The Influence of Education on quantum, timing and spacing of births in Austria

Spielauer, Martin; Städtner, Karin

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Titel **„THE INFLUENCE OF EDUCATION ON QUANTUM, TIMING AND SPACING OF BIRTHS IN AUSTRIA“**

AutorInnen **Karin Städtner**
Martin Spielauer

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ÖIF, Gonzagagasse 19/8, A-1010 Wien
Tel. +43-1-535 14 54-0
Fax +43-1-535 14 55
url: http://www.oif.ac.at
email: team@oif.ac.at

Abstract

The aim of this paper is to study the quantum, timing and spacing of births in Austria and their changes over time by educational groups and school leaving age. Rather than taking the age as such, we take the school leaving age as reference point in our analysis, as – with the exception of university drop-outs that are partly caused by pregnancy – very few women give birth while being in education. As the analysis shows, the recent overall increase of age at first birth can be observed in all educational groups and is not (only) the result of staying in the education system for a longer time. As expected, parity progression rates vary considerably between different educational groups and follow different patterns of change. Changes of norms – i.e. to and from the two-child norm – seem to be more pronounced in urban areas, were drops in parity progression rates were biggest for higher educated women. As the educational composition of the population changes in the course of time, this will considerably influence overall fertility rates in future, even assuming unchanged individual fertility behavior of women of given educational groups.

This paper is also understood as background paper in the context of the ongoing development of the FAMSIM+, family microsimulation model, that shows fertility decisions along with other life careers, such as education, partnership and job careers. Besides other applications, FAMSIM+ will serve to study the impact of various dynamics, like changes of timing and educational changes, on fertility changes.

Content

1 Introduction

The aim of this paper is to study of quantum, timing and spacing of births in Austria by educational groups and school leaving age. Besides the range of variables frequently used in the analysis of fertility, i.e. marital status, labor market participation, income and age, it is education that has been identified as the single most important variable alongside age regarding fertility decisions (Lutz et. al., 1999). The type of education attended is deemed to impart specific values and norms and the date of finishing highest education is considered a milestone in everybody's life. Therefore, the completion of education could indeed be a major influence factor regarding fertility decisions – especially, because being in education is often perceived as a barrier of getting pregnant (Blossfeld & Huinink, 1991).

Besides other changes, in recent years an overall increase of age at first birth can be observed in all educational groups, which is not (only) the result of staying in the education system for a longer time. Rather than taking the age as such, we take school leaving age as reference point in our analysis, as – with the exception of university drop-outs that are partly caused by pregnancy – very few women give birth while being in education. Age may have different meanings for individuals with different types of highest education (Hoem J. et. al., 1999). While at the age of 23 the graduation date for women with compulsory education dates back eight years on average, women studying at university may still be in education. This example clarifies the reason for taking the date of the completion of the highest education as reference point when analyzing Austrian fertility behavior.

The impact of education on fertility is a priori ambiguous: On the one hand Becker (1981) and the 'new home economics' refer to the higher labor-force attachment and opportunity costs of better educated females, which lead them to postpone or even avoid births. They attribute the reduction in the number of births to the decreasing demand for children due to the enhanced earnings prospects of those women. On the other hand highly qualified women generally enjoy more personal freedom and independence: economic independence and independence of prevailing standards, e.g. the Austrian two-child norm (Hoem J. et. al., 1999). Furthermore, better qualified women are more able 'to afford' children, which means that they more easily manage to pay for external child care.

In her recent work, Buber (2001) carried out a similar study in which she focused on the correlation between the time that went by since the last education completed and the birth of the first child. The findings of Buber regarding lower education are in line with the theory: Women with compulsory education as their highest education have their children earlier than better qualified females. However, when analyzing women with tertiary education, a so-called 'catch-up' effect was identified: Those women who mainly remained childless until the completion of their education, refrained from getting pregnant immediately after graduation, but after one year started catching up rapidly with women of the same age. A possible explanation for this effect is their higher graduation age, which pressurizes these females to have their first child before getting 'too old', at least according to public opinion.

The following chapter gives a brief overview of the data used for our calculations. Chapter 3 shows past fertility trends in Austria. In the following sections the age at first childbirth (chap-

ter 4), the timing of first birth (chapter 5), the space between births (chapter 6) and the parity progression rates as well as the risk of getting a(nother) child by current parity are thoroughly investigated. As expected, parity progression rates vary considerably between different educational groups. As the educational composition of the population changes over time, this will considerably influence overall fertility rates in future, even assuming unchanged individual fertility behavior of women of given educational groups.

This paper is also understood as background paper in the context of the ongoing development of the FAMSIM+, family microsimulation model, that shows fertility decisions along with other life careers, such as education (e.g. Schwarz et. al. 2002) and partnerships (Schwarz & Spielauer 2002). Besides other applications FAMSIM+ will serve to study the impact of various dynamics, like changes of timing and educational changes, on fertility changes.

2 Data and Variables

The data source underlying our evaluation was the special program of the Austrian micro census from June 1996, which contained a questionnaire on the educational history as well as a biography of births. For the purpose of our analysis the questions of main interest were:

- Kind of graduation in compulsory education
- All kinds of ever attended/started schooling following compulsory education
- Date of enrollment and graduation or dropout respectively
- Municipality type
- Date(s) of birth of child(ren)

In contrast to the basic program of the micro census, the special program is voluntary. Since for various reasons individuals refuse to answer the questionnaire, e.g. due to lack of interest or embarrassment, we have to consider a systematic error. Particularly in a survey on education we can expect less interest in the program from individuals with a lower educational level; consequently, some caution is advisable when using the results. Similarly, individuals without children or those who are not in a relationship may be more reluctant to participate in a survey on births and marriage histories. In addition, questions on children and relationships may be seen as invading one's privacy, which might prevent some people from answering them. This might further distort the results. However, since we evaluate individual behavior in dependency on influence factors, it is not so important that a certain distribution in the sample (i.e. highest education) is equivalent to this distribution in the total population, but that the individual behavior in the sample corresponds to the behavior of the individuals in the total population.

For the purpose of our analysis, all time indications are given in months. We corrected all monthly data entries lower than one or greater than twelve and reassigned them plausible values per random generator. When speaking about *years*, we do not mean calendar years, but the actual distance between two events divided by twelve. In our fertility analysis we took the date of birth into consideration, being aware of the fact that the 'decision' of getting a child is made nine months earlier.

