, confirming the assumption made in this thesis regarding the stability of distribution of ethnic groups over time (see Section 3.2). Considering the ethnic cultural and socio-economic diversity, it is expected to find changes in their effect between the two birth cohorts. The analysis also accounts for women's educational attainment during the period in which they were at the risk of marriage (see Section 4.2.1, for more information). The proportion of illiterate women

reduced over time (13.5% in the 1971-75 and 7.1% in the 1976-80 birth cohorts). In both birth cohorts, nearly half women attained primary school education. A higher proportion of the younger birth cohort acquired secondary and high school education.

At the contextual level, the process of development and changes in women's socio-economic status and marriage market characteristics are included in the analysis. The descriptive statistics in Table 5.1 show that the 1976-80 birth cohort lives in areas where women enjoy a higher access to education. For instance, nearly 60 per cent of women in these areas are literate, compared with around half women in areas of residence of the 1971-75 birth cohort. This birth cohort also lives in areas where suitable men (in terms of age, economic status, and educational enrolment) are less available. In addition, the younger birth cohort lives in higher educated areas and more urbanised and industrialised places.

Table 5.1. Distribution of sample by variables included in the analysis and birth cohort (all person-years included in the analysis)

Variable	Birth cohort		
	1971-75	1976-80	All
Individual-level variables	%	%	%
Region (in terms of the predominant ethnicity)			
Persian-predominated	30.32	32.91	31.80
Gilak-predominated	4.07	3.95	4.00
Mazandarani-predominated	4.69	4.00	4.30
Turk-predominated	14.48	15.08	14.82
Kurd-predominated	5.40	5.05	5.20
Lur-predominated	3.48	3.75	3.63
Baluch-predominated	2.20	2.40	2.32
Persian and Turk-predominated	21.22	18.81	19.84
Mixed	14.15	14.04	14.09
Educational attainment*			
Illiterate	13.54	7.11	9.86
Primary	51.37	49.15	50.10
Secondary	23.06	26.42	24.98
High school	12.03	17.31	15.06
Contextual-level variables**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Marriage-market characteristics			

Variable	Birth cohort		
	1971-75	1976-80	All
Sex ratio	0.960	0.932	0.944
	(0.072)	(0.101)	(0.091)
Ratio of men participating in the labour force to women	0.446	0.384	0.411
	(0.181)	(0.142)	(0.163)
Ratio of employed men to women	0.332	0.293	0.310
	(0.168)	(0.147)	(0.157)
Ratio of men enrolled in education to women	0.442	0.468	0.457
	(0.211)	(0.181)	(0.195)
Women's socio-economic status			
Proportion of literate women	0.481	0.583	0.539
	(0.147)	(0.170)	(0.168)
Proportion of women with post-primary schooling	0.370	0.366	0.368
	(0.101)	(0.101)	(0.101)
Proportion of women with university education	0.020	0.028	0.025
	(0.011)	(0.016)	(0.015)
Proportion of participating in the labour force	0.059	0.072	0.066
	(0.048)	(0.052)	(0.051)
Proportion of women employed	0.044	0.058	0.052
	(0.043)	(0.049)	(0.047)
The process of socio-economic development			

Variable	Birth cohort		
	1971-75	1976-80	All
Proportion of urban population	0.469	0.499	0.486
	(0.207)	(0.213)	(0.211)
Proportion of population employed in agriculture	0.333	0.310	0.320
	(0.161)	(0.159)	(0.160)
Proportion of population employed in industry	0.105	0.122	0.115
	(0.077)	(0.086)	(0.082)
Proportion of literate population	0.588	0.669	0.635
	(0.120)	(0.138)	(0.136)
Proportion of population with post-primary schooling	0.400	0.410	0.405
	(0.082)	(0.081)	(0.082)
Proportion of population with university education	0.034	0.043	0.039
	(0.014)	(0.019)	(0.018)
Total number of person-	190,282	258,570	448,852

Note: * The value of women's educational attainment and the contextual variables represents changes in these variables over the period of study as they are constructed as time-varying variables (for further information, refer to Section 3.4.1). ** The value of the contextual variables represents changes in these variables over the period of study as they are constructed as time-varying variables.

The descriptive statistics of the variables are also presented in terms of women (not the total person-years) in Table 5.2. The table displays the distribution of the first person-year included in the analysis for both the individual- and contextual-level variables. In both birth cohorts, the value of the contextual variables at the first person-year have been derived from the 1986 census (see Table 3.2). The table also includes the first person-year derived from the 1996 census (for more information on the presentation of these statistics, see the note of Table 5.2). As shown in Table 3.2, for women born between 1971 and 1975, the first person-year derived from the 1996 census corresponds with the age of 20 and for those born during 1976-80 with the age of 15.

The descriptive statistics of the individual-level variables are similar to those presented in Table 5.1. However, as mentioned in Section 4.2.1, the variable of educational attainment only contains the two categories of illiterate and primary school because women could not have gained any higher educational level at the age of 10 which corresponds with the first person-year for all women. A comparison between the value of the contextual-level variables relating to the 1986 and those relating to the 1996 census reflect general improvements in women's socio-economic status and the process of development over time. However, they do not show differences between the two birth cohorts because for both cohorts the first person-year has been derived from the 1986 and the other from the 1996 census. As discussed in Section 4.2.2, these statistics have other limitations. Firstly, changes in the value of contextual variables are only reflected in the value of variables that measure the proportion of women/population with a specific characteristic and not in the value of the measure of marriage market. The reason is that the first person-year and the person-year derived from the 1996 census correspond with different ages and

are not comparable. Secondly, these statistics do not present the contribution of all women because the period of exposure to the risk of marriage is not similar for all women. On the other hand, the descriptive statistics presented in Table 5.1 relates to the total period of exposure (total person-years women contributed). Therefore, in the remainder of this chapter, where the descriptive statistics are referred, those derived from Table 5.1 are meant.

Table 5.2. Distribution of sample by variables included in the analysis and birth cohort (one person-year for each woman included in the analysis*)

Variable	Birth cohort		
	1971-75	1976-80	All
Individual-level variables	%	%	%
Region (in terms of the predominant ethnicity)			
Persian-predominated	30.63	32.99	31.95
Gilak-predominated	3.83	3.91	3.87
Mazandarani-predominated	4.62	4.03	4.29
Turk-predominated	14.33	14.96	14.68
Kurd-predominated	5.27	5.05	5.15
Lur-predominated	3.69	3.79	3.74
Baluch-predominated	2.45	2.67	2.57
Persian and Turk-predominated	20.87	18.67	19.64
Mixed	14.31	13.94	14.10
Educational attainment			
Illiterate	15.03	7.98	11.09
Primary	84.97	92.02	88.91
Contextual-level variables	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**
Marriage-market characteristics			
Sex ratio	0.993	0.992	0.993
	(0.052)	(0.052)	(0.052)

Variable	1971-75	1976-80	All
	0.902	0.865	0.876
	(0.116)	(0.099)	(0.105)
Ratio of men participating in the labour force to women	0.293	0.294	0.293
	(0.059)	(0.059)	(0.059)
	0.740	0.440	0.528
	(0.105)	(0.098)	(0.169)
Ratio of employed men to women	0.198	0.199	0.198
	(0.058)	(0.058)	(0.058)
	0.647	0.355	0.441
	(0.117)	(0.106)	(0.172)
Ratio of men enrolled in education to women	0.623	0.621	0.622
	(0.080)	(0.080)	(0.080)
	0.105	0.339	0.271
	(0.047)	(0.069)	(0.124)
Women's socio-economic status			
Proportion of literate women	0.465	0.462	0.464
	(0.139)	(0.140)	(0.139)
	0.711	0.707	0.708
	(0.088)	(0.092)	(0.091)
Proportion of women with post-primary schooling	0.368	0.367	0.368
	(0.101)	(0.102)	(0.101)

Variable	1971-75	1976-80	All
	0.370	0.365	0.366
	(0.100)	(0.101)	(0.101)
Proportion of women with university education	0.019	0.019	0.019
	(0.010)	(0.010)	(0.010)
	0.037	0.036	0.037
	(0.016)	(0.017)	(0.017)
Proportion of participating in the labour force	0.056	0.057	0.057
	(0.046)	(0.047)	(0.046)
	0.088	0.087	0.087
	(0.053)	(0.053)	(0.053)
Proportion of women employed	0.042	0.042	0.042
	(0.041)	(0.041)	(0.041)
	0.075	0.074	0.074
	(0.050)	(0.051)	(0.051)
The process of socio-economic development			
Proportion of urban population	0.463	0.462	0.462
	(0.208)	(0.210)	(0.209)
	0.540	0.539	0.539
	(0.205)	(0.211)	(0.209)
Proportion of population employed in agriculture	0.338	0.340	0.339
	(0.161)	(0.162)	(0.162)

Variable	1971-75	1976-80	All
	0.277	0.278	0.278
	(0.149)	(0.150)	(0.150)
Proportion of population employed in industry	0.103	0.101	0.102
	(0.076)	(0.075)	(0.075)
	0.143	0.144	0.144
	(0.088)	(0.091)	(0.090)
Proportion of literate population	0.575	0.573	0.574
	(0.115)	(0.115)	(0.115)
	0.772	0.769	0.770
	(0.070)	(0.073)	(0.072)
Proportion of population with post-primary schooling	0.397	0.395	0.396
	(0.083)	(0.083)	(0.083)
	0.428	0.424	0.425
	(0.077)	(0.077)	(0.077)
Proportion of population with university education	0.033	0.033	0.033
	(0.012)	(0.012)	(0.012)
	0.055	0.054	0.054
	(0.018)	(0.019)	(0.018)
Total number of women	20,892	26,556	47,448
	10,384	25,050	35,434

Note: * For the individual-level characteristics, this table shows statistics for the first person-year for all women included in the analysis and for the contextual-level variables, the first two rows for each variable present the mean and standard deviation, respectively, of the first person-year for all women included in the analysis which has been derived from the 1986 census and the second two rows (shaded) present the same statistics for the first person-year that has been derived from the 1996 census (for more information, see the text).

5.3. Results

Table 5.3 presents the parameter estimates of two discrete time hazard models for the duration of transition to first marriage. Model 1 includes all the individual- and contextual-level variables for the selected sample (women born between 1971 and 1980). Model 2 includes interaction terms between the covariate of birth cohort and all other covariates in order to assess cohort differences in contribution of different socio-economic factors. Amongst all the contextual variables, those variables that provide the best fit to the model are selected. The results suggest that the unobserved heterogeneity should be taken into account as the gamma variance coefficients are statistically significant in both model specifications ($p<0.0001$) (see Table 5.3)[1]. Therefore, only the results of models which account for the unobserved heterogeneity are presented.

The role of duration (time to first marriage): Figure 5.1 displays changes in the discrete time hazards for duration of transition to first marriage since the age of 10 for both birth cohorts. As shown in this figure, the hazards of marriage of women born during 1976-80 are lower than women born during 1971-75, suggesting the marriage postponement of the younger birth cohort.

Furthermore, accounting for the unobserved heterogeneity shifts the age at which the risk of marriage is highest into higher age intervals. Once the unobserved heterogeneity term is included in the analysis, the highest probability of marriage is for women aged 19. By including the unobserved heterogeneity term, different

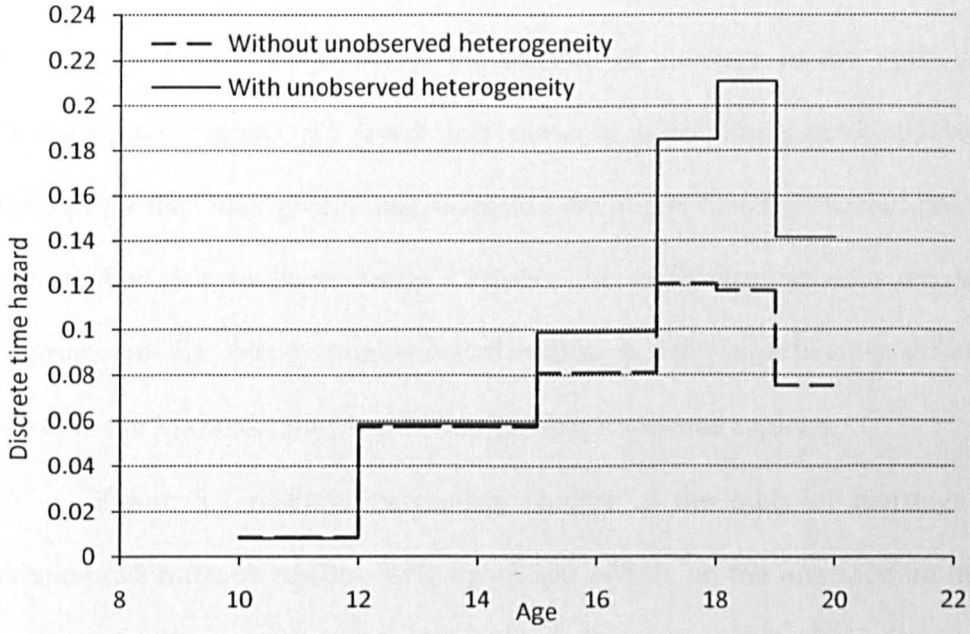
[1] The software limitations in estimating the discrete time hazard model with unobserved heterogeneity has already been mentioned (see Section 3.3.1). One of these limitations is an extremely low procedure, given the large sample size in this research. Using an Intel Pentium PC with 3.0 GB RAM, running Stata 10.0 for Windows Vista, estimation of the non-parametric baseline model of pgmhaz with the inclusion of unobserved heterogeneity term took more than 11 days (72 iterations, each one around four hours).

durations consist of women with similar unmeasured risks and the underestimation of the hazard rates at higher durations due to the selection effect is corrected.

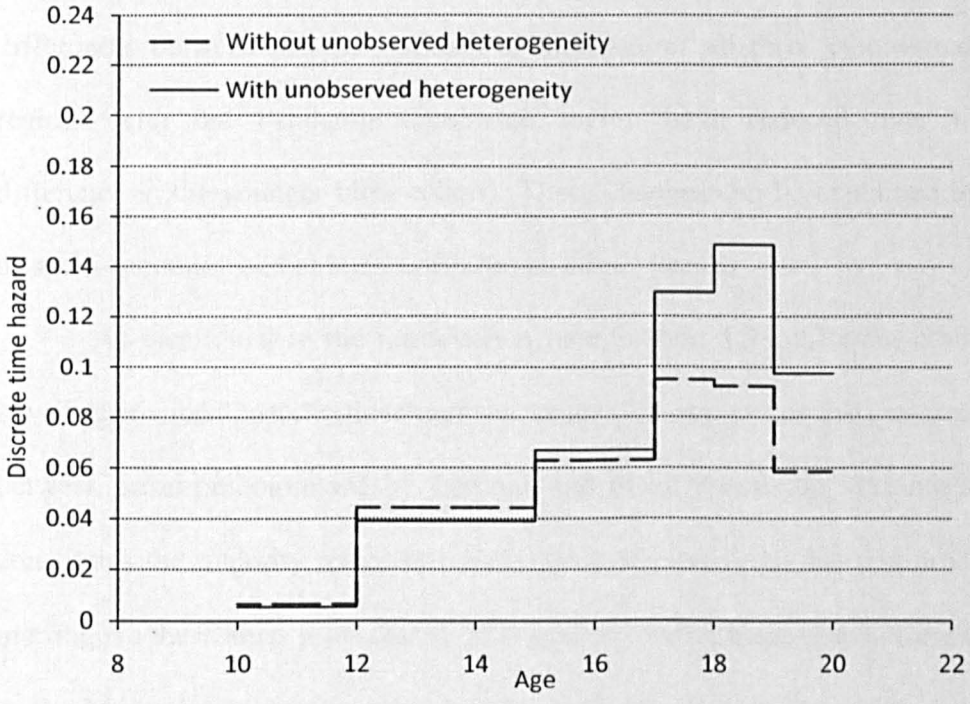
The figure also suggests that for durations higher than 17 years, there is a notable difference between the hazards of marriage in the model with and that without unobserved heterogeneity. As mentioned in Chapter 4 (Section 4.3), this difference reflects the effect of the omitted variables (such as the family background characteristics and retrospective information on women's economic activity) on the probability of marriage in the selected sample.