Table 2.1 gives a brief explanation of the variables used for the calculations conducted. The term 'municipality' refers to the place at which an individual lived at the age of 15. Thus, we are unable to account for territorial migration flows when the individual is older than 15.

Data about educational attainment is only available for individuals born after 1937. In our analysis we only consider first-chance education, i.e. education that immediately follows compulsory education. All kinds of secondary education that start after the age of 19, colleges that begin at the age of 22 or older and enrollments at universities after the age of 25 are considered as second-chance education. As can be seen from Table 2.1, we distinguish eight different types of education. The category *compulsory education* comprises all individuals who did not finish compulsory school (although it is obligatory in Austria), who did not start any school or training after graduating from compulsory school or dropped out of sec-

ondary education and never graduated from another school. Furthermore, we consider university drop-outs as an additional group, as we presume that they are significantly influenced by their university education even if they did not graduate.

Table 2.1: Variable description

Variable	Description	Type
municip	Municipality type, where lived at age of fifteen	Categorical with the categories 0 rural 1 urban
high_educ	Highest education completed (only first-chance education)	Categorical with the categories 0 compulsory education 1 apprenticeship 2 secondary vocational and technical school (BMS) 3 secondary academic school (AHS) 4 secondary vocational and technical college (BHS) 5 college / academy 6 university graduate 7 university drop-out
birth_age_m	Woman's age at first childbirth	Numerical (from 180 to 528 years)
birth_age_y	Woman's age at first childbirth	Numerical (from 15 to 44 years)
timin_m	Time interval in months between completion of education and first childbirth	Numerical (from –60 to 240 months)
timin_y	Time interval in years between completion of education and first childbirth	Numerical (from –5 to 20 years)
space1_2	Time interval in months between first and second childbirth	Numerical (from 0 to 180 months)
child1_2	Time interval in years between first and second childbirth	Numerical (from 0 to 15 years)
cohort5	Women's birth cohort	Categorical with the categories 1 1940-44 2 1945-49 3 1950-54
bir_coh1	Birth cohort of first child	Categorical with the categories 1 1956-65 2 1966-75 3 1976-85 4 1986-95

Table 9.1 in the Appendix provides a general description of the composition of our sample.

3 Fertility Indicators for Austria

As most other industrial countries Austria has experienced a continuous decline in fertility rates, far below replacement level. With a total fertility rate of 1.34 in 2000, Austria is among those countries that have the lowest fertility rates worldwide. Within the EU only Spain and Italy have a total fertility rate lower than Austria (Statistik Austria, 2000).

Various key figures can be computed in order to measure fertility. The most common ones are listed in Box 1 below:

Box 1: Basic concepts of fertility

- The *crude birth rate*, defined as the number of live births during a year, per 1,000 population at mid-year, is a rough indicator of fertility.
- A more common concept is the *age-specific fertility rate*, which is calculated from the number of births during a year to women in a particular age group (e.g. 20-24 years), divided by 1,000 women of that age group.
- The *total fertility rate* measures the average number of children a woman has during her life-time, if she were to pass through all her childbearing years in conformity with the age-specific fertility rates of a given year.
- Another concept is the *net reproduction rate*, which quantifies the number of daughters a women will bear during her entire lifetime, assuming fixed age-specific fertility rates. Thus, it reflects the degree to which a cohort of females reproduces themselves.
- The *replacement fertility* is defined as the level of fertility at which population just replaces it-self, taking into account mortality. Because of the relatively low mortality levels in industrialized countries, replacement fertility requires a total fertility rate of about 2.1.

Age-specific fertility rates for the years 1980, 1985, 1990 and 1995, which are computed by dint of micro census data, are illustrated in Figure 3.1. In 1980, the graph peaked for those aged 20 to 24 with a value of 139, which means that of thousand females aged 20 to 24 139 had a child in that particular year. The graphs for 1980 and 1985 have a similar development, while those for 1990 and 1995 display a somewhat different trend, indicating a postponement of childbearing age.

When considering birth rates, attention has to be paid to cohort and period effects. While cohort effects affect all individuals born in the same calendar year or group of years, period effects pertain to all occurrences happening during a specific period. The age specific fertility rates displayed in Figure 3.1 measure period fertility. However, in the – admittedly implausible – case that all women aged 20 to 24 in 1995 had decided to postpone their desire to get children by one year, their age-specific fertility rate in 1995 would have been zero. Thus, we have to be aware that some fertility indicators are biased, as they do not account for the postponement of childbearing to later years. Especially when considering indicators of cohort fertility one has to take into account that younger cohorts may not have reached their fertile age limits and thus have not completed their reproduction.

Figure 3.1: Age-specific fertility rates for four points in time (only live births)

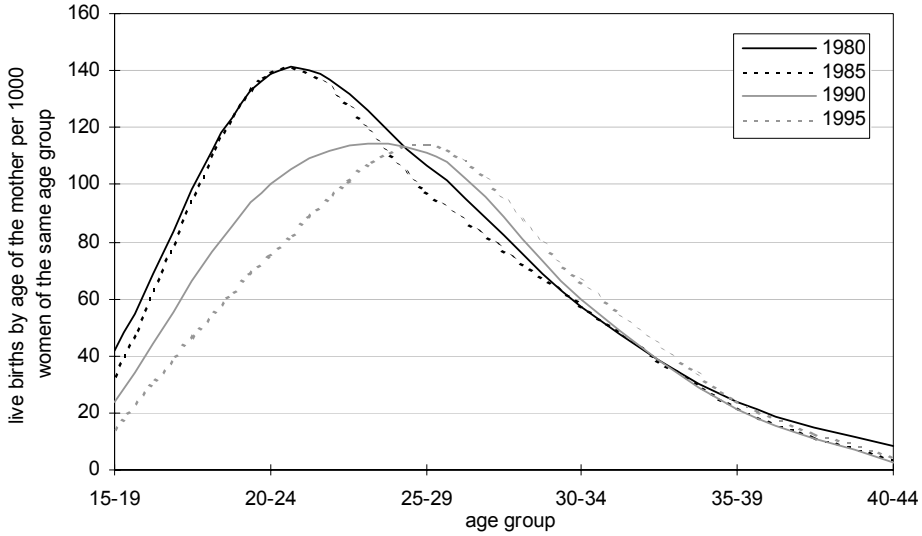
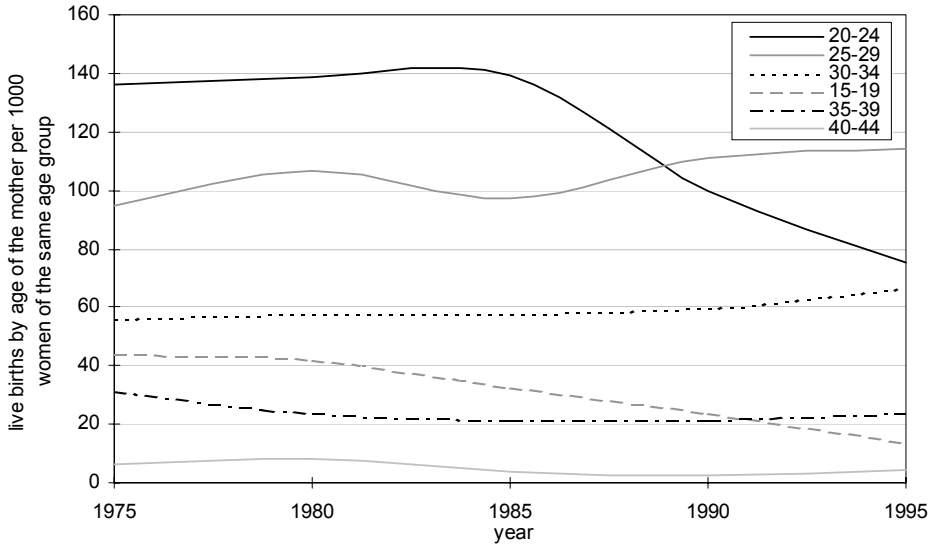


Figure 3.2 illustrates age specific fertility rates and their development over time. It shows a substantial decline in fertility for those aged 20 to 24, commencing in the mid-1980s. A clear reduction in fertility can also be found for those aged 15 to 19, thus the fertility decline can be traced back mainly to young women. This assumption is confirmed when looking at women between the ages of 25 and 29, who experienced a clear increase in their number of births. Women aged 30 to 34 had an almost stable fertility behavior in the past but experienced a relatively large increase at the last point in time investigated.

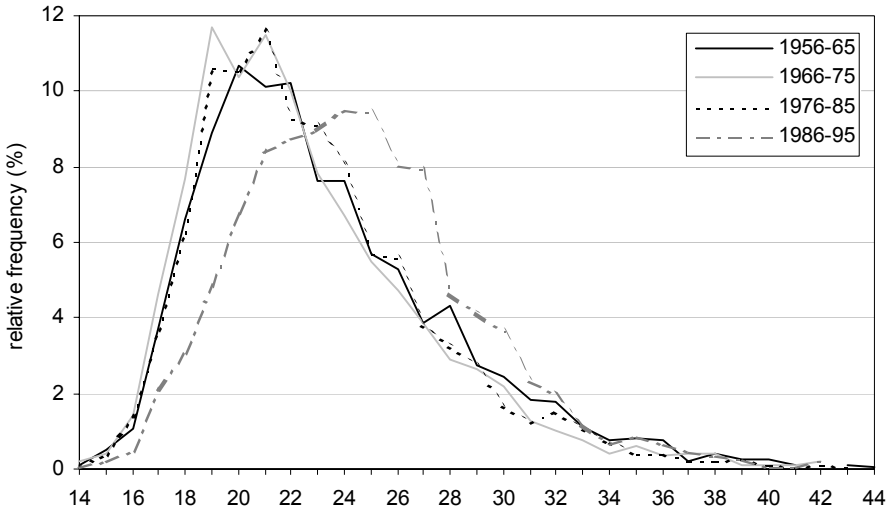
Figure 3.2: Age-specific fertility rates in five year groups (1975-1995)



4 Age at First Childbirth

In connection with the decline of fertility rates the postponement of childbirth is often stated, the longer schooling of females probably being the decisive factor for this postponement. As we want to find out whether our data does indeed show a postponement of first childbirth, we will look at the mother's age when bearing her child. Figure 4.1 illustrates this relation and reveals a rather similar pattern of mother's age at first childbirth for all women who bore their first child within the cohorts 1956-65, 1966-75 and 1976-85. However, for those women who bore their first child in the last cohort investigated, a clear deviation is visible, although the graphs adjust again for females giving birth to their first child when 30 years or older. While the median age for women pertaining to the first three cohorts is 22 years, it is 24 years for those belonging to the last one.

Figure 4.1: Women's age at first childbirth for different birth cohorts of first child



The increase in women's age at first childbirth as shown in Figure 4.1 may be traced back to the longer schooling of females. Since nowadays women stay longer in the educational system than they did in the past, parenthood is automatically delayed – especially, as the finishing of education is commonly viewed as an important precondition for entering motherhood (Blossfeld & Huinink, 1991).

Another question of interest is whether the age at first childbirth diverges for different municipality types. Figure 4.2 displays the course of women's median age at first birth for rural and urban municipalities over time. While there are many interactions and no clear trends identifiable from the 1950s until the late 60s, the median age of first childbirth in urban areas clearly exceeds that in rural areas. While the median age at first parturition over the whole period investigated is 23 years for females in urban regions, women in rural municipalities are one year younger when giving birth to their first child. However, since the 1980s, a clear increase in the age at first birth can be observed for both municipality types, which is especially pronounced for women in rural regions. When interpreting these figures one should be

aware that these dissimilarities probably arose because of the different schooling of females in both areas.