Figure 5.1. Estimated hazards of women's transition to first marriage by accounting for the unobserved heterogeneity, women born during 1971-75 (A) and 1976-80 (B)

A.1971-75 birth cohort



B.1976-80 birth cohort



Note: In this figure, the results of Model 1 in Table 5.3 and identical models without unobserved heterogeneity (see Appendix, Table C) have been used. The hazards at duration t years, $p(t)$, have been calculated using the equation $p(t) = \exp(bx)/[1+\exp(bx)]$, where b is a vector of parameter estimates and x is the appropriate covariate vector. The covariate vector used in the calculations relates to Persian women with the mean value of the statistically significant contextual covariates, and primary school educational attainment.

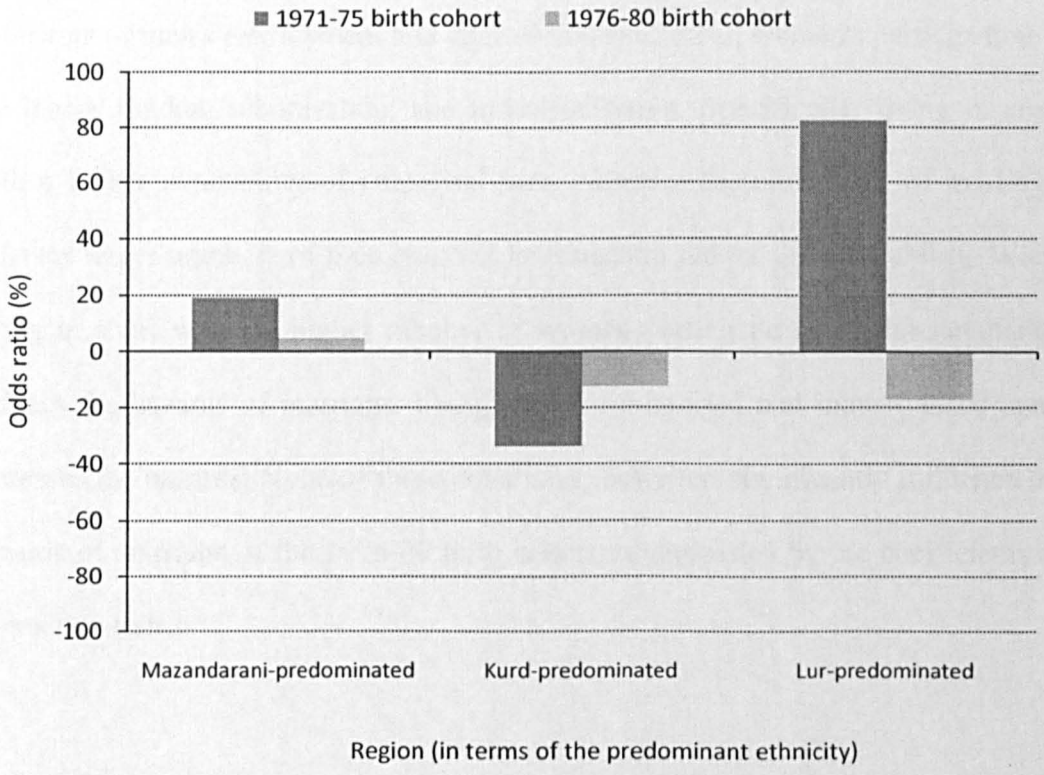
The role of ethnicity: There are considerable differences in the contribution of ethnicity to the probability of marriage of the 1971-75 and 1976-80 birth cohorts, even after adjusting for all the individual- and contextual-level factors (see Model 2). For women born during1971-75, the hazards of marriage in the Turk- and Kurd-predominated regions are lower and those in other ethnic-predominated regions (except for the Gilak-predominated region) are higher than the Persian-predominated region. For women born during 1976-80, the difference between the hazards of marriage in the Persian-predominated region is only significantly different from those in the Mazandarani-, Kurd-, and Lur-predominated regions.

Figure 5.2 displays percentage change in the odds of marriage in those ethnic-predominated regions with significant effects on the marriage timing of both birth cohorts (the Mazandarani-, Kurd-, and Lur-predominated regions), using Persian-predominated region as the baseline group. The figure suggests that the differences between the probabilities of marriage of all three ethnic-predominated regions with the Persian-predominated region have reduced over time (less difference in the younger birth cohort). These changes can be explained by the role of socio-economic and cultural attributes of ethnic groups.

As mentioned in the introduction (see Section 1.3), different ethnic groups have experienced specific development trends. On one hand, the development gap between areas predominated by Persians and those where the Mazandarani group constitutes the majority remained relatively stable over time but the probability of marriage in these areas grew closer. This suggests that the marriage timing of women in the Mazandarani-predominated region is more related to the cultural values and norms associated with ethnicity rather than to socio-economic influences. On the other hand, both the development level and marriage timing of areas predominated

by Persians have become closer to those where Kurds and Lurs are the main ethnic groups, suggesting that the marriage timing in these regions is more closely related to socio-economic influences.

Figure 5.2. Odds ratio (%) of marriage by ethnic-predominated regions and birth cohort, Persian-predominated region as the baseline group



Note: In this figure, the results of Model 2 in Table 5.3 have been used. The odds ratio of marriage has been calculated using $(100 \times [\exp(b_t) - 1])$ where b is a vector of parameter estimates of the covariate of ethnicity for the 1971-75 birth cohort and a product of this estimate and the interaction coefficient between the covariates of birth cohort and ethnicity for the 1976-80 birth cohort. For instance, For the Mazandarani-predominated region, the odds ratio for the 1971-75 cohort has been calculated using the value of 0.175 and for the 1976-80 cohort, the value of 0.175*0.284.

The role of women's educational attainment: Acquiring any higher educational level reduces the probability of marriage of the 1971-75 birth cohort to a higher extent (see the coefficients of education in Model 2). For women born between 1976 and 1980, the only educational level with a statistically significant effect is high school (see the interaction coefficients). In this birth cohort, the odds

$(100 \times [\exp(b_t) - 1])$ of marriage of women with high school education are 27.08 per cent lower than women with no education.

The role of contextual-level factors: After all the individual- and contextual-level covariates and the interaction terms are included in the analysis (Model 2), the hazards of marriage of the 1971-75 birth cohort is significantly influenced by the indicators of men's employment and educational enrolment, women's participation in the labour market, urbanisation, and industrialisation. Specifically, living in areas with a higher availability of employed men increases the probability of marriage, whereas larger numbers of men enrolled in education reduce this probability. While living in areas where a higher number of women participate in the labour market reduces the hazards of marriage, living in more urbanised and industrialised areas increases the hazards. None of these covariates, however, significantly influence the hazards of marriage of the 1976-80 birth cohort, as suggested by the coefficients of interaction terms.

Table 5.3. Parameter estimates of discrete time hazard models for duration of women's transition to first marriage by birth cohort

Covariate	Model 1 (all covariates)	Model 2 (Model 1+ interaction between birth cohort and all covariates)
Birth cohort		
1971-75	0	0
1976-80	-0.424**	4.842
Duration (Years since the age of 10)		
0-2 (corresponds with ages 10-12)	0	0
3-5 (corresponds with ages 13-15)	2.025**	1.895**
6-7 (corresponds with ages 16-17)	2.590**	2.394**
8 (corresponds with ages 18)	3.318**	3.138**
9 (corresponds with ages 19)	3.479**	3.275**
10 (corresponds with ages 20)	2.998**	3.121**
Interaction between birth cohort and duration		
0-2 amongst the 1976-80 birth cohort		0
3-5 amongst the 1976-80 birth cohort		0.302**
6-7 amongst the 1976-80 birth cohort		0.395**
8 amongst the 1976-80 birth cohort		0.327**
9 amongst the 1976-80 birth cohort		0.349**
10 amongst the 1976-80 birth cohort		-0.078

Covariate	Model 1	Model 2
Region (in terms of the predominant ethnicity)		
Persian-predominated	0	0
Gilak-predominated	0.126	-0.001
Mazandarani-predominated	0.272**	0.175*
Turk-predominated	-0.210**	-0.312**
Kurd-predominated	-0.146**	-0.412*
Lur-predominated	0.462**	0.601**
Baluch-predominated	0.600**	0.371**
Persian and Turk-predominated	0.095*	0.138*
Mixed	-0.026	0.047
Interaction between birth cohort and region		
Persian-predominated amongst the 1976-80 birth cohort		0
Gilak-predominated amongst the 1976-80 birth cohort		0.240
Mazandarani-predominated amongst the 1976-80 birth cohort		0.284*
Turk-predominated amongst the 1976-80 birth cohort		0.119
Kurd-predominated amongst the 1976-80 birth cohort		0.330**
Lur-predominated amongst the 1976-80 birth cohort		-0.314**
Baluch-predominated amongst the 1976-80 birth cohort		0.179
Persian or Turk-predominated amongst the 1976-80 birth cohort		-0.033
Mixed amongst the 1976-80 birth cohort		-0.184
Educational attainment		
Illiterate	0	0

Covariate	Model 1	Model 2
Primary	-0.789**	-0.694**
Secondary	-1.084**	-0.982**
High school	-1.630**	-1.698**
Interaction between birth cohort and education		
Illiterates amongst the 1976-80 birth cohort		0
Primary amongst the 1976-80 birth cohort		-0.093
Secondary amongst the 1976-80 birth cohort		-0.089
High school amongst the 1976-80 birth cohort		0.186*
Marriage market characteristics		
Sex ratio	-0.553*	-0.154
Ratio of employed men to women	1.724**	1.815**
Ratio of men enrolled in education to women	-1.017**	-1.022**
Interaction between birth cohort and marriage market		
Sex ratio amongst the 1976-80 birth cohort		0.245
Ratio of employed men to women amongst the 1976-80 birth cohort		-0.640
Ratio of men enrolled to education to women amongst the 1976-80 birth cohort		-0.630
Women's Socio-economic status		
Proportion of literate women	0.755**	-0.366
Proportion of women participating in the labour force	-1.837**	-1.549**
Interaction between birth cohort and women's socio-economic status		
Proportion of literate women amongst the 1976-80 birth cohort		1.126**
Proportion of women participating in the labour force amongst the 1976-80 birth cohort		-0.110

Covariate	Model 1	Model 2
The process of socio-economic development		
Proportion of urban population	0.208**	0.370 **
Proportion of population employed in industry	1.314**	1.234**
Interaction between birth cohort and the process of socio-economic development		
Proportion of urban population amongst the 1976-80 birth cohort		-0.062
Proportion of population employed in industry amongst the 1976-80 birth cohort		0.175
Constant	-4.098**	-3.979**
Gamma variance	1.418**	1.317**

Note: Absolute value of z statistics in the parentheses; *significant at 5%, ** significant at 1%. The z statistics have not been presented to avoid the length of the table.

5.4. Discussion

This chapter investigated the fourth research question by analysing the marriage timing of consecutive birth cohorts of women who contributed to the recent marriage postponement in Iran (1971-75 and 1976-80 birth cohorts) in relation to their life course experience. The findings suggest that the difference in the marriage timing of the 1971-75 and 1976-80 birth cohorts of Iranian women and the substantial marriage postponement experienced by the younger birth cohort was related to changes in the socio-economic context of marriage and to specific responses to this context.

The marriage postponement of the younger (1976-80) birth cohort was related to improvements in women's education (at the individual-level). Compared with the 1971-75 birth cohort, the only educational level with a statistically significant effect on the hazards of marriage of the 1976-80 birth cohort is high school educational attainment. High school education is associated with lower hazards of marriage in the younger birth cohort. This suggests a growing importance of high school educational attainment for Iranian girls before marriage which has emerged along with growing numbers of women graduating from high school.

The results also suggest that a number of contextual-level covariates (the indicators of men's employment and educational enrolment, women's participation in the labour market, urbanisation, and industrialisation) influence the probability of marriage of the older birth cohort, but none significantly influence the hazards of marriage of the younger birth cohort. In addition, ethnic differences in transition to first marriage reduced over time. Two findings support this statement. Firstly, the number of ethnic-predominated regions with statistically significant differences in the probability of marriage is lower in the younger birth cohort. Secondly, the effect

of ethnic-predominated region on the probability of marriage reduced over time (less pronounced in the younger birth cohort). This reduction appears to be related to both socio-economic attributes and cultural values and norms associated with ethnicity.

In addition to a substantive contribution, the findings of this chapter also made a methodological contribution by highlighting the role of unmeasured characteristics in the marriage analysis and showing that including the unobserved heterogeneity term in the hazard model corrects the hazard rates and can capture the effect of the omitted variables.

Chapter 6

Childbearing

6.1. Introduction

As discussed in Chapter 1, the sharp fertility decline (over four children per woman) experienced by Iranian women since the mid 1980s closely corresponds with profound socio-economic changes in the society (see Section 1.2). Chapter 1 also discussed changes in the context of fertility amongst cohorts of women who became exposed to the risk of childbearing at different points of time (see Section 1.2). Ethnic patterns of fertility and how these patterns can be related to ethnic diversity in the cultural and socio-economic attributes were other issues covered in Chapter 1 (see Section 1.3). Despite profound socio-economic changes in Iranian society, the

existing demographic literature has not studied the recent remarkable fall in the number of children by accounting for changes in the socio-economic context and, in particular, differences in the life course experience of cohorts of women who contributed to this substantial fertility change. In addition, previous studies did not examine the role of ethnicity by accounting for ethnic diversity in socio-economic changes over time, nor explored ethnic patterns of these influences. The research questions (see Section 1.4) address these literature gaps and are explored in this chapter. The chapter, specifically, examines the correlates of fertility decline (individual-level factors and changes in the socio-economic context) in Iran (Question 1), the role of ethnicity after accounting for ethnic diversity in socio-economic changes (Question 2), and ethnic-specific patterns of the socio-economic influences (Question 3). The chapter also examines the fertility of consecutive cohorts of women who contributed to the fertility decline in relation to their life course experience (Question 4).

Both the conceptual framework (see Section 2.3) and the data (the 2000 IDHS and the 1986 and 1996 Iranian censuses) and method (discrete time hazard model) applied (see Sections 3.2 and 3.3) facilitate including time-varying contextual-level variables in the fertility analysis. This way, temporal changes in the context of childbearing is taken into account and the fertility experience of cohorts of women who became exposed to the risk of childbearing at different points of time is analysed in relation to their life course experience. The selected sample includes women who became exposed to the risk of second or third birth (gave birth to their first or second child) during 1986-95 because of substantial changes in both the quantum and tempo of progression to second and third conceptions (see Section 3.3.2).

This chapter introduces the measures included in the fertility analysis and present their descriptive statistics first for women who became exposed to the risk of second or third birth over the whole period of fertility decline (1986-95) and then for cohorts who contributed to this decline (the 1986-90 and 1991-95 cohorts) (Section 6.2). These cohorts experienced socio-economic changes at different points of their life cycle. The 1986-90 cohort was at the risk of childbearing between the mid 1980s and the mid 1990s, whereas the 1991-95 cohort experienced the whole period of exposure in the 1990s during a period of education expansion (for children and women) and of economic recovery and increase in material aspirations (see Section 1.2). Then the findings are presented in two sections.

Firstly, the effect of different individual- and contextual-level factors and, in particular, the role of ethnicity on the probability of second conception is elaborated for women who became exposed to the risk of second birth over the period of 1986-95 and the cohort-specific responses to the socio-economic forces are discussed (Section 6.3.1). Then, the determinants of progression to third conception are discussed (Section 6.3.2). The findings of this chapter provide more insight into the process of fertility decline in Iran by investigating the cultural sensitivity of different ethnic groups to socio-economic influences and by examining the role of the timing of socio-economic changes in the fertility response of cohorts of Iranian women with distinct life course experiences. The results are discussed and concluded in the final section (Section 6.4).