Figure 4.2: Changes over time in women's median age at first childbirth for different municipality types

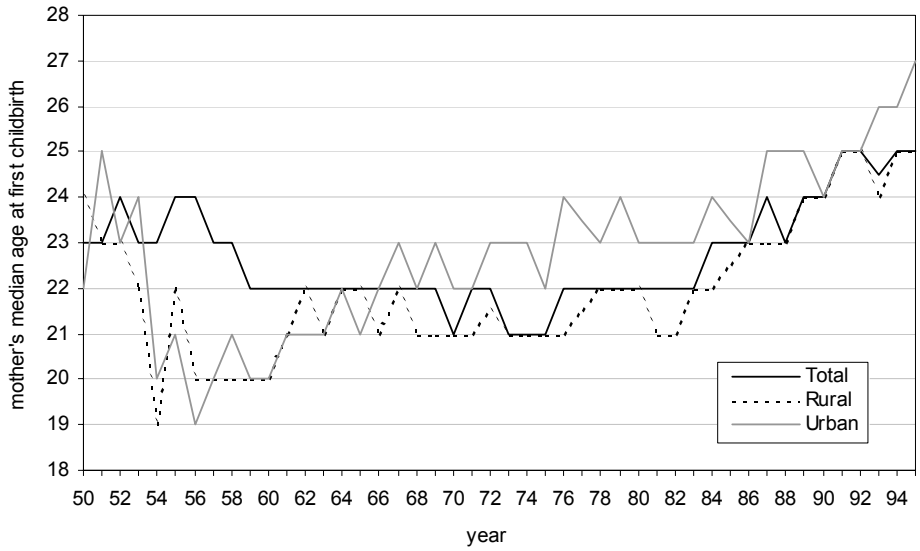


Table 4.1 demonstrates whether the age at first birth varies for women with different educational attainments. It has to be mentioned again that we only consider first-chance education, i.e. the education immediately following compulsory education, if it did not start later than the age of 25.

When looking at Table 4.1, clear trends are observable: The median birth age increases gradually with higher education, which is quite plausible and induces us to assume that this correlation may be due to the different graduation ages of distinct types of education. The median age is 21 years for women who have compulsory education only and reaches a maximum of 28 years for those holding a university degree. University graduates also exhibit the widest age range at parturition which can be seen from the 5% and 95% percentiles that diverge most. Women who graduated from AHS or BHS exhibit a quite similar reproduction behavior. Their median age at first parturition is 24 years, and in each group 50% of the females enter motherhood between the ages of 22 and 28 (AHS) or 27 (BHS) respectively.

Table 4.1: Statistical measures quantifying the age at first childbirth (in years) for different types of education

Highest education	n	Mean	5% Percentile	25% Quartile	Median	75% Quartile	95% Percentile
Compulsory	3242	21.85	17	19	21	24	30
Apprentice	2849	22.52	18	20	22	25	30
BMS	1428	23.54	18	21	23	26	31
AHS	254	24.94	19	22	24	28	33
BHS	442	24.80	19	22	24	27	32
Colleges/Academies	372	25.14	20	22	25	27	32
University graduate	208	28.11	21	25	28	31	36
University drop-out	71	25.45	19	21	25	29	33

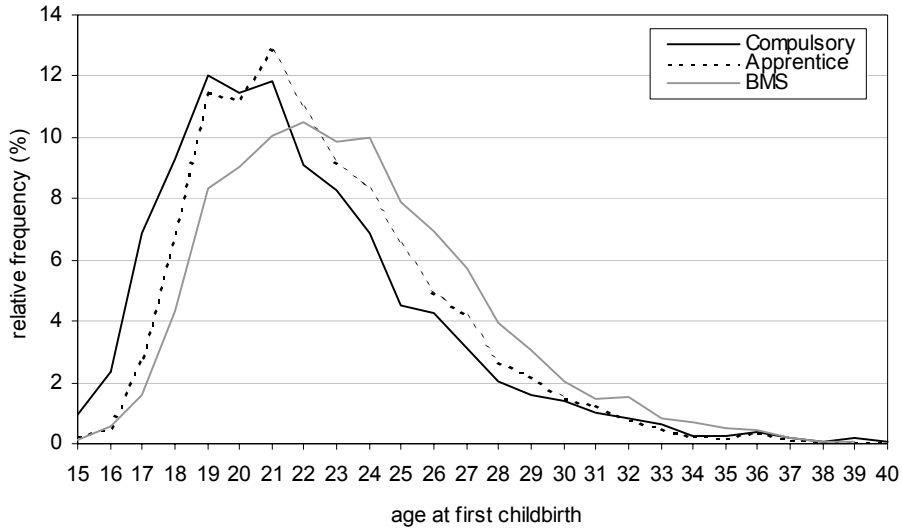
The facts shown in Table 4.1 are visualized in Figure 4.3 below. It seems that the graphs for individuals with compulsory education, apprenticeship and BMS have a similar development. However, the graph representing apprenticeship is shifted to the right compared with the one for compulsory education. The graph for women who graduated from BMS lies even further to the right.

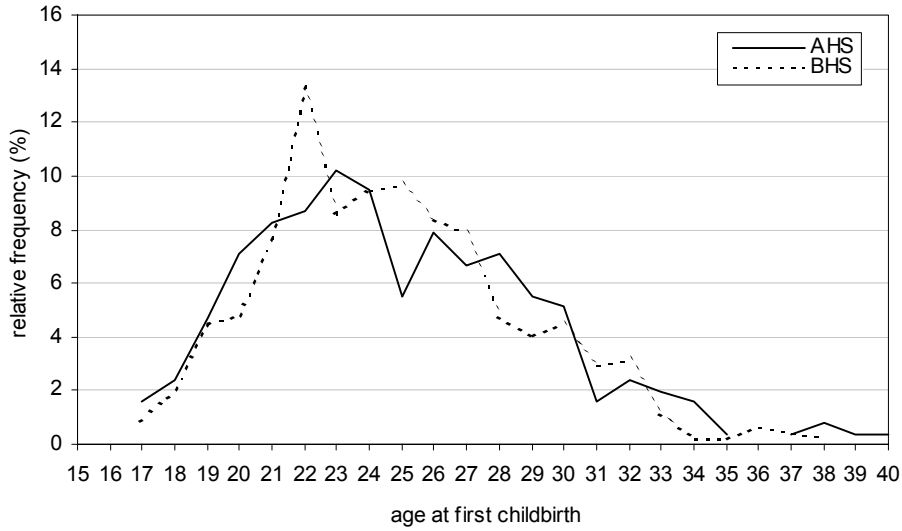
From the second picture it becomes evident that although the two distributions for females who graduated from secondary academic school (AHS) and those who completed vocational and technical colleges (BHS) more or less equal each other, the former deviates from the latter as it peaks at the age of 22.