6.2. Measures

This section introduces the descriptive statistics of measures included in the analysis of second and third conceptions and highlights (1) differences in the characteristics (individual- and then contextual-level) of women who were exposed to the risk of second birth with those at the risk of third birth and (2) changes in the distribution of the sample over time (between women who became exposed to the risk of childbearing in 1986-90 and those who became exposed to this risk in 1991-95).

6.2.1. Individual-level variables

These variables include duration, women's characteristics (ethnicity, educational attainment, age, age at marriage, and cohort) and the characteristics of previous birth/s (experiencing child mortality, sex of child/children, and previous birth interval)[1] (see Table 6.1).

The variable of duration measures the interval between previous birth and conception (for those who continued childbearing) or the date of survey (for those who did not continue childbearing). The time variable is divided into the categories of 0-2, 3-5, 6-8, 9-12, 13-16, 17-20, 21-24, 25-36, and 37-51 months. This interval is limited to 51 months in order to avoid any selection bias resulting from different periods of exposure to the risk of childbearing between the two cohorts (1986-90 and 1991-95) included in the analysis[2]. The first duration categories include narrower time intervals because it has been shown (Hobcraft and McDonald 1984) that the

[1] Similar to the marriage analysis (see Section 4.2.1), the fertility analysis does not account for individual-or household-level measures of wealth or income because these information in the IDHS relates to the time of survey and cannot be used to measure the economic status over the period of study.

[2] The maximum period of exposure to the risk of conception for women who became exposed to the risk of childbearing in 1995 (51 months) is less that women who became exposed to this risk earlier (1986-94).

hazards change quickly at the beginning of birth interval, mainly due to rapid changes in the effect of lactation after birth.

Women's ethnicity is represented by the predominant ethnic group in the region where they live, as in previous chapters (see Section 3.2 for details). The descriptive statistics in Table 6.1 show that women in the Persian-predominated region represent the largest and those in the Blauch-predominated region the smallest component of the sample. The ethnic distribution is similar between the cohorts of women who became exposed to the risk of childbearing at different periods of time, confirming the assumption of stability of distribution of ethnic groups over time (see Section 3.2).

Women's age is a time-varying variable which represents women's age during the period of exposure to the risk of conception. Women at the risk of second birth display a younger age structure than those at the risk of third birth. Specifically, 32.7 per cent of women who became exposed to the risk of second birth in 1986-95 aged less than 20, compared with 16.2 per cent of those who became exposed to the risk of third birth over the same period. A comparison between the distribution of the cohorts of women who became exposed to the risk of second or third birth in 1986-90 and 1991-95 shows a pattern of later childbearing, as the proportion of women in the youngest age group (<20) reduced and that of women in the oldest age group (25+) increased over time.

The analysis also accounts for women's educational attainment. Similar to the marriage analysis (see Section 4.2.1), women's educational attainment is adjusted according to their age and presented as a time-varying covariate. A lower probability of conception is expected for higher educated women as a result of ideational and behavioural changes or higher opportunity costs of childbearing.

Around 40 per cent of women who were exposed to the risk of second or third birth attained primary school education but the post-primary school educational levels are more prevalent amongst women who were exposed to the risk of second birth which can be related to their younger age structure and improvement in educational attainment of Iranian women.

Amongst women exposed to the risk of second birth, those who became exposed to this risk in 1991-95 generally attained higher education than those who were at this risk during 1986-90, whereas the educational improvement over time is not observed in all educational levels amongst women exposed to the risk of third conception This suggests that women who progressed to second birth and were at the risk of third birth in 1991-95 constitute a selected subset of Iranian women.

Women's age at marriage is also included in the analysis. Higher age at marriage is expected to reduce the probability of conception due to a reduction in the period of exposure to the risk of childbearing and an increase in the contraception efficacy. Alternatively, marriage postponement can be accompanied by a catch up effect, in that women who marry later can reduce birth intervals to achieve their desired number of children.

The descriptive statistics show that women who became exposed to the risk of second birth experienced a later marriage. Specifically, 47.7 per cent of women who became exposed to the risk of second birth in 1986-95 married before the age of 18, compared with 56.9 per cent of those who became exposed to the risk of third birth over the same period. Given the younger age structure of the former group, this can reflect the general process of marriage postponement amongst Iranian women. In addition, cohorts of women who became exposed to the risk of childbearing (second

or third) in 1991-95 experienced a later marriage compared with those who became exposed to this risk in 1986-90.

Previous birth-conception interval represents the interval between marriage and first conception for those at the risk of second birth and the interval between the first birth and second conception for those at the risk of third birth. As discussed in Chapter 2, shorter previous birth interval has been found to reduce the probability of conception and vice versa as it can be an indicator of fecundity, breastfeeding, and contraception efficacy and length (see Section 2.3). In this study, it is expected to find a negative association between the probability of conception and the previous birth interval. However, the interval between marriage and first conception is not expected to reflect exactly the same underlying factors as the interval between the first birth and second conception. For instance, the former can be an indicator of fecundity and contraceptive use but the latter can also reflect the breastfeeding practice.

The descriptive statistics show that previous birth interval is shorter for women exposed to the risk of second conception. In other words, first conceptions have happened in a shorter interval: 18.2 per cent of women at the risk of second birth conceived their first birth within one year, compared with 7.6 per cent of women at the risk of third birth who conceived their second birth at the same interval. A comparison between the cohorts of women who became exposed to the risk of childbearing in 1986-90 and 1991-95 suggest that the interval between marriage and first conception remained constant, whereas the interval between first birth and second conception became longer over time.

Experiencing child mortality is expected to increase the probability of conception through biological and behavioural mechanisms. As shown in Table 6.1,

women exposed to the risk of second birth experienced slightly lower child mortality over time (compare the 1986-90 and 1991-95 cohorts), whereas women who became exposed to the risk of third birth later in time (1991-95) experienced higher child mortality (13.3%) compared with those who became exposed to this risk earlier (10.8% in the 1986-90 cohort). This suggest that a selected subset of women who experienced child mortality became more likely to progress to second birth and become exposed to the risk of third birth over time.

The descriptive statistics of the individual-level variables are also presented in terms of women (not the total person-years) in Table 6.2. The table displays the distribution of the first person-year, for each woman included in the analysis. The distribution is generally similar to that presented in Table 6.1.

Table 6.1. Distribution (%) of sample by individual-level variables and cohorts of women who became exposed to the risk of second or third conception during 1986-95, 1986-90, and 1991-95 (all person-years included in the analysis)

	Second conception			Third conception		
Variable	**1986-95**	**1986-90**	**1991-95**	**1986-95**	**1986-90**	**1991-95**
Region (in terms of the predominant ethnicity)						
Persian-predominated	35.39	35.22	35.53	37.37	38.00	36.40
Gilak-predominated	4.27	4.59	3.99	3.35	3.56	3.01
Mazandarani-predominated	5.82	6.16	5.50	5.48	5.60	5.30
Turk-predominated	12.01	11.18	12.76	11.18	11.17	11.20
Kurd-predominated	2.34	1.88	2.76	2.16	2.13	2.21
Lur-predominated	3.38	3.25	3.51	4.36	4.14	4.71
Baluch-predominated	1.40	1.04	1.73	2.05	1.51	2.88
Persian or Turk-predominated	22.16	24.57	19.97	16.34	17.46	14.60
Mixed	13.22	12.09	14.24	17.71	16.43	19.69
Women's educational attainment						
Illiterate	24.93	28.47	21.77	38.58	38.94	38.07
Primary school	41.07	39.08	42.83	41.38	39.98	43.37
Secondary school	17.87	17.01	18.63	11.89	12.22	11.41
High school	13.07	13.12	13.03	6.98	7.69	5.98
University	3.06	2.32	3.73	1.17	1.17	1.17
Women's age at marriage (years)						
<18	47.67	53.69	42.23	56.87	59.85	52.26
18-22	40.23	37.06	43.09	36.17	33.87	39.72
23+	12.10	9.25	14.68	6.96	6.28	8.01

Variable	Second conception			Third conception		
	1986-95	1986-90	1991-95	1986-95	1986-90	1991-95
Women's age (years)						
<20	32.70	39.37	26.68	16.18	19.45	11.11
20-24	47.11	45.17	48.86	52.29	53.35	50.64
25+	20.19	15.46	24.46	31.53	27.20	38.25
Previous birth-conception interval (months)						
<13	18.22	17.81	18.60	7.63	8.12	6.87
13-24	32.22	31.42	32.94	40.61	43.23	36.56
25-36	23.12	24.51	21.86	27.64	28.53	26.26
37+	26.44	26.26	26.60	24.12	20.11	30.32
Experiencing child mortality						
Not having any dead child	96.91	96.54	97.25	88.25	89.22	86.74
Having at least one dead child	3.09	3.46	2.75	11.75	10.78	13.26
Sex of child/children						
Male	51.29	52.45	50.24	27.40	27.88	26.65
Female	48.71	47.55	49.76	25.37	24.56	26.63
Mixed	NA	NA	NA	47.23	47.56	46.72
Cohort						
Became exposed to childbearing during 1986-90	47.49	NA	NA	60.77	NA	NA
Became exposed to childbearing during 1991-95	52.51	NA	NA	39.23	NA	NA
Total number of observations (person months)	402,897	189,896	213,001	291,825	171,415	120,410

Table 6.2. Distribution (%) of sample by individual-level variables and cohorts of women who became exposed to the risk of second or third conception during 1986-95, 1986-90, and 1991-95 (one person-year for each woman included in the analysis)

	Second conception			Third conception		
Variable	**1986-95**	**1986-90**	**1991-95**	**1986-95**	**1986-90**	**1991-95**
Region (in terms of the predominant ethnicity)						
Persian-predominated	35.03	35.05	35.00	37.22	38.12	35.67
Gilak-predominated	4.16	4.50	3.79	3.44	3.56	3.22
Mazandarani-predominated	5.31	5.74	4.84	5.00	5.12	4.78
Turk-predominated	11.98	11.33	12.67	11.16	11.34	10.84
Kurd-predominated	2.34	2.03	2.66	2.32	2.25	2.43
Lur-predominated	3.71	3.50	3.93	4.35	4.03	4.91
Baluch-predominated	1.75	1.40	2.13	2.30	1.82	3.12
Persian or Turk-predominated	20.86	22.25	19.36	16.35	17.09	15.08
Mixed	14.88	14.19	15.60	17.86	16.66	19.95
Women's educational attainment						
Illiterate	29.34	32.20	26.25	41.77	42.21	41.05
Primary school	41.56	40.11	43.13	39.90	38.94	41.46
Secondary school	15.90	15.14	16.72	10.94	11.05	10.76
High school	10.82	10.75	10.88	6.32	6.77	5.58
University	2.38	1.79	3.02	1.07	1.03	1.14
Women's age at marriage (years)						
<18	49.16	54.63	43.32	58.41	61.10	53.77
18-22	39.35	36.60	42.30	35.16	33.14	38.66
23+	11.49	8.77	14.38	6.42	5.76	7.57

Variable	Second conception			Third conception		
	1986-95	1986-90	1991-95	1986-95	1986-90	1991-95
Women's age (years)						
<20	44.05	50.09	37.60	24.48	27.91	18.54
20-24	41.70	38.57	45.04	52.26	51.74	53.16
25+	14.25	11.33	17.36	23.26	20.34	28.30
Previous birth-conception interval (months)						
<13	19.01	19.23	18.78	7.91	8.42	7.02
13-24	30.97	29.88	32.14	40.02	42.85	35.13
25-36	22.74	23.48	21.94	27.74	28.21	26.92
37+	27.28	27.41	27.14	24.33	20.52	30.93
Experiencing child mortality						
Not having any dead child	95.12	94.99	95.26	86.24	86.88	85.12
Having at least one dead child	4.88	5.01	4.73	13.76	13.12	14.88
Sex of child/children						
Male	50.77	51.80	49.67	26.35	26.28	26.46
Female	49.23	48.20	50.32	26.19	25.81	26.84
Mixed	NA	NA	NA	47.46	47.91	46.69
Cohort						
Became exposed to childbearing during 1986-90	51.62	NA	NA	63.37	NA	NA
Became exposed to childbearing during 1991-95	48.38	NA	NA	36.63	NA	NA
Total number of observations (person months)	19,545	10,144	9401	13,546	8382	5164

6.2.2. Contextual-level variable

The analysis includes women's socio-economic status and the process of development (see Table 6.2). A number of variables are constructed to measure *women's socio-economic status in the area*, including the district-level proportions of literate women, women with post-primary schooling, women with university education[1], women who participate in the labour force (those who are either employed or are in search of employment), and women who are employed. This will allow us to test the potential negative effect of women's higher status in the area on the risk of conception of women living in that area due to an increase in the opportunity costs of childbearing or changes in the attitude or behaviour of these women.

As shown in Table 6.3, women exposed to the risk of second birth have generally higher status. Specifically, these women live in areas where higher proportions of women are literate, have university education, and participate in the labour market. The descriptive statistics also show that the status of women improved over time. Amongst women exposed to the risk of second birth, for instance, the proportion of literate women increased from 55.3 per cent in areas where the 1986-90 cohort lives to 70.5 per cent in areas of residence of the 1991-95 cohort. However, women's economic activity has been low over the period of study (no more than 8%). The same pattern is observed for women who were exposed to the risk of third birth.

The process of socio-economic development is indicated by the proportions of urban population and population who are employed in the agricultural and industrial sectors in each district. Other measures include the district-level

[1] The proportions of women with post-primary schooling and university education refer to women with these educational levels amongst literate women.

proportions of literate population, population with post-primary schooling, and population with university education[1]. The analysis also include the proportions of 10-14 year-old children who are enrolled in education, participate in the labour force (those who are either employed or are in search of employment), and are employed in each district[2]. A lower probability of conception is expected for women living in more developed areas due to an increase in the costs and a reduction in the benefits of childbearing.

As shown in Table 6.3, women exposed to the risk of second birth generally lived in more developed areas (in terms of population's educational attainment, urban residency, living in industrial areas, and children's educational enrolment). The descriptive statistics also reflect the general process of development in the country, in that women who became exposed to the risk of childbearing (second or third) in 1991-95 lived in more developed areas.

[1] The proportions of population with post-primary schooling and university education refer to the population with these educational levels amongst literate population.

[2] Similar to the marriage analysis (see Section 4.2.1), the fertility analysis does not include any district-level measure of wealth or income because of the lack of information. Moreover, as mentioned in Chapter 3, the provincial-level contextual variables do not generally fit; both in terms of the significance and the direction of the effect (see Section 3.2).

Table 6.3. Descriptive statistics (mean and standard deviation) of contextual-level variables and cohorts of women who became exposed to the risk of second or third conception during 1986-95, 1986-90, and 1991-95 (all person-years included in the analysis)

	Second conception			Third conception		
Variable	**1986-95**	**1986-90**	**1991-95**	**1986-95**	**1986-90**	**1991-95**
Women's socio-economic status						
Proportion of literate women	0.634	0.553	0.705	0.595	0.532	0.686
	(0.156)	(0.172)	(0.095)	(0.165)	(0.171)	(0.103)
Proportion of women with post-primary schooling	0.368	0.371	0.365	0.357	0.364	0.348
	(0.102)	(0.101)	(0.103)	(0.102)	(0.102)	(0.102)
Proportion of women with university education	0.031	0.025	0.036	0.027	0.024	0.033
	(0.017)	(0.015)	(0.017)	(0.016)	(0.014)	(0.016)
Proportion of women participating in the labour force	0.077	0.069	0.085	0.071	0.064	0.081
	(0.052)	(0.051)	(0.052)	(0.050)	(0.049)	(0.050)
Proportion of women employed	0.064	0.054	0.073	0.058	0.050	0.068
	(0.050)	(0.048)	(0.050)	(0.047)	(0.049)	(0.048)
The process of socio-economic development						
Proportion of literate population	0.709	0.645	0.767	0.678	0.628	0.750
	(0.127)	(0.141)	(0.076)	(0.134)	(0.140)	(0.083)
Proportion of population with post-primary schooling	0.417	0.408	0.425	0.409	0.404	0.415
	(0.081)	(0.082)	(0.079)	(0.080)	(0.082)	(0.077)
Proportion of population with university education	0.048	0.040	0.054	0.044	0.039	0.052
	(0.020)	(0.018)	(0.019)	(0.019)	(0.017)	(0.018)
Proportion of urban population	0.516	0 .493	0.535	0.485	0.476	0.498
	(0.214)	(0.211)	(0.214)	(0.213)	(0.211)	(0.214)

Variable	Second conception			Third conception		
	1986-95	**1986-90**	**1991-95**	**1986-95**	**1986-90**	**1991-95**
Proportion of population employed in agriculture	0.294	0.314	0.277	0.315	0.325	0.300
	(0.156)	(0.161)	(0.150)	(0.157)	(0.160)	(0.152)
Proportion of population employed in industry	0.133	0.122	0.143	0.117	0.109	0.130
	(0.089)	(0.086)	(0.091)	(0.084)	(0.080)	(0.088)
Proportion of children enrolled in education	0.815	0.765	0.859	0.790	0.753	0.844
	(0.122)	(0.134)	(0.089)	(0.126)	(0.131)	(0.097)
Proportion of children participate in the labour force	0.057	0.069	0.045	0.061	0.071	0.047
	(0.048)	(0.047)	(0.047)	(0.049)	(0.049)	(0.046)
Proportion of children employed	0.037	0.041	0.032	0.038	0.042	0.033
	(0.036)	(0.033)	(0.038)	(0.038)	(0.036)	(0.039)
Total number of observations (person months)	402,897	189,896	213,001	291,825	171,415	120,410

The descriptive statistics of the contextual-level variables are also presented in terms of women (not total person-years) in Table 6.4. The table displays the distribution of the first person-year for each woman included in the analysis. According to Table 3.3, for the 1986-90 cohort this person-year has been derived from the 1986 and for the 1991-96 cohort from the 1996 census. Contrary to the tables presented for the marriage analyses (see Sections 4.2.2 and 5.2), this table only includes one person-year for each woman because all the contextual values related to the 1991-95 cohort have been derived from the 1996 census (see Table 3.4). The distribution of the sample is generally similar to what presented in Table 6.3. Furthermore, a comparison between the value of the contextual variables derived from the 1986 (those belonging to the 1991-95 cohort) and those derived from the 1996 census (those belonging to the 1991-96 cohort) reflect general improvements in women's socio-economic status and the process of development over time. For the sake of consistency with the marriage analyses, where the individual or contextual values are referred, those derived from Tables 6.1 and 6.3 are meant.

Table 6.4. Descriptive statistics (mean and standard deviation) of contextual-level variables and cohorts of women who became exposed to the risk of second or third conception during 1986-95, 1986-90, and 1991-95 (one person-years for each woman included in the analysis)

	Second conception			Third conception		
Variable	**1986-95**	**1986-90**	**1991-95**	**1986-95**	**1986-90**	**1991-95**
Women's socio-economic status						
Proportion of literate women	0.600	0.510	0.696	0.562	0.490	0.680
	(0.166)	(0.164)	(0.101)	(0.165)	(0.163)	(0.108)
Proportion of women with post-primary schooling	0.363	0.367	0.359	0.355	0.361	0.345
	(0.103)	(0.102)	(0.103)	(0.103)	(0.102)	(0.103)
Proportion of women with university education	0.028	0.022	0.035	0.026	0.021	0.033
	(0.016)	(0.013)	(0.017)	(0.015)	(0.012)	(0.016)
Proportion of women participating in the labour force	0.072	0.062	0.083	0.067	0.059	0.080
	(0.050)	(0.047)	(0.051)	(0.048)	(0.046)	(0.049)
Proportion of women employed	0.059	0.048	0.071	0.053	0.045	0.068
	(0.048)	(0.043)	(0.049)	(0.045)	(0.042)	(0.048)
The process of socio-economic development						
Proportion of literate population	0.682	0.610	0.760	0.652	0.594	0.746
	(0.135)	(0.135)	(0.080)	(0.139)	(0.134)	(0.087)
Proportion of population with post-primary schooling	0.411	0.402	0.421	0.404	0.398	0.414
	(0.081)	(0.082)	(0.079)	(0.081)	(0.082)	(0.078)
Proportion of population with university education	0.045	0.037	0.053	0.041	0.036	0.051
	(0.019)	(0.016)	(0.019)	(0.018)	(0.015)	(0.018)
Proportion of urban population	0.498	0.475	0.524	0.472	0.458	0.494
	(0.214)	(0.211)	(0.216)	(0.214)	(0.211)	(0.216)

Variable	Second conception			Third conception		
	1986-95	**1986-90**	**1991-95**	**1986-95**	**1986-90**	**1991-95**
Proportion of population employed in agriculture	0.307	0.328	0.283	0.325	0.339	0.302
	(0.158)	(0.161)	(0.151)	(0.159)	(0.162)	(0.152)
Proportion of population employed in industry	0.124	0.110	0.139	0.111	0.101	0.128
	(0.086)	(0.080)	(0.090)	(0.082)	(0.076)	(0.087)
Proportion of children enrolled in education	0.792	0.737	0.851	0.768	0.724	0.839
	(0.128)	(0.131)	(0.094)	(0.132)	(0.129)	(0.104)
Proportion of children participate in the labour force	0.062	0.076	0.046	0.067	0.078	0.048
	(0.049)	(0.047)	(0.047)	(0.050)	(0.048)	(0.048)
Proportion of children employed	0.038	0.044	0.032	0.040	0.044	0.034
	(0.036)	(0.033)	(0.038)	(0.038)	(0.036)	(0.041)
Total number of observations (person months)	19,545	10,144	9401	13,546	8382	5164

6.3. Results

This section first presents the results for progression to second conception (Section 6.3.1) and then for the third conception (Section 6.3.2). In each section, the role of different individual- and contextual-level factors on the probability of conception is discussed and a particular attention is given to the contribution of ethnicity.

6.3.1. Progression to second conception

Table 6.5 presents the parameter estimates of three discrete time hazard models for duration of progression to second conception for women who became exposed to the risk of second birth between 1986 and 1995. Model 1 includes duration (time since first birth) and ethnicity. Model 2 adds the individual-level variables to Model 1 and Model 3 includes all the individual- and contextual-level covariates. This modelling strategy enables us (1) to assess the contribution of different socio-economic and demographic factors to the probability of conception and (2) to examine changes in the effect of ethnicity after accounting for the role of these factors.

Amongst all the contextual variables, those variables that provide the best fit are selected. The results suggest that the gamma variance coefficient is not statistically significant (see Table 6.5). Therefore, only the results of the models which does not account for unobserved heterogeneity are presented. The results of likelihood ratio test (Kirkwood and Sterne 2003) provides strong evidence ($p<0.0001$) that each nested model performs better. In the next section, the effect of different socio-economic and demographic factors on the probability of second conception is discussed (Section 6.3.1.1). The following section elaborates ethnic fertility patterns and changes in the effect of ethnicity after accounting for the individual and contextual factors (Section 6.3.1.2).

6.3.1.1. The role of socio-economic and demographic factors

This section discusses the role of the covariates with statistically significant influences on the probability of progression to second conception. The role of ethnicity or, more precisely, ethnic-predominated region is discussed in the next section.

The role of individual-level factors: First consider the role of *Women's educational attainment.* Higher education reduces the hazards of second conception. After accounting for the individual- and contextual-level covariates (Model 3), the odds $(100\times[(\exp(b_t)-1)]$ of second conception are, respectively, 13.1, 29.3, 35.5, and 36.9 per cent lower for those with primary school, secondary school, high school, and university education than illiterate women[1]. The other individual-level factor with an influence on the probability of second conception is *experiencing child mortality.* In the final model, the odds of second conception are 42.5 per cent higher amongst women who lost their first child than those whose first child survived.

The results also suggest an influence of *sex of previous child* on the probability of progression to second conception. The odds of conception are 3.7 per cent higher amongst those whose first child is a girl, after adjusting for all the individual and contextual covariates (Model 3). Finally, the *cohort* of women who became exposed to the risk of second birth later (1991-95) are less likely to progress to second conception that the cohort who became exposed to this risk earlier (1986-90), even after all the individual and contextual factors are taken into account.

[1] The difference between the risk of second conception for different educational levels are statistically significant at 1-5%, except for university educational attainment which is not significantly different form secondary or high school levels.

The role of contextual-level factors: After adjusting for all the individual and contextual factors, the only covariates with statistically significant effects on the hazards of conception are the indicators of women's participation in the labour force, industrialisation, and children's enrolment in education. Specifically, living in areas where a higher proportion of women are economically active, a higher proportion of the population is employed in industrial sectors, or a higher proportion of children are enrolled in education reduces the probability of second conception. The contribution of all these factors is similar; in that living in areas with 1 standard deviation lower and higher values than the mean value of all the three covariates changes the hazards of second conception by eight per cent[1].

[1] This is the change in the hazards of conception in the duration between 13 and 16 months for women with primary school education and belonging to the baseline group of other individual-level variables. The changes in the hazards of conception in areas with 1 standard deviation lower and higher values than the mean value of the indicators of women's participation in the labour force, industrialisation, and children's enrolment in education are, respectively, 8.3, 8.5, and 8.1 per cent.

Table 6.5. Parameter estimates of discrete time hazard models for duration of progression to second conception, women who became exposed to the risk of conception between 1986 and 1995

Covariate	Model 1 (Duration + Ethnicity)	Model 2 (Individual-level variables)	Model 3 (Model2+ contextual-level variables)
Duration (months since the previous birth)			
0-2	0	0	0
3-5	1.075**	1.076**	1.078**
6-8	1.150 **	1.159**	1.161**
9-12	1.394**	1.413**	1.417**
13-16	1.679**	1.695**	1.710**
17-20	1.617 **	1.665**	1.683**
21-24	1.651 **	1.714**	1.734**
25-36	1.803 **	1.891 **	1.924**
37-51	2.620 **	2.739**	2.782**
Region (in terms of the predominant ethnicity)			
Persian-predominated	0	0	0
Gilak-predominated	-0.115*	-0.106*	0.007
Mazandarni-predominated	-0.186**	-0.152**	-0.146**
Turk-predominated	0.073**	0.015	-0.008
Kurd-predominated	0.115**	0.012	-0.060
Lur-predominated	0.130**	0.101**	0.022
Baluch-predominated	0.302**	0.178**	0.026

Covariate	Model 1	Model 2	Model 3
Persian or Turk-predominated	-0.099**	-0.097**	-0.051
Mixed	0.132**	0.106**	0.078**
Women's educational attainment			
Illiterate		0	0
Primary		-0.169**	-0.141**
Secondary		-0.372**	-0.347**
High school		-0.470**	-0.439**
University		-0.494**	-0.460**
Women's age at marriage (years)			
<18		0	0
18-22		-0.014	-0.011
23+		0.022	0.032
Women's age (years)			
<20		0	0
20-22		0.004	0.012
25+		0.032	0.039
Previous birth-conception interval (months)			
<13		0	0
13-24		-0.018	-0.011
25-36		-0.009	0.003
37+		0.014	0.018
Experiencing child mortality			

Covariate	Model 1	Model 2	Model 3
Not having a dead child		0	0
Having a dead child		0.487**	0.487 **
Sex of child			
Male		0	0
Female		0.036*	0.036*
Cohort			
Became exposed to childbearing during 1986-90		0	0
Became exposed to childbearing during 1991-95		-0.268**	-0.222**
Women's socio-economic status			
Proportion of women with post-primary schooling			-0.049
Proportion of women participating in the labour force			-0.903**
The process of socio-economic development			
Proportion of urban population			-0.021
Proportion of population employed in industry			-0.539**
Proportion of children enrolled in education			-0.374**
Proportion of children participate in the labour force			-0.216
Constant	-4.582**	-3.815**	-3.385**
Gamma variance	4.635e-07	1.633e-07	2.961e-07
Log likelihood	-75446.785	-74285.358	-74163.518

Note: * Significant at 5%, ** significant at 1%. The z statistics have not been presented to avoid the length of the table.

Cohort differences in the role of socio-economic and demographic factors: In order to assess the specific fertility response of cohorts of women who became exposed to the risk of second birth in 1986-90 and 1991-95, a discrete time hazard model with interaction terms between the covariate of cohort and other covariates is estimated. These results are presented in the Appendix, Table D and summarised in Table 6.6. Compared with women who became exposed to the risk of second birth between 1986 and 1990, the hazards of conception of women who became exposed to this risk during 1991-95 are lower amongst women who attained primary or secondary school educational levels, did not experience child mortality, and were living in urban areas and areas where a higher proportion of children are enrolled in education.

Table 6.6. Results of statistically significant interactions between the covariate of cohort and the socio-economic and demographic factors, progression to second conception

Cohort	Covariate	
1986-90	0	
1991-95	Education (primary)	-0.128**
	Education (secondary)	-0.112*
	Experiencing child mortality (having a dead child)	0.357**
	Proportion of urban population	-0.223*
	Proportion of population employed in industry	0.711*
	Proportion of children enrolled in education	-0.702*

Note: * Significant at 5%, ** significant at 1%. In this table, only the categories of those categorical variables with statistically significant effect are presented. For complete results, see Appendix, Table D.

6.3.1.2. The role of ethnicity

Accounting for the individual- and contextual- level factors removes ethnic differences in the probability of second conception (Model 3). Only women in the Mazandarani-predominated region have lower hazards of conception than those in the Persian-predominated region after adjusting for the socio-economic and

demographic factors. This suggests the importance of the cultural aspects associated with ethnicity in determining the childbearing behaviour of women in the Mazandarani-predominated region over the period of study.

In order to assess ethnic-specific responses to the socio-economic influences, a discrete time hazard model with interactions between the covariate of ethnicity and other covariates is estimated for the whole sample (women who became exposed to the risk of second conception in 1986-95). The results of statistically significant interactions are presented in Table 6.7. These results provide an evidence for some specific fertility responses to the socio-economic forces amongst the ethnic-predominated regions.

Compared with the Persian-predominated region, the probability of conception in the Turk-predominated region is lower in areas where more women have post-primary schooling or more children are enrolled in education and is higher in urban areas. In the Lur-predominate region, women with primary school education have higher hazards of conception compared with those in the Persian-predominated region. In the Baluch-predominated region, women who attained primary or secondary school educational levels, did not experience child mortality, and were living in areas where a higher proportion of women participate in the labour force experience higher hazards of conception, compared with those in the Persian-predominated region. The overall assessment of these specific influences is beyond the scope of this thesis and the future qualitative studies are needed to shed light on these influences.

Table 6.7. Results of statistically significant interactions between the indicator of ethnicity and the socio-economic and demographic factors, progression to second conception

Region (in terms of the predominant ethnicity)	Covariate	
Persian-predominated	0	
Gilak-predominated	-	
Mazandarani-predominated	-	
Turk-predominated	Proportion of urban population	0.435*
	Proportion of women with post-primary schooling	-0.877*
	Proportion of children enrolled in education	-1.173*
Kurd-predominated	-	
Lur-predominated	Educational attainment (primary)	0.154*
Baluch-predominated	Cohort (1991-95)	0.292*
	Education (primary)	0.277*
	Education (secondary)	0.368*
	Experiencing child mortality (having a dead child)	-0.325*
	Proportion of women participating in the labour force	13.3*

Note: In this table, only the categories of those categorical variables with statistically significant effect are presented. For other categories, see Table 6.5.

6.3.2. Progression to third conception

Table 6.8 presents the parameter estimates of three discrete time hazard models for duration of progression to third conception for women who became exposed to the risk of third birth between 1986 and 1995. Similar to the models estimated for progression to second conception (see Section 6.3.1), Model 1 includes duration (time since the second birth) and ethnicity. Model 2 adds the individual-level variables to Model 1, Model 3 includes all the individual- and contextual-level covariates. The results suggest that the gamma variance coefficient is not statistically significant (see Table 6.7). Therefore, the results of the models which does not account for unobserved heterogeneity are presented. The results of likelihood ratio test (Kirkwood and Sterne 2003) provides strong evidence ($p<0.0001$) that each nested model performs better. The next section discusses the effect of different socio-economic and demographic factors on the probability of progression to third

conception (Section 6.3.2.1). The following section elaborates ethnic fertility patterns and changes in the effect of ethnicity after accounting for the individual and contextual factors (Section 6.3.2.2).