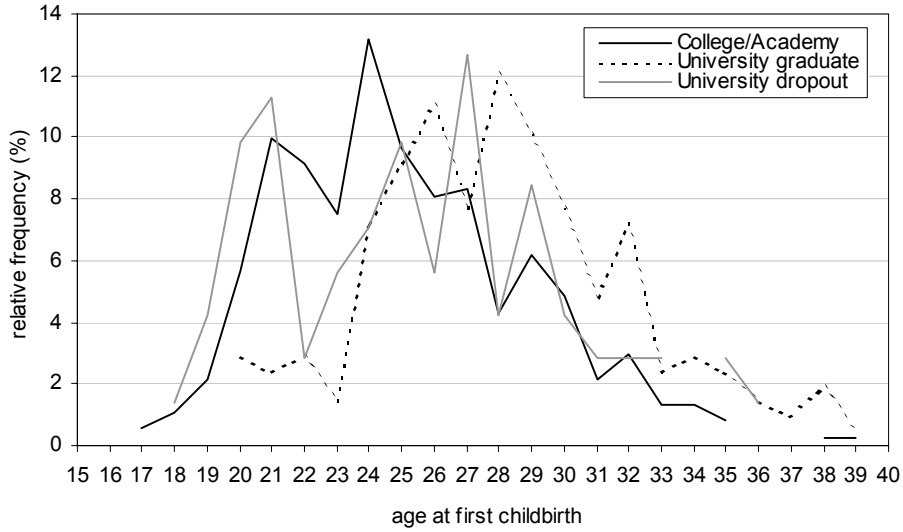
The third picture displays the age at first childbirth for women who finished a college, hold a university degree or dropped out of university. While the graph for university graduates starts at a relatively late age, the one for drop-outs is hardly interpretable, as it exhibits many erratic fluctuations.

Thus, the type of highest education completed is a decisive influence factor regarding the age at first childbirth. According to Hoem et. al. (2001), women's age at first childbirth is an important indicator of the timing and number of further childbirths. Therefore, the following chapter will thoroughly investigate the time interval between the end of the highest education and the birth of the first child and will analyze the role of municipality type and highest education completed in this context.

Figure 4.3: Mothers age at first childbirth for different types of highest education







5 The Timing of First Births

In this section, general trends and patterns will be identified in order to gain insight into the timing of first childbirths. First of all we will investigate the question of whether changes over time in the timing of births are observable. We will look at three birth cohorts of females who had completed their reproduction process at the time of the interview. As emerges from Figure 5.1, the later the women are born, the more left-handed is the appendant graph. This implies that the time interval between the completion of the highest education and first childbirth became smaller in the course of the years. While the median time interval in this regard is six years for the cohort 1940-44, it is merely five years for the two other cohorts.

Figure 5.1: Changes over time in the timing of first births by mother's birth cohorts

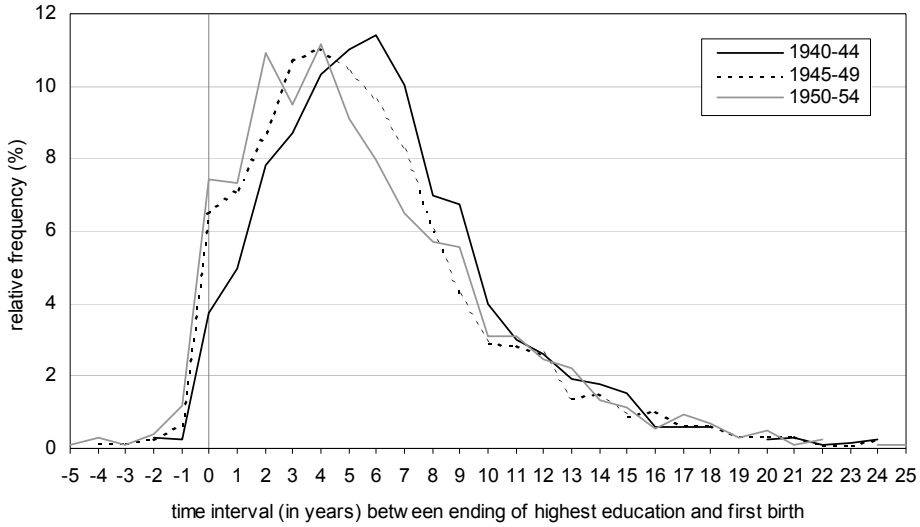


Figure 5.2 below shows the importance of the end of education for first births, as only a minority of women enters motherhood before having completed their education. In the year of completing the highest education, the graph raises sharply to a value of 6.6%. 50% of the women get their first child within the second and the sixth year after having graduated from their final school. The time distance between the completion of education and the first childbirth is 5.5 years on average.

Figure 5.2: Years between completion of highest education and first childbirth for different municipality types

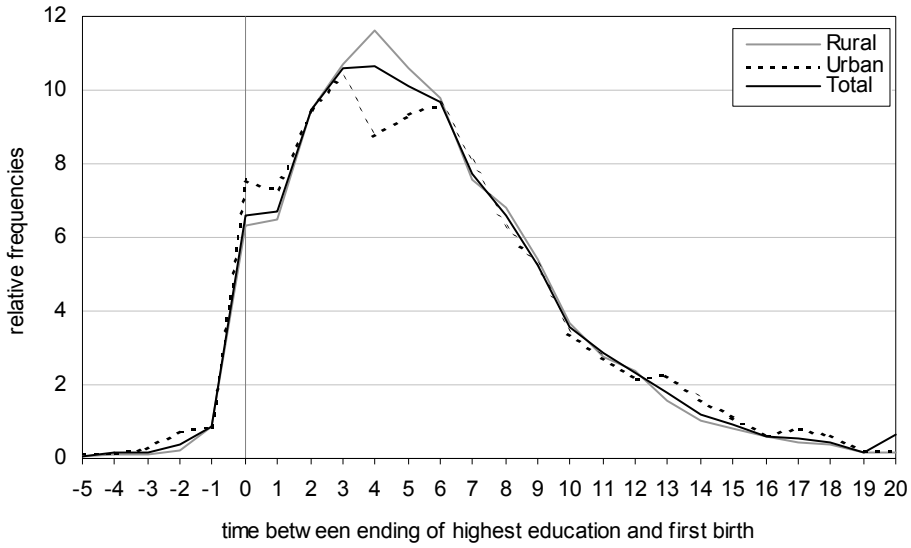


Figure 5.2 also shows differences regarding the timing of births and municipality types. Both graphs have quite a similar course, although they differ in respect to their peaks. While the peak for women living in rural areas is well-defined, the graph for females in urban regions displays more variation.