6.3.2.1. The role of socio-economic and demographic factors

This section discusses the role of the covariates with a statistically significant influence on the probability of progression to third conception. The role of ethnic-predominated region is discussed in the next section.

The role of individual-level factors: First consider the role of *women's educational attainment.* Higher pre-university education reduces the hazards of conception. After accounting for the individual- and contextual-level covariates (Model 3), the odds of third conception are, respectively, 14.1, 21.2, 23.0, and 20.0 per cent lower for women with primary school, secondary school, high school, and university education than illiterate women[1]. Another individual-level factor with an influence on the probability of third conception is the survival status of children. Women with the experience of child mortality are more likely to conceive their third child. In the final model, the odds of third conception are 33.4 percent higher amongst women who lost at least one child than those whose children survived.

The role of contextual-level factors: The only covariate that influences the hazards of third conception is the indicator of children's enrolment in education. Living in areas where a higher proportion of children are enrolled in education reduces the hazards of conception. Living in areas with 1 standard deviation lower

[1] The difference between the risk of progression to second conception for different educational levels are statistically significant at 1-5%, except for high school educational attainment which is not significantly different from secondary school or university levels and also for university educational attainment which is only significantly different form illiteracy.

and higher values of the mean value of this covariate changes the hazards of third conception by 7.5 per cent[1].

Cohort differences in the role of socio-economic and demographic factors: In order to assess the specific fertility response of cohorts of women who became exposed to the risk of second birth in 1986-90 and 1991-95, a discrete time hazard model with interaction terms between the covariate of cohort and other covariates is estimated (see Appendix, Table D). Compared with the 1986-90 cohort, women's age is the only covariate that significantly influences the hazards of third conception in the 1991-95 cohort. The findings suggest that higher age reduces the hazards of conception in the 1991-95 cohort.

[1] This is changes in the hazards of conception in the duration between 13 and 16 months for women with primary school education and belonging to the baseline group of other individual-level variables.

Table 6.8. Parameter estimates of discrete time hazard models for duration of progression to third conception, women who became exposed to the risk of conception between 1986 and 1995

Covariate	Model 1 (Duration + Ethnicity)	Model 2 (Individual-level variables)	Model 3 (Model2+ contextual-level variables)
Duration (months since the previous birth)			
0-2	0	0	0
3-5	1.130**	1.140 **	1.141**
6-8	1.234 **	1.249**	1.248**
9-12	1.477**	1.494**	1.495**
13-16	1.955**	1.977 **	1.987**
17-20	2.013**	2.044 **	2.055**
21-24	2.124 **	2.162 **	2.175**
25-36	2.226 **	2.281**	2.306**
37-51	2.960 **	3.037**	3.072**
Ethnicity (in terms of the predominant ethnicity)			
Persian-predominated	0	0	0
Gilak-predominated	0.048	0.035	0.123
Mazandarani-predominated	-0.170*	-0.139*	-0.096
Turk-predominated	0.046	-0.015	-0.042
Kurd-predominated	0.131**	0.022	-0.041
Lur-predominated	0.038	0.019	-0.003
Baluch-predominated	0.266**	0.212**	0.101 *

Covariate	Model 1	Model 2	Model 3
Persian or Turk-predominated	-0.028	-0.032	-0.006
Mixed	0.088**	0.080**	0.078*
Women's educational attainment			
Illiterate		0	0
Primary		-0.167**	-0.152**
Secondary		-0.265**	-0.238**
High school		-0.290**	-0.261**
University		-0.255*	-0.223**
Women's age at marriage (years)			
<18		0	0
18-22		-0.045	-0.040
23+		-0.111	-0.102
Women's age (years)			
<20		0	0
20-22		0.046	0.052
25+		0.039	0.044
Previous birth-conception interval (months)			
<13		0	0
13-24		-0.042	-0.041
25-36		-0.058	-0.056
37+		-0.070	-0.064

Covariate	Model 1	Model 2	Model 3
Experiencing child mortality			
Not having any dead child		0	0
Having at least a dead child		0.289 **	0.288**
Sex of children			
Male		0	0
Female		0.040	0.041
Mixed		-0.029	-0.030
Cohort			
Became exposed to childbearing during 1986-90		0	0
Became exposed to childbearing during 1991-95		-0.222**	-0.182**
Women's socio-economic status			
Proportion of women with post-primary schooling			-0.128
Proportion of women participating in the labour force			-0.464
The process of socio-economic development			
Proportion of urban population			-0.006
Proportion of population employed in industry			-0.118
Proportion of children enrolled in education			-0.332*
Proportion of children participate in the labour force			0.343
Constant	-4.905**	-4.419**	-4.118**
Gamma variance	5.827e-08	5.277e-07	5.304e-07
Log likelihood	-52305.413	-51908.462	-51845.183

Note: * Significant at 5%, ** significant at 1%. The z statistics have not been presented to avoid the length of the table.

6.3.2.2. The role of ethnicity

Accounting for the individual- and contextual-level factors removes ethnic differences in the probability of third conception (Model 3). Only women in the Baluch-predominated region have higher hazards of conception than those in the Persian-predominated region, suggesting strong cultural influence on the childbearing behaviour of these women.

The results of a discrete time hazard model with interactions between the covariate of ethnicity and all the socio-economic and demographic factors for women who became exposed to the risk of third conception between 1986 and 1995 (results not shown here) provides some evidence of the specific fertility responses to the socio-economic factors amongst the ethnic-predominated regions. Compared with the Persian-predominated region, high school educational attainment, experiencing child mortality, and longer intervals between first birth and second conception increase the probability of third conception, respectively, in the Gilak-, Turk-, and Kurd-predominated regions. As mentioned earlier, future studies are needed to shed light on these specific influences.

6.4. Discussion

By analysing different aspects of the recent change in the childbearing behaviour of Iranian women, this chapter investigated the research questions. The chapter examined the correlates of progression to second and third conceptions amongst women at risk for these transitions during the period of substantial fertility decline (those who became exposed to the risk of second or third births between 1986 and 1995) (Question 1), the role of ethnicity after accounting for ethnic diversity in socio-economic attributes (Question 2), and ethnic-specific patterns of the influences

of socio-economic and demographic forces at the individual and contextual levels (Question 3). The chapter also examined the childbearing behaviour of consecutive cohorts of women who contributed to this decline (the 1986-91 and 1991-95 cohorts) (Question 4). This section summarises the findings in response to each question.

The findings suggest that the decline in the probability of second and third conceptions since the mid 1980s was related to improvements in women's education and reductions in child mortality (at the individual level). Higher education was found to reduce the hazards of conception, whereas experiencing child mortality was found to increase this probability. At the contextual level, children's higher enrolment in education was found to reduce the probability of both conceptions (second and third). This can be explained by the increase in the costs and reduction in the benefits of childbearing in these areas.

The probability of second conception was also found to reduce in industrial areas. Although living in areas where a higher proportion of women participate in the labour force reduces the hazards of second conception, this factor is unlikely to have made a notable contribution to the recent fertility decline because paid work is uncommon amongst Iranian women. The findings also suggest higher probability of second conception amongst women whose first child was a girl.

Turning to the second and third research questions, the findings suggest that ethnic patterns of the probability of progression to second and third conceptions are strongly related to ethnic differences in the socio-economic and demographic forces as the effect of ethnicity generally disappeared after accounting for these factors. The results also provide some evidence of ethnic patterns of the influences of socio-economic factors at the individual and contextual levels.

Finally, the reduction in the probability of second conception in the 1991-95 cohort was related to the reduction in child mortality and improvements in women's educational attainment (primary and secondary school) (at the individual level). At the contextual level, the reduction in the probability of second conception in the 1991-95 cohort was related to the process of development. Specifically, living in urban areas and areas where a higher proportion of children were enrolled in education was found to reduce the hazards of second conception.

The findings suggest that the reduction in the probability of third conception amongst the 1991-95 cohort was only related to their older age structure (at the individual level). Compared with the 1986-90 cohort, an increase in age results in lower hazards of third conception amongst women who became exposed to the risk of third birth between 1991 and 1995. For the latter cohort who was exposed to the risk of third birth in the 1990s when the country experienced a rise in material aspirations, it seems that older women became less likely to progress to third birth. In a society where material desires have risen and raising high quality children has become important, this can suggest that the rationality that comes with age has resulted in less desire for progression to third birth. This finding suggests that the reduction in progression to third conception in the 1991-95 cohort has happened regardless of most socio-economic and demographic factors, probably reflecting a common preference for stopping at two children. This is consistent with the findings of Hosseini-Chavoshi, McDonald, and Abbasi-Shavazi (2006); using data from the 2000 IDHS and examining synthetic parity progression ratios, they found a pattern of *stopping at two* in the recent fertility decline in Iran.

Chapter 7

Summary and conclusion

7.1. Introduction

This thesis aimed to investigate the patterns and determinants of the substantial marriage postponement and fertility decline experienced by Iranian women during the last two decades of the twentieth century, by accounting for the role of ethnicity and changes in the socio-economic context over time. During this period, the average age at marriage of Iranian women increased by three years and the number of their children reduced by over four children per woman. These demographic changes corresponded with profound changes in the socio-economic context (e.g. improvements in education, urbanisation, economic fluctuations, etc.) and differed

between Iranian ethnic groups, probably due to their dissimilar cultural and socio-economic attributes. The existing demographic literature in Iran has not studied the recent marriage postponement and fertility decline by taking temporal changes in the socio-economic context into account. In addition, previous studies have not examined the role of ethnicity by accounting for ethnic diversity in socio-economic changes over time, nor explored ethnic patterns in response to these influences. This study aimed to address these gaps in the existing literature. It, specifically, accounted for temporal changes in the socio-economic context of marriage and childbearing by incorporating time-varying district-level contextual measures (derived from two rounds of Iranian censuses) with individual-level measures (derived from the 2000 Iran Demographic and Health Survey). By examining the marriage timing and fertility patterns of the cohorts of women who contributed to the recent marriage and fertility changes in Iran[1], this study provided an insight into the role of the timing of important socio-economic changes in Iranian society and on the specific influence of those changes on the demographic response of cohorts with distinct life course experiences. Another contribution of this thesis is in recognising the multi-ethnic composition of the population of Iran when analysing the recent demographic changes. The thesis, in particular, examined the role of ethnicity on the marriage timing and fertility behaviour by accounting for ethnic-diversity in socio-economic changes over time and explored the cultural sensitivity of different ethnic groups to socio-economic influences. This is crucial for a full understanding of the demographic change which occurred in Iran in a short period of time and the implications of the role of ethnicity for shaping demographic processes in the future.

[1] In the marriage analysis, these cohorts included the 1966-70, 1971-75, 1976-80 birth cohorts. In the fertility analysis, these cohorts include women who became exposed to the risk of childbearing during 1986-90 and 1991-95.

The findings of this thesis will inform policy makers of the role of different social, economic, demographic, and cultural factors in marriage and fertility change and hence assist in the design of marriage and fertility programmes. For instance, the contribution of women's educational attainment and participation in the labour market, the suitability of the spouse supply in terms of age and economic status, or the process of urbanisation and industrialisation can be taken into account in designing programmes to reach marriage goals. Similarly, the role of women's socio-economic status, the process of development, or such factors as the survival status of children and sex preference can be taken into account in designing fertility programmes. The findings will also assist policy makers to take account of ethnicity for the population forecasts and to design specific programmes to enable different ethnic groups reach marriage and fertility goals. This thesis has also made a contribution to the methodological literature by incorporating contextual-level time-varying measures with individual-level measures and by accounting for unobserved heterogeneity due to unmeasured characteristics in the analysis. The final section of each result chapter (Chapters 4-6) answered to the research questions proposed in the first chapter (Section 1.4). This chapter discusses the main findings of this thesis together with their policy implications (Section 7.2) and discusses the data limitations and suggestions for future research (Section 7.3).

7.2. Key findings and policy implications

The main findings of this research are presented in this section. Section 7.2.1 discusses the role of socio-economic and demographic factors in the recent marriage postponement and fertility decline in Iran. Section 7.2.2 illustrates the contribution

of ethnicity to women's marriage timing and fertility behaviour. Section 7.2.3 discusses the methodological contribution of this thesis.

7.2.1. The role of socio-economic and demographic factors

In order to account for changes in the socio-economic context of marriage and childbearing, several contextual measures at the district level were derived from the 1986 and 1996 Iranian censuses and linked to the individual-level characteristics from the 2000 IDHS. The measures included in the analysis were selected according to several theories of marriage and fertility. In the marriage analysis, the contextual measures included several indicators of the marriage market, women's socio-economic status, and process of development and the individual measures consisted of women's age, birth cohort, and educational attainment. In the fertility analysis, the contextual measures included the indicators of women's socio-economic status and process of development and the individual measures consisted of the characteristics of women (age, marriage timing, educational attainment, and the period in which women became exposed to the risk of childbearing) and some characteristics of previous child/children (birth interval, survival status, and sex).

The findings suggest that the recent marriage postponement was related to improvements in women's education and restrictions in the marriage market, with the former being the only factor contributing to changes in the marriage timing of consecutive (1971-75 and 1976-80) birth cohorts. The recent decline in the probability of second and third conceptions was related to improvements in women's education, reductions in child mortality, and improvements in children's enrolment in education. The contribution of son preference to the conception of a second child and the different impact of urbanisation and industrialisation on the recent marriage

and fertility changes were also notable discoveries. Different socio-economic factors (improvements in women's education, reductions in child mortality, and improvements in children's enrolment in education) were found responsible for the change in the probability of second conception across consecutive cohorts of women (those who became exposed to the risk of childbearing in 1986-90 and 1991-95), whereas cohort differences in the probability of third conception was not generally related to socio-economic forces, probably reflecting a common preference for stopping at two children.

This section discusses these findings in detail. We begin by illustrating the impact of education on the recent marriage and childbearing changes and speculating possible reasons for such influences. Then, the influence of marriage market on marriage postponement and the impact of child mortality and sex preference on fertility decline are discussed. This section ends by comparing the effect of urbanisation and industrialisation on the recent marriage and fertility changes in Iran.

The role of education: Iranian women experienced a remarkable improvement in education over the last decades of the twentieth century. Only one in every three Iranian women was literate in the mid 1970s whereas by the mid 1990s, three out of every four women were literate (Statistical Centre of Iran 2007). Similarly, increasingly more women attained higher levels of education over time. This educational improvement (at the individual level) played an important role in the recent postponement in the marriage (amongst women born between 1966 and 1980) and reduction in the probability of second and third conceptions (amongst women who were at the risk of childbearing between 1986 and 1999). At the contextual level, the marriage postponement was also related to women's higher

post-primary schooling in area. The specific impact of education on the demographic behaviour of Iranian ethnic groups is discussed in the next section.

In the last two decades of the twentieth century, women with higher pre-university education were found less likely to marry and to conceive their second and third children. The reduction in the probability of these transitions was not found to the same extent from pre-university to university education. It seems that transition to such adulthood role as marriage and childbearing is more likely to be postponed until Iranian women graduate from high school. Aghajanian (1998) also noted the social norm for postponing the marriage of Iranian women until high school graduation.

This finding is confirmed by the cohort analysis of marriage where the marriage timing of the birth cohorts who contributed to the recent marriage postponement (1971-75 and 1976-80 birth cohorts) was analysed. High school education was the only factor (individual or contextual) that explained later marriage of the younger birth cohort. In the cohort analysis of fertility (where the childbearing behaviour of women who became exposed to the risk of second or third conceptions during 1986-90 and 1991-95 was analysed) primary and secondary school educational attainment were found to reduce the probability of second conception in the cohort who became exposed to the risk of childbearing later (1991-95 cohort). This might suggest the more important role of access to education in changing women's attitude and behaviours. For instance, changes that access to the knowledge beyond the family and community network can make in women's perception regarding the quality of children and the idea of birth control or in applying efficient ways to achieve the couple's desired family size.

A number of reasons can be speculated for the impact of the educational attainment of Iranian women on their transition to marriage and progression to higher birth orders. Later marriage of higher educated women can partly be explained by restrictions in continuation of education after marriage. Even in 1996, only 2.1 per cent of married women were enrolled in education (Statistical Centre of Iran 2007). Blossfeld (1995) found that women's higher education reduces the probability of marriage only in societies where despite substantial gender equality in societal roles the gender equality in family roles remains low. A question arises from this argument: What is the role of post-marital opportunity for educational attainment in the marriage timing of Iranian women? In other words, can an increase in the opportunity of educational attainment after marriage prevent marriage postponement amongst Iranian women, at least to some extent?

This question can be addressed by examining the contribution of women's post-marital opportunity for educational attainment to their transition to first marriage[1]. The measure of the post-marital opportunity for educational attainment is a district-level contextual covariate measured by the proportion of married women enrolled in education. The findings suggest that after accounting for women's characteristics at the individual level and changes in the socio-economic context, living in areas where a higher proportion of married women are enrolled in education increases the probability of marriage (see Appendix, Table E). This suggests that the marriage postponement of Iranian women can partly be prevented by increasing their opportunity for educational attainment after marriage and highlights the role of gender equality in the family sphere in a society where, despite a strong emphasis on marriage, higher educational opportunities for women result in their later marriage.

[1] This analysis applies a discrete time hazard model to the data from the 2000 IDHS linked to the contextual-level data from the 1986 and 1996 censuses. The measures included in the analysis and the estimated models are shown in Appendix, Table E.

Although Iranian women have gained greater freedom in family decision makings and there is a growing positive perception regarding women's social and economic roles in the society (Mohseni 2000; Shadi-Talab 2001), changes in the family organisation is quite slow (see McDonald 1994). Thus, a rise in gender equality in family roles to the same extent as equality in the individual roles is unlikely to be achieved in the near future and have an immediate impact on the marriage of Iranian women.

In addition to this cultural aspect, the supply side of women's post-marital opportunity for education should also be taken into consideration. In other words, although the social acceptability of women's education after marriage is important, adequate facilities need to be provided to ensure that women have access to education after they get married. In Iran, married women are not allowed to study in the same schools as unmarried women; in fact, special schools enrol married women as well as those women who cannot study full-time, for such reasons such as participation in the labour market. Higher availability of these schools even in remote areas can increase the opportunity for women's post-marital education and result in higher chances of marriage.

Similarly at the tertiary level, women's acceptance in universities in their area of residence can increase their chances of education continuation. Even if accommodation facilities are provided for married couples by universities, a typical husband may not be willing to lose his social and economic opportunities just to accompany his wife to another district or province for university education, particularly in a context where paid work in uncommon for women and economic returns to women's education are not substantial. This may considerably shrink the pool of suitable spouses for a female university student. These women may postpone

marriage until they finish their education which may, in turn, place them in a disadvantaged position in marriage market. This reverse causal effect of education in the context of East and Southeast Asia has extensively been discussed by Jones (2004). One solution to this situation can be facilitating the enrolment of married women in universities close to their place of residence which can prevent marriage postponement for women who are willing to and have the capability of university education. This research does not allow us to further investigate the role of either cultural or supply aspects of women's post-marital opportunity for education and future studies are needed to shed light on these interesting subjects.

The recent fertility decline in Iran can also be related to a rise in gender equality in the individual roles, such as educational attainment, which has not been accompanied to the same extent in equality in the family roles. In an explanation of the causes of the very low fertility levels witnessed in developed countries, McDonald (2000) argues that when gender equality in the individual-oriented institutions (such as education and employment) is achieved in a greater extent than in the family sphere, women opt to remain childless or limit the number of children. This issue is not addressed in this thesis because of the lack of information to measure such equality in individual and family roles; Iranian censuses do not provide information regarding women's enrolment in education by their motherhood status or the number of children. If the results found for the marriage analysis also hold for the fertility levels of Iranian women, we can agree with McDonald (2000) in that a higher gender equality in women's family roles (as wives or mothers) is necessary to avoid a persistent low fertility in a society where women have enjoyed high levels of equality as individuals. As discussed for the marriage of Iranian women, both the cultural and supply aspects of education continuation after

childbirth can contribute to the childbearing decision of Iranian women. This interesting subject is, however, beyond the scope of the present research.

Another aspect of the recent substantial improvement in the educational attainment of Iranian women is that it has happened in a context of very low participation in the labour market. Several studies (e.g. Jones 2004, 2007, 2009) have attributed the late marriage and low fertility of the East and Southeast Asian countries (e.g. Japan, South Korea, and Singapore) to the opportunity costs of marriage and childbearing in a context that women's higher educational attainment translates into higher opportunity of paid work. In the Middle East and North African (MENA) region, Iran and Turkey have similar female mean age at marriage (22.1 and 21.8 in the late 1990s, respectively) and total fertility rates (2.1 and 2.5 children per woman in the early 2000s, respectively) and more than three quarter of women are literate in these two neighbouring Muslim countries (Tabutin and Schoumaker 2005). Yet, the female participation in the labour force (amongst 25-54 year-olds in the late 1990s) in Turkey (32.9%) is more than 2.5 times higher than Iran (12.5%) (United Nations Population Division 2001). In fact, the female participation in the labour force in Iran is one of the lowest in the MENA and even in the world (United Nations Population Division 2001). How can we explain the opportunity costs of marriage and childbearing for highly educated Iranian women when their higher educational attainment does not translate into higher opportunity for paid work?

The pathway in which education influences the marriage timing and fertility of Iranian women should be studied in the unique context of this country. The educational attainment of Iranian women has not translated into their higher paid work outside home. Instead, it appears that they have become more engaged in

activities such as attending language (English, French, etc.), art (painting, sewing, etc.), and computer courses, religious gathering (reciting and interpreting Quran, learning Islamic regulations, etc.), sport and beauty salons (which are sex segregated). In addition, taking part in daytime family and friend gatherings has become very common amongst Iranian women. Most of these activities are more common amongst educated women. A typical unmarried woman who has graduated from high school or university and is not employed in a paid work is more likely to enrol in English, art, or other courses to remain socially active, to increase her human capital, and maybe to become more attractive in the marriage market. These activities introduce new opportunity costs of marriage which are different from those related to paid work and observed in other countries. Furthermore, the economic status of the future husband becomes very important in this context in order to ensure that women can enjoy these activities after marriage. We return to the role of marriage market later in this section.

Similarly for married women, the time and money required to participate in these activities lower the demand for a large family size. In addition, heightened material aspirations and the importance of the quality of children have been shown by previous studies (see, e.g. Mohseni 2000 and Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2003). Women with higher education are more likely to invest in the quality of their children, simply because they are more aware of the advantages of investment in their children's human capital. The time and money required to invest in children's education and health reduce the demand for a large family size. These requirements lower the immediate benefits and increase the costs of children and result in lower fertility. This is confirmed by the findings of this thesis: amongst women who were exposed to the risk of childbearing between 1986 and 1999, those

living in areas where a higher proportion of children are enrolled in education were found less likely to progress to second or third births. Compared with women who became exposed to the risk of second birth between 1986 and 1990, the lower probability of second conception amongst those who became exposed to this risk during 1991-95 was in part related to this factor. As children who are enrolled in formal education are also more likely to be enrolled in extra courses such as English, computer, art, etc., this finding can indicate a growing importance of the quality of children to ensure a successful future. The role of this ideational change in the recent fertility decline in Iran has also been mentioned in previous studies (see, e.g, Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2009).

The role of marriage market: The availability of suitable spouses also contributed to the recent postponement in the marriage of Iranian women. Living in areas with higher availability of employed men increased the probability of marriage, whereas higher availability of employed men reduced the probability of marriage of women who experienced marriage postponement (those born between 1966 and 1980). Therefore, the recent marriage postponement was partly related to a rise in the number of young men continuing their education and also to economic fluctuations in the country and a rise in material expectations that have probably increased the importance of men's current economic status.

The role of the economic status of husband in providing the opportunity for his wife to participate in different social activities has already been mentioned. The financial requirements for marriage should also be noticed. The groom or his family should provide a special gift for the bride (*Mehrieh* which is usually several gold coins, money, or property), a home, and several gifts for the bride (including jewellery and cloths). Moreover, marriage in Iran requires several ceremonies. These

usually include an engagement party, a wedding ceremony, and a post-wedding ceremony (*patakhti*) in which those who were invited to the wedding present their gifts to the newlyweds. Although the engagement party is usually hosted by the bride's family, even in this ceremony several gifs (including jewellery) are presented to the bride by the groom or his family. Honeymoon trips have also become more common, whose costs should be covered by the groom. In a study of the social and cultural developments through three generations (grandparents, parents, and children) in Tehrani families, Azad-Armaki, Zand, and Khazai (2000) showed the intensification of marriage ceremonies over time (across generations). For instance, only 18 per cent of the first generation (grandparents) expressed that they had a wedding ceremony, compared with over 40 per cent of the third generation (children). Similarly, only 9 per cent of grandparents expressed that they had a complete wedding shopping, compared with around 30 per cent of children. Although these patterns can vary across the country, between rural and urban areas, and between families with different socio-economic backgrounds, they show how the material aspects have become important in marriage formation and highlight the importance of the economic status of young men or their family resources.

According to the findings of this thesis, age preference was the most flexible characteristic of the spouse supply during the period of study as its effect on the probability of marriage was not statistically significant. This suggest that the important role which is given to sex imbalance (caused by the mid 1980s baby boom) in the continued marriage delay of Iranian women (see, e.g. Abbasi-Shavazi and McDonald 2006; Abbasi-Shavazi, Hosseini-Chavoshi, and McDonald 2007; Egel and Salehi-Isfahani Forthcoming) should probably be shifted towards the role

of adequate occupational opportunities and secure economic status that enable young men to meet the requirements of marriage.

The role of child mortality and sex preference: The recent fertility decline in Iran was in part related to reductions in child mortality. Amongst women who became exposed to the risk of second or third birth between 1986 and 1995, those whose previous child/children survived were less likely to progress to a higher birth order. Similarly, the lower probability of second conception amongst women who became exposed to the risk of childbearing during 1991-95 (compared with the 1986-90 cohort) was in part related to this factor. As suggested by Preston (1987), child mortality can increase childbearing by the termination of breastfeeding, which enhances the return of fecundity, and the desire to replace the lost child. In addition, in a society where child mortality is high, parents may decide to increase their family size in order to ensure their desired number of children will survive. Therefore, a continued decline in child mortality, such as happened in Iran in the 1980s and 1990s, could result in lower fertility through both biological and behavioural mechanisms. The findings also suggest that son preference contributed to the probability of conception of second child. Amongst women who became exposed to the risk of childbearing between 1986 and 1995, those whose first child was a girl were more likely to conceive their second child.

The role of urbanisation and industrialisation: The population of Iran has become increasingly urban; in the mid 1970s less than half of the population (46.9%) lived in urban areas, compared with 61.3 per cent in the mid 1990s (Statistical Centre of Iran 2007). Similarly, the country became more industrialised; by the mid 1990s over 30 per cent of the population of Iran were employed in industrial sectors

whereas this proportion was around 25 per cent in the mid 1980s (Statistical Centre of Iran 2007).

According to the findings of this thesis, urbanisation and industrialisation have made different contributions to the marriage timing and fertility behaviour of Iranian women over the period of study. Living in urban and industrial areas was found to increase the probability of marriage of women who experienced marriage postponement (those born between 1966 and 1980). Therefore, the recent rise in the age at marriage of Iranian women was not related to the ongoing process of urbanisation and industrialisation in the country. The effect of the socio-cultural environment of urban and industrial areas in promoting marriage delay appears to have been offset by better economic conditions in these areas which facilitate marriage.

However, the results of fertility analysis suggest that amongst women who became exposed to the risk of second birth during 1986-95, those living in industrial areas were less likely to conceive their second child. Furthermore, the lower probability of second conception amongst women who became exposed to the risk of second birth during 1991-95 (compared with the 1986-90 cohort) was in part related to the process of urbanisation. The role of urbanisation and industrialisation in the recent fertility decline in Iran can be attributed to the social and economic context of urban and industrial areas. In these areas large family size is not as rewarding as in rural areas where familial modes of production are prevalent and the economic benefits of children are higher and their costs are lower. In addition, non-familial institutions and new forms of investments can be more available in urban and industrial areas. This reduces the reliance of families on their children as sources of security in old age.

Overall, the findings suggest that the goal of early and universal marriage in Iran is more likely to be achieved in a socio-economically developed context where young men are provided with secure economic status. However, higher development and improved economic status and even women's higher educational attainment in the future can result in higher economic expectations and marriage requirements which, in turn, may lead to further delay in women's marriage. In addition, women's participation in the labour force was found to reduce the probability of marriage. In a context of growing educational attainment for Iranian women and an increased acceptance and desire for women's work (Mohseni 2000; Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2003), a rise in women's paid work and a resulting delay in their marriage can be expected. In fact, the proportion of Iranian women participating in the labour force reached 16 per cent by 2006 (Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2009). However, the employment rates of Iranian women are not expected to dramatically rise in the near future, simply because they are precluded in some areas of employment (e.g. construction, sales, hotel industry, etc.) (see Abbasi-Shavazi et al. 2002).

The continued process of development and improvements in the education of Iranian women and children are likely to contribute to further declines in the fertility level of Iranian women in the future. In fact, the total fertility rate (TFR) of Iranian women reached 1.9 by 2006 (Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi 2009). Although the recent fertility decline in Iran was in part due to reductions in child mortality, the recent stall in child mortality suggests the diminishing importance of this factor in the fertility levels of Iranian women. By 2009, the infant mortality rate (IMR) in Iran still remained around 30 deaths per 1000 live births (Population Reference Bureau 2009). The role of population policy in the future of

fertility in Iran should also be noticed. The recent remarkable fall in fertility has happened in a context where low fertility was encouraged and supported by the government. There are, however, some indications of concern amongst the political leaders about the low fertility levels in the country. In a move to encourage childbearing, the Iranian President, Mahmoud Ahmadinejad, inaugurated an initiative in July 2010 to pay families for every new child and deposit money into the newborn's bank account until they reach the age of 18. Abbasi-Shavazi, McDonald, and Hosseini-Chavoshi (2003) showed that governmental financial support is unlikely to play an important role on the fertility decision of couples in four selected provinces of Iran[1]. However, the future fertility trends will show to what extent the demand for children will be influenced by such programmes.

7.2.2. The role of ethnicity

Recent marriage and fertility changes were not experienced similarly by different ethnic groups. The existing demographic literature suggests the independent effect of ethnicity on the age at marriage and the number of children of Iranian women after accounting for individual- and household-level socio-economic characteristics. However, previous studies did not examine the role of ethnicity on the marriage timing and fertility behaviour of Iranian women by accounting for ethnic diversity in socio-economic changes over time, nor explored ethnic differences in relation to these influences. This thesis tried to address these literature gaps.

The findings show changes in the effect of ethnicity on both the marriage timing and childbearing experience after accounting for ethnic diversity in the individual-level factors and changes in the socio-economic context. Accounting for

[1] These provinces include Gilan, Sistan-and-Baluchistan, West Azerbaijan, and Yazd.

these factors changed the ethnic pattern of women's transition to first marriage and removed differences in the probability of second and third conceptions between different ethnic groups. These findings are consistent with the findings of Abbasi-Shavazi and Sadeghi (2005 and 2006): the reduction in the effect of ethnicity on the fertility of Iranian women after accounting for a number of individual- and household-level variables (60.0%) was more than twice as great as the reduction in the effect of ethnicity on women's age at marriage (25.7%). It seems that accounting for contextual factors in this thesis has reduced the effect of ethnicity on women's childbearing even to a higher extent and nearly totally removed ethnic patterns of the second and third conceptions. The more important role of ethnicity in the marriage timing (compared with childbearing behaviour) of Iranian women can be related to the stability and high prevalence of consanguineous marriage (Abbasi-Shavazi and Torabi 2007a and b) and a high level of intra-ethnic marriages (Abbasi-Shavazi and Sadeghi 2005) in Iran. However, the impact of ethnicity on women's age at marriage is expected to reduce in the future, as suggested by the cohort analysis of marriage: ethnic differences in transition to first marriage reduced over time (less pronounced in the younger birth cohort).