In this paper we focus on the relationship between the end of the highest (first-chance) education and the timing of the first birth. Above all we are interested in the questions of whether the timing differs for different groups of education. Table 5.1 summarizes our findings and displays noticeable differences between the various types of education. The median time that past by since the completion of the education for females having compulsory education only is 78 months, i.e. six and a half years. Females of all other types of education have a median lower than 78, ranging from 25 months (2 years) for university drop-outs to 68 months (5 and a half years) for AHS graduates. When looking at the lower and upper quartiles of individuals who run through an apprenticeship, we see that 50% of those women get their first child between two and seven years (24 and 82 months) after having completed their apprenticeship, that is, rather soon compared to most other types of education. In Table 5.1 the mean is always higher than the median, indicating that the distribution is skewed to the right.

Table 5.1: Statistical measures quantifying the time span (in months) between end of highest education and first childbirth for different types of education

Highest education	n	Mean	5% Percentile	25% Quartile	Median	25% Quartile	95% Percentile
Compulsory	3242	87.6	27	53	78	112	183
Apprentice	2849	56.6	-1	24	49	82	142
BMS	1428	73.3	8	36	67	101	165
AHS	254	77.6	-1	39	68	114	170
BHS	442	69.2	0	35	63	97	157
College/Academy	372	53.2	-15	20	48	83	140
University graduate	208	40.0	-54	11	41	71	139
University drop-out	71	33.3	-43	-3	25	66	138

The results presented in Table 5.1 are quite plausible as we have to be aware that graduation from these various types of school occurs at different ages. Thus, females with no more than compulsory education are only 15 years old when completing their education and so it is 'too early' for them to get children. However, females holding a university degree are much older at the time of graduation and thus it is quite reasonable that 50% of them get their first child within three and a half years after having graduated. These findings are in line with those of Buber (2001), who also showed that women who finished their university studies get their children shortly after graduation, causing a so-called 'catching-up' effect.

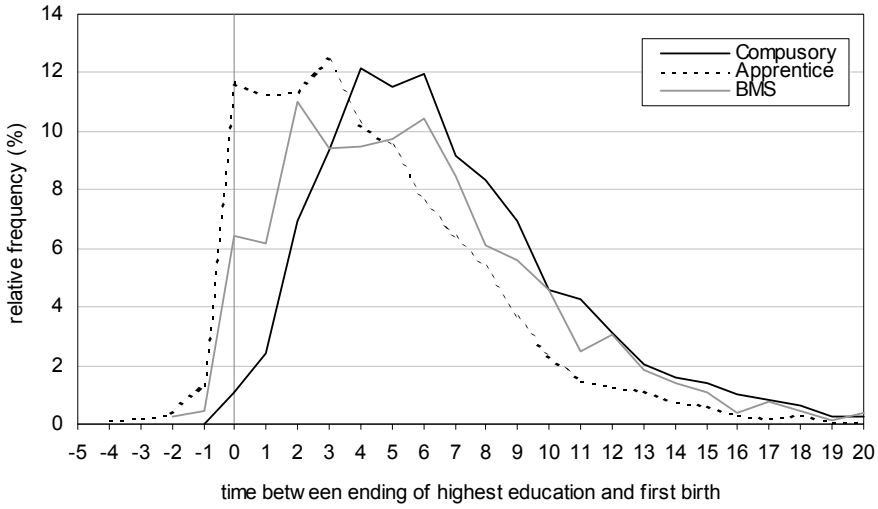
Figure 5.3 pictures the same circumstance as displayed in Table 5.1. Again, it illustrates the relation between the end of education and the first childbirth for the eight distinct types of education. In order to enable a better comparison, similar types of education are always shown together.

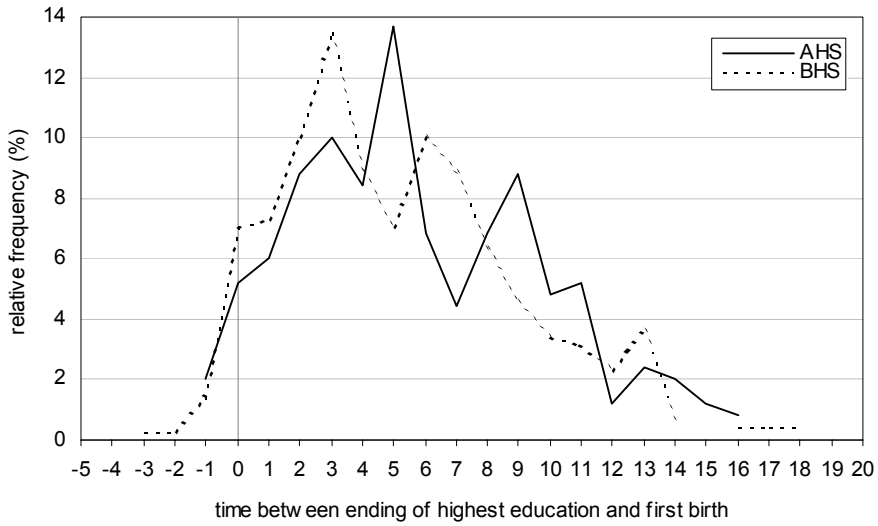
The first figure demonstrates that females who completed an apprenticeship training, enter motherhood right after ending their apprenticeship, 11.6% of them even within the same year.

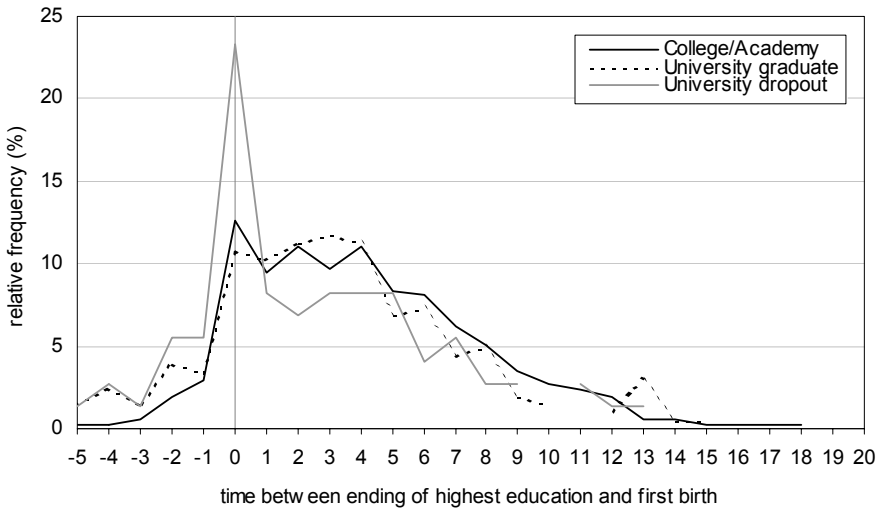
The figure beneath shows the same context for women graduating from AHS (secondary academic schools) or BHS (vocational and technical colleges). From the picture it becomes evident that females who attended AHS have their first child later than their BHS counterparts.

The graph for university drop-outs in the third figure is particularly outstanding, peaking at the value 0. This indicates that almost a quarter of the female drop-outs bear their first child in the year in which the drop-out occurs. This shows that the child is obviously the reason for dropping out.

Figure 5.3: Years between completion of highest education and first childbirth for different types of highest education

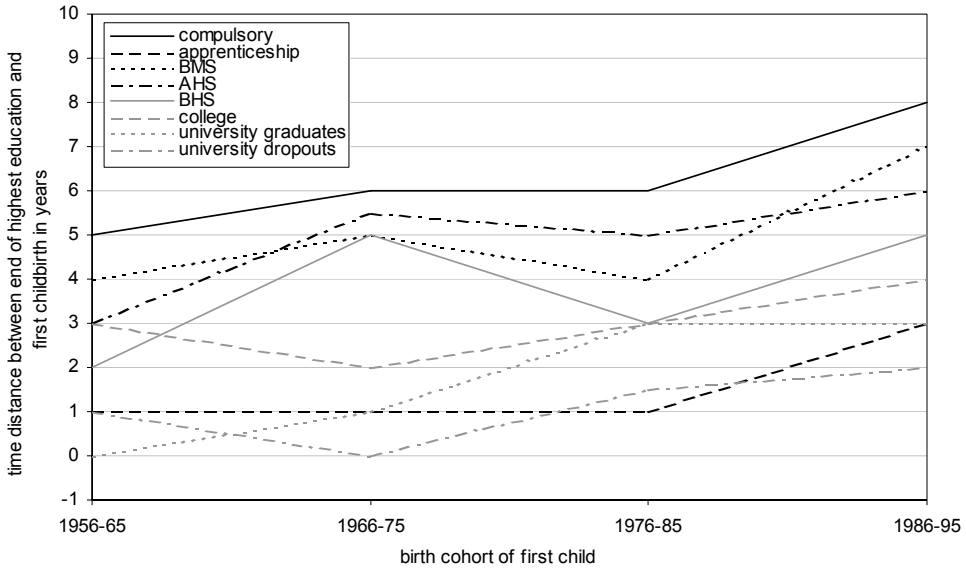






The figures above show remarkable relations, but apply to the whole sample investigated. However, we are now interested in whether there are changes in the timing of first births over time. Therefore we will analyze four different childbirth cohorts, showing the results in Figure 5.4 below. The figure displays an unambiguous increase in the time interval between the completion of the highest education and the first childbirth for all types of education. For individuals with compulsory education, vocational and technical school (BMS), secondary academic school (AHS), vocational and technical college (BHS) and university graduates, this time interval increased by three years from the first cohort to the last (1986-95). A particularly pronounced increase in the time distance can be found for the cohorts 1966-75 and 1986-95.

Figure 5.4: Trends in the timing of first births by highest education by investigation of four birth cohorts



6 The Spacing between Births

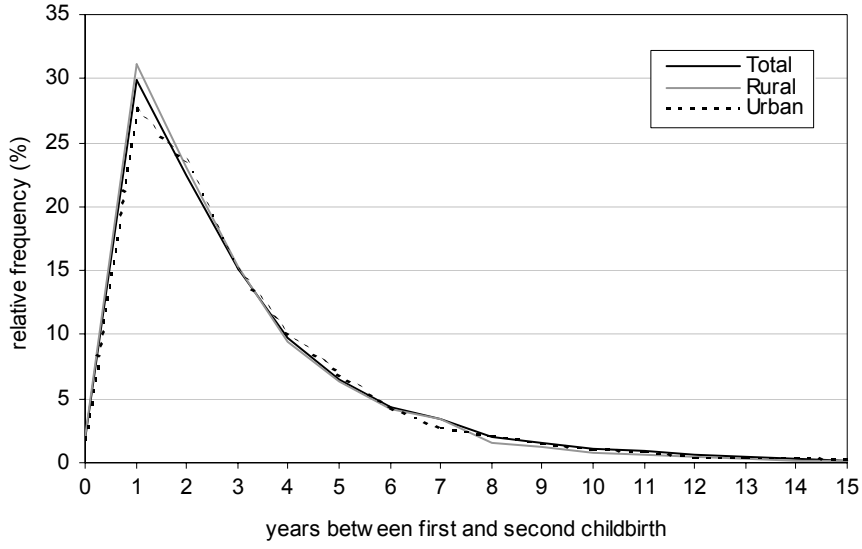
In this chapter we will compare two subsequent births to find out whether the time difference between them exhibits discrepancies with respect to the birth order, the municipality areas or types of education. However, we have to be aware that the time interval between births may be influenced by public policies and thus, variations may be due to changes in family policy measures (e.g. parental leave policies, family benefits, child-care policies, etc.).

6.1 The Spacing between First and Second Births

Figure 6.1 shows the time difference between the first and the subsequent birth for all females in our sample. Most women (30%) get their second child only one year after the birth of their first. Two years after giving birth to their first child 22.5% of the women bear their second child and over the years the percentage steadily declines and eventually approaches zero after the maximum range of 15 years.

As in the previous chapter, we are again interested in whether differences exist in the spacing between births for distinct municipality types. Figure 6.1 shows the connection between municipality type and the spacing between births. It reveals hardly any dissimilarities between urban and rural regions.