The findings also provided some evidence of ethnic patterns in the influence of different individual- and contextual-level factors on transition to first marriage and progression to second and third conceptions. These findings confirm the results of previous studies (Lesthaeghe 1983; Thornton and Fricke 1987; Lesthaeghe and Surkyn 1988; Thornton and Lin 1994; Abbasi-Shavazi et al. 2009), suggesting the role of the pre-existing cultural values and norms in shaping the individual's demographic behaviour. For instance, the findings of this thesis showed that the marriage timing of women in the Baluch-predominated region was not generally

influenced by different individual and contextual factors. This suggests the limited contribution of socio-economic factors to the demographic behaviours (such as marriage) in a traditional context where arranged and consanguineous marriage is common and women's roles are mainly limited to family roles. The only factor contributing to the marriage timing of this group was women's educational attainment. This shows the important role of education in changing the cultural values and norms associated with ethnicity. Another example is the contribution of women's higher socio-economic status (education and participation in the labour market) to the persistently later marriage of women in the Gilak-predominated region. This group have displayed the lowest arranged and consanguineous marriage in the country (Abbasi-Shavazi and Sadeghi 2005; Abbasi-Shavazi and Torabi 2007a) and enjoyed higher levels of autonomy, compared with other groups (Abbasi-Shavaiz et al. 2004).

7.2.3. The methodological contribution

The findings of this thesis provided not only a substantive contribution to the demographic literature in Iran by shedding more light on the nature of the recent marriage and fertility changes, but also a methodological contribution by incorporating socio-economic and cultural changes in time and geographic space with individual-level measures. Another methodological contribution of this research is accounting for unobserved heterogeneity in the marriage and fertility analyses in order to address the issue of unmeasured characteristics (the omitted variables). The results of marriage analysis suggest that unobserved heterogeneity should be taken into account in analysing the transition to first marriage, as accounting for this factor considerably changed the estimated coefficients. This shows the role of the omitted

variables (e.g. women's family background characteristics, marriage patterns such as arranged and consanguineous marriage, women's pre-marriage work experiences, etc.) in the marriage timing of Iranian women over the period of study. In the fertility analysis, however, accounting for unobserved heterogeneity was not found to change the results. In other words, this thesis did not find any evidence of the impact of the omitted variables (e.g. breastfeeding, contraceptive use, etc.) on the childbearing behaviour of Iranian women. This can be explained by the dominance of the role of these unmeasured characteristics by the role of other variables such as education or the period of exposure to the risk of childbearing.

7.3. Data limitations and suggestions for future research

The limitations in the data and software have been mentioned in previous chapters. This section summarises these limitations and discusses what information is needed for providing a clearer picture of demographic processes in Iran. This research was undertaken as a secondary analysis of collected data. As such, the selection of variables was restricted to the available information in the survey and censuses. There are further variables that would have been included in the marriage analysis if the information were available; including women's family background characteristics (e.g. socio-economic status of parents, number of siblings, birth order, etc.) and pre-marriage employment and economic status as well as such family patterns as consanguinity and arranged marriage. The fertility analysis also suffered from the lack of information on economic status of parents and some proximate determinants of fertility (e.g. breastfeeding, contraceptive use[1], etc.). As mentioned

[1] The 2000 IDHS does not provide any information regarding the history of contraceptive use. Contraceptive use cannot be introduced as a time-varying contextual-level variable as no source of data is available to provide information regarding the geographic distribution of contraceptive use

in the previous section, the issue of omitted variables was addressed in this thesis by accounting for unobserved heterogeneity and no evidence of the direct influence of such factors was found in the fertility analysis.

Another limitation was the lack of information on respondents' ethnic group in the data sources applied in this research (IDHS and censuses). This issue was addressed by using geographic regions as proxies for ethnicity. This approach has limitations in measuring ethnicity per se. and in distinguishing the cultural influences associated with ethnicity form geographic influences. However, this was the only way to account for the multi-ethnic composition of the population of Iran in analysing the recent marriage and fertility changes.

Furthermore, due to the lack of retrospective information about respondents' place of residence in the IDHS, their district and province of residence at the time of survey was considered as their place of residence during the period of study. Although this place could have varied over time, the flow of migration between districts and particularly between provinces was not large during the period of study.

The software (pgmhaz in STATA) limitations included the very slow procedure (particularly using the large sample size derived from the IDHS), difficulties in convergence, and not allowing for the multi-level structure of the data. However, this software was applied based on its specific advantages (accounting for the unmeasured characteristics in the marriage and fertility analyses and providing accurate estimates of hazard rates).

This thesis only examined the marriage timing of Iranian women. However, marriage involves both men and women. The marriage timing of Iranian men remained relatively stable at around 25 years over the period of 1966-96

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during the period of study. The only data with such information, *Zij*, only collect data from rural areas.

(Kazemipour 2004). Nevertheless, exploring the correlates of men's marriage timing can shed more light on the process of transition to marriage in Iran.

Collecting the following information in future surveys can provide more insight into the marriage and fertility processes in Iran:

- Family background characteristics of men and women
- Time-varying information about the employment status of men and women and different proximate determinants of fertility (either by conducting longitudinal surveys or by collecting retrospective information in cross-sectional surveys)
- Family patterns (such as arranged and consanguineous marriage)
- Costs involved in marriage (ceremonies, housing, wedding shopping, etc.) and childbearing (from delivery costs to costs related to education, health, and leisure activities)
- Time and money spent by women in different types of social activities
- The perception of women (as well as men) about the value of women's family roles (as mothers and wives) as compared with their social and economic roles
- Spouse preferences and requirements perceived by young men and women for marriage and childbearing.

Providing this information by women's educational attainment, employment status, rural-urban place of residence, and ethnic group enable researches to shed more light on marriage and fertility differentials in Iran and help policy makers to design efficient programmes for different segments of the society to achieve desired family goals. Future research will also benefit from comprehensive demographic-anthropological studies which identify the nature of marriage and fertility patterns amongst ethnic groups and contribute to understanding of the attitudes and

perceptions guiding ethnic patterns of the role of the social, economic, and demographic factors.

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Appendix

Table A. Parameter estimates of discrete time hazard models for duration of women's transition to first marriage, including interactions between the covariate of ethnicity and other covariates

Covariate	Model
Region (in terms of the predominant ethnicity)	
Persian-predominated	0
Gilak-predominated	1.600
Mazandarani-predominated	1.489
Turk-predominated	1.020**
Kurd-predominated	0.971*
Lur-predominated	2.293**
Baluch-predominated	1.703**
Persian and Turk-predominated	-0.635
Mixed	1.092**
Duration (Years since the age of 10)	
0-3 (corresponds with ages 10-13)	0
4-7 (corresponds with ages 14-17)	1.895**
8-10 (corresponds with ages 18-20)	2.247**
11-14 (corresponds with ages 21-24)	1.916**
15-19 (corresponds with ages 25-29)	1.479**
20-24 (corresponds with ages 30-34)	0.658**
Interaction between region and duration	
0-3 in the Persian-predominated	0
4-7 in the Persian-predominated	0
8-10 in the Persian-predominated	0
11-14 in the Persian-predominated	0
15-19 in the Persian-predominated	0
20-24 in the Persian-predominated	0
0-3 in the Gilak-predominated	0
4-7 in the Gilak-predominated	0.223
8-10 in the Gilak-predominated	0.365
11-14 in the Gilak-predominated	0.674*
15-19 in the Gilak-predominated	1.043**
20-24 in the Gilak-predominated	0.945*
0-3 in the Mazandarani-predominated	0
4-7 in the Mazandarani-predominated	0.302
8-10 in the Mazandarani-predominated	0.383*
11-14 in the Mazandarani-predominated	0.472*
15-19 in the Mazandarani-predominated	0.579*

Covariate	Model
20-24 in the Mazandarani-predominated	0.795
0-3 in the Turk-predominated	0
4-7 in the Turk-predominated	0.027
8-10 in the Turk-predominated	0.0001
11-14 in the Turk-predominated	-0.064
15-19 in the Turk-predominated	-0.039
20-24 in the Turk-predominated	0.018
0-3 in the Kurd-predominated	0
4-7 in the Kurd-predominated	0.068
8-10 in the Kurd-predominated	0.140
11-14 in the Kurd-predominated	0.123
15-19 in the Kurd-predominated	0.152
20-24 in the Kurd-predominated	-0.065
0-3 in the Lur-predominated	0
4-7 in the Lur-predominated	-0.514**
8-10 in the Lur-predominated	-0.598**
11-14 in the Lur-predominated	-0.667**
15-19 in the Lur-predominated	-0.729**
20-24 in the Lur-predominated	-0.692*
0-3 in the Baluch-predominated	0
4-7 in the Baluch-predominated	-0.439**
8-10 in the Baluch-predominated	-0.632**
11-14 in the Baluch-predominated	-0.713**
15-19 in the Baluch-predominated	-0.295
20-24 in the Baluch-predominated	-0.113
0-3 in the Persian and Turk-predominated	0
4-7 in the Persian and Turk-predominated	-0.080
8-10 in the Persian and Turk-predominated	0.148
11-14 in the Persian and Turk-predominated	0.355*
15-19 in the Persian and Turk-predominated	0.561**
20-24 in the Persian and Turk-predominated	0.885*
0-3 in the mixed	0
4-7 in the mixed	-0.094
8-10 in the mixed	-0.148
11-14 in the mixed	-0.242*
15-19 in the mixed	-0.298*
20-24 in the mixed	-0.272
Birth cohort	
1966-70	0

Covariate	Model
1971-75	-0.239**
1976-80	-0.473**
Interaction between region and birth cohort	
1966-70 in the Persian-predominated	0
1971-75 in the Persian-predominated	0
1976-80 in the Persian-predominated	0
1966-70 in the Gilak-predominated	0
1971-75 in the Gilak-predominated	0.112
1976-80 in the Gilak-predominated	0.269*
1966-70 in the Mazandarani-predominated	0
1971-75 in the Mazandarani-predominated	0.120
1976-80 in the Mazandarani-predominated	0.309*
1966-70 in the Turk-predominated	0
1971-75 in the Turk-predominated	0.003
1976-80 in the Turk-predominated	-0.070
1966-70 in the Kurd-predominated	0
1971-75 in the Kurd-predominated	-0.070
1976-80 in the Kurd-predominated	-0.007
1966-70 in the Lur-predominated	0
1971-75 in the Lur-predominated	-0.125*
1976-80 in the Lur-predominated	-0.348**
1966-70 in the Baluch-predominated	0
1971-75 in the Baluch-predominated	-0.010
1976-80 in the Baluch-predominated	-0.049
1966-70 in the Persian and Turk-predominated	0
1971-75 in the Persian and Turk-predominated	-0.038
1976-80 in the Persian and Turk-predominated	-0.092
1966-70 in the mixed	0
1971-75 in the mixed	-0.099*
1976-80 in the mixed	-0.300*
Educational attainment	
Illiterate	0
Primary	-0.264**
Secondary	-0.508**
High school	-0.569**
University	-0.347**
Interaction between region and educational attainment	
Illiterate in the Persian-predominated	0
Primary in the Persian-predominated	0

Covariate	Model
Secondary in the Persian-predominated	0
High school in the Persian-predominated	0
University in the Persian-predominated	0
Illiterate in the Gilak-predominated	0
Primary in the Gilak-predominated	0.257*
Secondary in the Gilak-predominated	0.278*
High school in the Gilak-predominated	0.116
University in the Gilak-predominated	-0.453*
Illiterate in the Mazandarani-predominated	0
Primary in the Mazandarani-predominated	0.679**
Secondary in the Mazandarani-predominated	0.693**
High school in the Mazandarani-predominated	0.630**
University in the Mazandarani-predominated	0.260
Illiterate in the Turk-predominated	0
Primary in the Turk-predominated	-0.076
Secondary in the Turk-predominated	0.033
High school in the Turk-predominated	-0.008
University in the Turk-predominated	0.019
Illiterate in the Kurd-predominated	0
Primary in the Kurd-predominated	-0.025
Secondary in the Kurd-predominated	0.121
High school in the Kurd-predominated	-0.088
University in the Kurd-predominated	0.006
Illiterate in the Lur-predominated	0
Primary in the Lur-predominated	-0.214**
Secondary in the Lur-predominated	-0.197*
High school in the Lur-predominated	-0.334**
University in the Lur-predominated	-0.169
Illiterate in the Baluch-predominated	0
Primary in the Baluch-predominated	-0.111
Secondary in the Baluch-predominated	-0.248*
High school in the Baluch-predominated	-0.238*
University in the Baluch-predominated	-0.112
Illiterate in the Persian and Turk-predominated	0
Primary in the Persian and Turk-predominated	0.089
Secondary in the Persian and Turk-predominated	0.046
High school in the Persian and Turk-predominated	-0.117
University in the Persian and Turk-predominated	-0.431**
Illiterate in the mixed	0

Covariate	Model
Primary in the mixed	-0.030
Secondary in the mixed	0.031
High school in the mixed	-0.017
University in the mixed	0.234*
Marriage market characteristics	
Sex ratio	1.583**
Ratio of employed men to women	-0.605*
Ratio of men enrolled in education to women	-1.745**
Interaction between region and marriage market characteristics	
Sex ratio in the Persian-predominated in the Persian-predominated	0
Ratio of employed men to women in the Persian-predominated	0
Ratio of men enrolled in education to women in the Persian-predominated	0
Sex ratio in the Persian-predominated in the Gilak-predominated	-3.494**
Ratio of employed men to women in the Gilak-predominated	1.367
Ratio of men enrolled in education to women in the Gilak-predominated	1.115
Sex ratio in the Persian-predominated in the Mazandarani-predominated	-1.962
Ratio of employed men to women in the Mazandarani-predominated	0.250
Ratio of men enrolled in education to women in the Mazandarani-predominated	-0.203
Sex ratio in the Persian-predominated in the Turk-predominated	-1.722**
Ratio of employed men to women in the Turk-predominated	0.991*
Ratio of men enrolled in education to women in the Turk-predominated	0.739*
Sex ratio in the Persian-predominated in the Kurd-predominated	-1.182*
Ratio of employed men to women in the Kurd-predominated	0.429
Ratio of men enrolled in education to women in the Kurd-predominated	0.383
Sex ratio in the Persian-predominated in the Lur-predominated	-1.821*
Ratio of employed men to women in the Lur-predominated	0.772
Ratio of men enrolled in education to women in the Lur-predominated	1.257*
Sex ratio in the Persian-predominated in the Baluch-predominated	0.195
Ratio of employed men to women in the Baluch-predominated	-1.227
Ratio of men enrolled in education to women in the Baluch-predominated	-1.657
Sex ratio in the Persian-predominated in the Persian and Turk-predominated	3.665**
Ratio of employed men to women in the Persian and Turk-predominated	-4.735**
Ratio of men enrolled in education to women in the Persian and Turk-predominated	-4.264**
Sex ratio in the Persian-predominated in the mixed	-2.151**
Ratio of employed men to women in the mixed	1.592**
Ratio of men enrolled in education to women in the mixed	1.610**
Women's Socio-economic status	
Proportion of literate women	0.377*
Proportion of women with post-primary schooling	-0.587**

Covariate	Model
Proportion of women participating in the labour force	-0.091
Interaction between region and women's socio-economic status	
Proportion of literate women in the Persian-predominated	0
Proportion of women with post-primary schooling in the Persian-predominated	0
Proportion of women participating in the labour force in the Persian-predominated	0
Proportion of literate women in the Gilak-predominated	-2.415*
Proportion of women with post-primary schooling in the Gilak-predominated	4.263**
Proportion of women participating in the labour force in the Gilak-predominated	-1.811*
Proportion of literate women in the Mazandarani-predominated	-0.091
Proportion of women with post-primary schooling in the Mazandarani-predominated	-0.807
Proportion of women participating in the labour force in the Mazandarani-predominated	-1.292
Proportion of literate women in the Turk-predominated	-0.164
Proportion of women with post-primary schooling in the Turk-predominated	-0.011
Proportion of women participating in the labour force in the Turk-predominated	-0.436
Proportion of literate women in the Kurd-predominated	-0.664*
Proportion of women with post-primary schooling in the Kurd-predominated	-0.295
Proportion of women participating in the labour force in the Kurd-predominated	-0.795
Proportion of literate women in the Lur-predominated	-0.919*
Proportion of women with post-primary schooling in the Lur-predominated	1.366*
Proportion of women participating in the labour force in the Lur-predominated	10.188**
Proportion of literate women in the Baluch-predominated	0.122
Proportion of women with post-primary schooling in the Baluch-predominated	-0.186
Proportion of women participating in the labour force in the Baluch-predominated	-1.823
Proportion of literate women in the Persian and Turk-predominated	4.302**
Proportion of women with post-primary schooling in the Persian and Turk -predominated	-2.512**
Proportion of women participating in the labour force in the Persian and Turk -predominated	-16.29**
Proportion of literate women in the mixed	0.050
Proportion of women with post-primary schooling in the mixed	1.142**
Proportion of women participating in the labour force in the mixed	-1.815**
The process of socio-economic development	
Proportion of urban population	0.390**
Proportion of population employed in industry	0.879**
Interaction between region and the process of socio-economic development	
Proportion of urban population in the Persian-predominated	0
Proportion of population employed in industry in the Persian-predominated	0
Proportion of urban population in the Gilak-predominated	-0.814
Proportion of population employed in industry in the Gilak-predominated	1.470*
Proportion of urban population in the Mazandarani-predominated	-0.148
Proportion of population employed in industry in the Mazandarani-predominated	-0.837

Covariate	Model
Proportion of urban population in the Turk-predominated	0.232
Proportion of population employed in industry in the Turk-predominated	-0.730*
Proportion of urban population in the Kurd-predominated	0.353
Proportion of population employed in industry in the Kurd-predominated	0.168
Proportion of urban population in the Lur-predominated	-2.809**
Proportion of population employed in industry in the Lur-predominated	8.021**
Proportion of urban population in the Baluch-predominated	0.347
Proportion of population employed in industry in the Baluch-predominated	-2.132
Proportion of urban population in the Persian and Turk -predominated	0.409*
Proportion of population employed in industry in the Persian and Turk -predominated	-2.228**
Proportion of urban population in the mixed	-0.766**
Proportion of population employed in industry in the mixed	0.550
Constant	-4.708**

Note: Absolute value of z statistics in the parentheses; *significant at 5%, ** significant at 1%. The z statistics have not been presented to avoid the length of the table.

Table B. Descriptive statistics (mean and standard deviation) for contextual-level variables included in the analysis, 1966-70 and 1971-75 birth cohorts

Variable *	Birth cohort	
	1966-70	1971-75
Women's socio-economic status		
Proportion of literate women	0.478	0.481
	(0.137)	(0.147)
Proportion of literate women with post-primary schooling	0.375	0.370
	(0.101)	(0.101)
Proportion of literate women with university education	0.020	0.020
	(0.010)	(0.011)
Proportion of women participating in the labour force	0.061	0.059
	(0.050)	(0.048)
Proportion of women employed	0.045	0.044
	(0.044)	(0.043)
Marriage-market characteristics		
Sex ratio	0.968	0.960
	(0.066)	(0.072)
Ratio of men participating in the labour force to women	0.440	0.446
	(0.188)	(0.181)
Ratio of employed men to women	0.325	0.332
	(0.171)	(0.168)
Ratio of men enrolled in education to women	0.447	0.442
	(0.214)	(0.211)
The process of socio-economic development		
Proportion of urban population	0.585	0.469
	(0.112)	(0.207)
Proportion of population employed in agriculture	0.403	0.333
	(0.081)	(0.161)
Proportion of population employed in industry	0.033	0.105
	(0.012)	(0.077)
Proportion of literate population	0.478	0.588
	(0.203)	(0.120)
Proportion of literate population with post-primary schooling	0.329	0.400
	(0.159)	(0.082)
Proportion of literate population with university education	0.106	0.034
	(0.075)	(0.014)
Total number of person years	146,655	190,282

Note: * The value of the contextual variables represents changes in these variables over the period of study as they are constructed as time-varying variables. Unlike the other contextual-level variables in the thesis, these statistics have not been presented in terms of the first person-year included in the analysis and the first person-year that has been derived from the 1996 census because the contextual variables for both cohorts at the whole

period of exposure to the risk of first marriage (except for the age of 20 in the 1971-75 birth cohort) have been derived from the 1986 census.

Table C. Parameter estimates of discrete time hazard models for duration of women's transition to first marriage by birth cohort, without accounting for unobserved heterogeneity

Covariate	Model
Birth cohort	
1971-75	0
1976-80	-0.271
	(-14.83)**
Duration (Years since the age of 10)	
0-2 (corresponds with ages 10-12)	0
3-5 (corresponds with ages 13-15)	1.9356
	(46.99)**
6-7 (corresponds with ages 16-17)	2.307
	(50.10)**
8 (corresponds with ages 18)	2.751
	(58.10)**
9 (corresponds with ages 19)	2.721
	(56.81)**
10 (corresponds with ages 20)	2.229
	(38.35)**
Region (in terms of the predominant ethnicity)	
Persian-predominated	0
Gilak-predominated	0.080
	(1.61)*
Mazandarani-predominated	0.207
	(5.21)**
Turk-predominated	-0.120
	(-5.53)**
Kurd-predominated	-0.081
	(-2.66)*
Lur-predominated	0.313
	(11.11)**
Baluch-predominated	0.386
	(9.82)**
Persian and Turk-predominated	0.078
	(2.77)*

Covariate	Model
Mixed	-0.008
	(-0.37)
Educational attainment	
Illiterate	0
Primary	-0.423
	(-22.09)**
Secondary	-0.587
	(-27.17)**
High school	-1.007
	(-41.93)**
Marriage market characteristics	
Sex ratio	-0.154
	(-0.98)
Ratio of employed men to women	1.046
	(7.51)**
Ratio of men enrolled in education to women	-1.146
	(-8.12)**
Women's Socio-economic status	
Proportion of literate women	0.485
	(6.13)**
Proportion of women participating in the labour force	-1.139
	(-6.24)**
The process of socio-economic development	
Proportion of urban population	0.249
	(5.64)**
Proportion of population employed in industry	0.953
	(8.44)**
Constant	-4.531
	(-45.23)**

Note: Absolute value of z statistics in the parentheses; *significant at 5%, ** significant at 1%.

Table D. Parameter estimates of discrete time hazard models for duration of progression to second and third conception, including interactions between the covariate of cohort and other covariates

Covariate	Progression to second conception	Progression to third conception
Cohort		
Became exposed to childbearing during 1986-90	0	0
Became exposed to childbearing during 1991-95	0.570*	-0.611*
Duration (months since the previous birth)		
0-2	0	0
3-5	1.030**	1.085**
6-8	1.102 **	1.184**
9-12	1.367**	1.397**
13-16	1.706 **	1.897 **
17-20	1.667 **	1.976 **
21-24	1.685**	2.133**
25-36	1.853**	2.215**
37-51	2.625**	2.912**
Interaction between cohort and duration		
0-2 amongst the 1991-95 cohort	0	0
3-5 amongst the 1991-95 cohort	0.124	0.193
6-8 amongst the 1991-95 cohort	0.152	0.221
9-12 amongst the 1991-95 cohort	0.134	0.325
13-16 amongst the 1991-95 cohort	0.027	0.299
17-20 amongst the 1991-95 cohort	0.065	0.269

Covariate	Model 3	Model 4
21-24 amongst the 1991-95 cohort	0.140	0.168
25-36 amongst the 1991-95 cohort	0.185	0.303
37-51 amongst the 1991-95 cohort	0.331*	0.455
Ethnicity (in terms of the predominant ethnicity)		
Persian-predominated	0	0
Gilak-predominated	0.064	0.044
Mazandarani-predominated	-0.140*	-0.119
Turk-predominated	-0.010	-0.042
Kurd-predominated	-0.035	-0.087
Lur-predominated	-0.023	-0.031
Baluch-predominated	-0.052	0.065
Persian or Turk-predominated	-0.067	-0.006
Mixed	0.068*	0.058
Interaction between cohort and region		
Persian-predominated amongst the 1991-95 cohort	0	0
Gilak-predominated amongst the 1991-95 cohort	-0.136	0.177
Mazandarani-predominated amongst the 1991-95 cohort	-0.043	0.030
Turk-predominated amongst the 1991-95 cohort	-0.006	0.018
Kurd-predominated amongst the 1991-95 cohort	-0.051	0.153
Lur-predominated amongst the 1991-95 cohort	0.108	0.080
Baluch-predominated amongst the 1991-95 cohort	0.113	0.120
Persian or Turk-predominated amongst the 1991-95 cohort	0.020	-0.005

Covariate	Model 3	Model 4
Mixed amongst the 1991-95 cohort	0.009	-0.045
Women's educational attainment		
Illiterate	0	0
Primary	-0.086**	-0.136**
Secondary	-0.303 **	-0.249 **
High school	-0.400**	-0.277**
University	-0.418**	-0.267*
Interaction between cohort and education		
Illiterate amongst the 1991-95 cohort	0	0
Primary amongst the 1991-95 cohort	-0.128**	-0.044
Secondary amongst the 1991-95 cohort	-0.112*	0.024
High school amongst the 1991-95 cohort	-0.105	0.024
University amongst the 1991-95 cohort	-0.109	0.107
Women's age at marriage (years)		
<18	0	0
18-22	0.019	-0.060*
23+	0.024	-0.110*
Interaction between cohort and women's age at marriage		
<18 amongst the 1991-95 cohort	0	0
18-22 amongst the 1991-95 cohort	-0.061	0.059
23+ amongst the 1991-95 cohort	0.008	0.040

Covariate	Model 3	Model 4
Women's age (years)		
<20	0	
20-22	0.029	0.095*
25+	0.037	0.101 *
Interaction between cohort and women's age		
<20 amongst the 1991-95 cohort	0	0
20-22 amongst the 1991-95 cohort	-0.031	-0.133*
25+ amongst the 1991-95 cohort	0.009	-0.175*
Previous birth-conception interval (months)		
<13	0	
13-24	0.017	-0.051
25-36	0.024	-0.097*
37+	0.006	-0.115*
Interaction between cohort and birth-conception interval		
<13 amongst the 1991-95 cohort	0	0
13-24 amongst the 1991-95 cohort	-0.064	0.035
25-36 amongst the 1991-95 cohort	-0.057	0.124
37+ amongst the 1991-95 cohort	0.011	0.140
Experiencing child mortality		
Not having any dead child	0	0
Having at least a dead child	0.354**	0.283**

Covariate	Model 3	Model 4
Interaction between cohort experiencing child mortality		
Not having a dead child amongst the 1991-95 cohort	0	0
Having a dead child amongst the 1991-95 cohort	0.357**	0.013
Sex of children		
Male	0	0
Female	0.033	0.062*
Mixed	-	-0.011
Interaction between cohort and sex of children		
Male amongst the 1991-95 cohort	0	0
Female amongst the 1991-95 cohort	0.015	-0.065
Mixed amongst the 1991-95 cohort	-	-0.053
Women's socio-economic status		
Proportion of women with post-primary schooling	-0.119	-0.148
Proportion of women participating in the labour force	-1.227**	-0.239
Interaction between cohort and women's socio-economic status		
Proportion of women with post-primary schooling amongst the 1991-95 cohort	0.395	0.102
Proportion of women participating in the labour force amongst the 1991-95 cohort	0.429	-0.455
The process of socio-economic development		
Proportion of urban population	0.069	0.009
Proportion of population employed in industry	-0.905**	-0.242
Proportion of children enrolled in education	-0.114	-0.362*
Proportion of children participate in the labour force	0.307	0.218

Covariate	Model 3	Model 4
Interaction between cohort and the process of development		
Proportion of urban population amongst the 1991-95 cohort	-0.223*	-0.087
Proportion of population employed in industry amongst the 1991-95 cohort	0.711*	0.304
Proportion of children enrolled in education amongst the 1991-95 cohort	-0.702*	0.213
Proportion of children participate in the labour force amongst the 1991-95 cohort	-0.780	0.255
Constant	-3.690**	-4.017**
Log likelihood	-74093.188	-51822.171

Note: * Significant at 5%, ** significant at 1%. The z statistics have not been presented to avoid the length of the table.

Table E. Parameter estimates of discrete time hazard models for duration to women's transition to first marriage

Covariate	Model 1 (Individual-level covariates)	Model 2 (Model 1+ contextual-level covariates)
Duration (years since the age of 10)		
0-3 (corresponds with ages 10-13)	0	0
4-7 (corresponds with ages 14-17)	2.218	1.934
	(102.99)**	(80.67)**
8-10 (corresponds with ages 18-20)	2.957	2.644
	(101.64)**	(81.19)**
11-14 (corresponds with ages 21-24)	2.995	2.600
	(75.14)**	(59.37)**
15-19 (corresponds with ages 25-29)	2.930	2.624
	(52.12)**	(42.92)**
20-24 (corresponds with ages 30-34)	2.404	2.208
	(26.04)**	(22.56)**
Region (in terms of the predominant ethnicity)		
Persian-predominated	0	0
Gilak-predominated	-0.215	-0.035
	(-6.27)**	(-0.81)

Covariate	Model 1	Model 2
Mazandarani-predominated	0.022	0.198
	(0.66)	(4.75)**
Turk-predominated	-0.114	-0.181
	(-6.44)**	(-8.15)**
Kurd-predominated	-0.232	-0.213
	(-9.30)**	(-6.86)**
Lur-predominated	0.085	0.384
	(3.56)**	(12.65)**
Baluch-predominated	0.261	0.330
	(7.93)**	(7.67)**
Persian and Turk-predominated	0.298	0.155
	(10.89)*	(5.43)**
Mixed	-0.113	-0.014
	(-6.51)**	(-0.69)
Birth cohort		
1966-1970	0	0
1971-1975	-0.353	-0.434
	(-23.17)**	(-23.97)**
1976-1980	-0.719	-0.837
	(-43.64)**	(-37.13)**
Educational attainment		

Covariate	Model 1	Model 2
Illiterate	0	0
Primary	- 0.420	-0.542
	(-23.00)**	(-24.97)**
Secondary	- 0.721	-0.899
	(-33.04)**	(-35.08)**
High school	-0.844	-1.141
	(-34.33)**	(-38.15)**
University	- 0.680	-1.040
	(-18.41)**	(-23.87)**
The opportunity of post-marital educational attainment		
Proportion of married women enrolled in education		11.773
		(10.85)**
Proportion of married women enrolled in education amongst women with university education		
Educational attainment in the area		
Proportion of literate women		-0.450
		(-5.75)**
Proportion of literate women with post-primary schooling		-0.468
		(-5.20)**
Marriage-market characteristics		
Sex ratio		0.323
		(2.21)*

Covariate	Model 1	Model 2
Ratio of employed men to women		0.616
		(4.93)**
Ratio of men enrolled in education to women		-1.151
		(-9.24)**
Socio-economic characteristics of the area		
Proportion of urban population		0.408
		(7.90)**
Proportion of population employed in industry		1.177
		(10.60)**
Constant	-3.696	-3.285
	(-136.52)**	(-36.17)**
Gamma variance	0. 475	0.928
	(17.80)**	(27.28)**
Log likelihood	-153887.008	-152942.364

Note: Absolute value of z statistics in the parentheses; *significant at 5%, ** significant at 1%.