Figure 6.1: Spacing between first and second childbirth for different municipality types (in years)



In a next step we want to investigate whether the spacing between births differs for different types of education. As can be seen from Table 6.1, the variation in the spacing between births between the eight types of education are negligible. The median fluctuates slightly around a value of 32, being lowest for university graduates with only 29 months. While the 25% quartile is also quite similar for all types of education, the upper quartile diverges a little

more, ranging from a minimum of 45 months for university graduates to a maximum of 55 months for females who completed an apprenticeship training. As Table 6.1 shows, university graduates have the smallest time interval between the first and second childbirths. This result is fairly reasonable, as university graduates are quite old when giving birth to their first child (cf. Table 4.1).

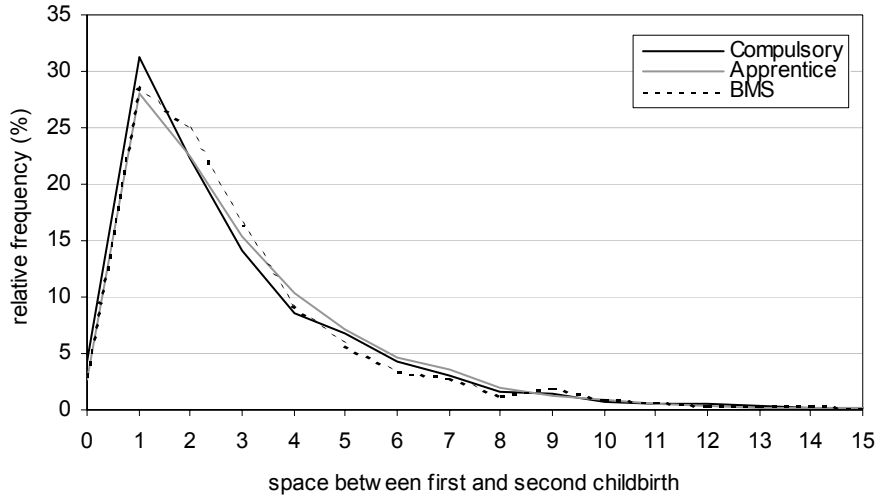
Table 6.1: Statistical measures quantifying the spacing between first and second birth (in months) subject to the highest education completed

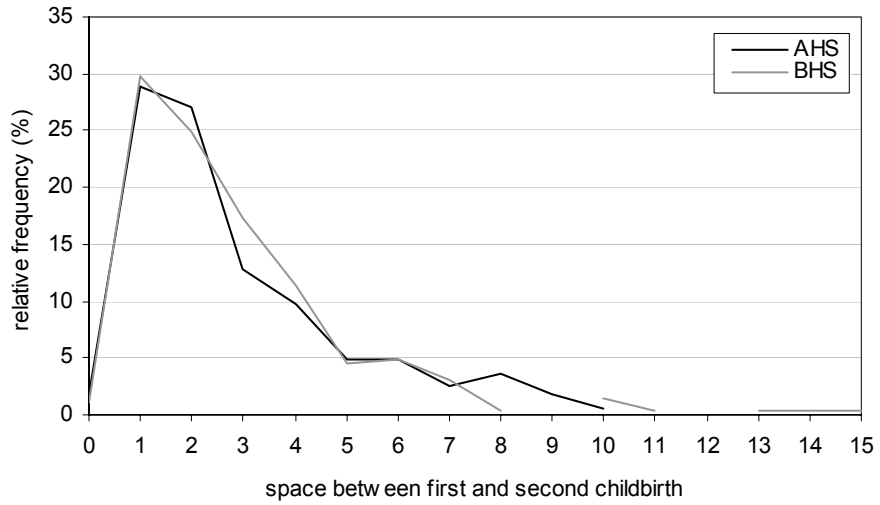
Highest education	n	Mean	5% Percentile	25% Quartile	Median	25% Quartile	5% Percentile
Compulsory	2518	40.5	12	19	31	52	102
Apprentice	1997	42.5	13	21	33	55	101
BMS	959	41.4	12	21	33	52	109
AHS	164	42.5	14	22	32	51	105
BHS	266	39.5	14	21	32	49	89
College/Academy	255	38.6	13	20	32	47	98
University graduate	127	37.4	11	21	29	45	98
University drop-out	47	37.8	11	20	33	52	88

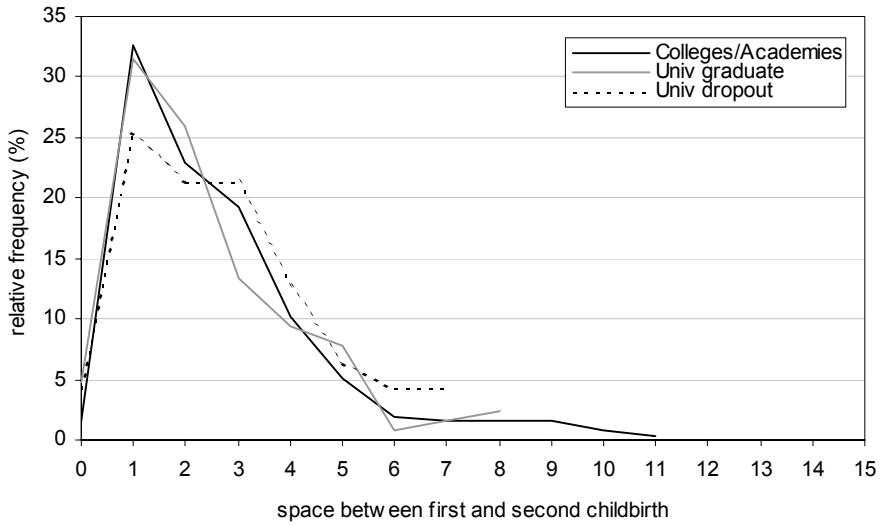
Figure 6.2 pictures the relations between the highest education completed and the time space between first and second childbirths. Again to facilitate a better comparison, similar types of education are combined in one diagram. Looking at the first figure it becomes clear that there are only minor differences in the spacing between first and second childbirths for females having compulsory education, apprenticeship or BMS as their highest education.

As the group of university drop-outs is quite a small one and as we presume it to be quite heterogeneous, our findings concerning them are less apparent than those for all other types of education.

Figure 6.2: The spacing between first and second childbirths (in years) for different types of education







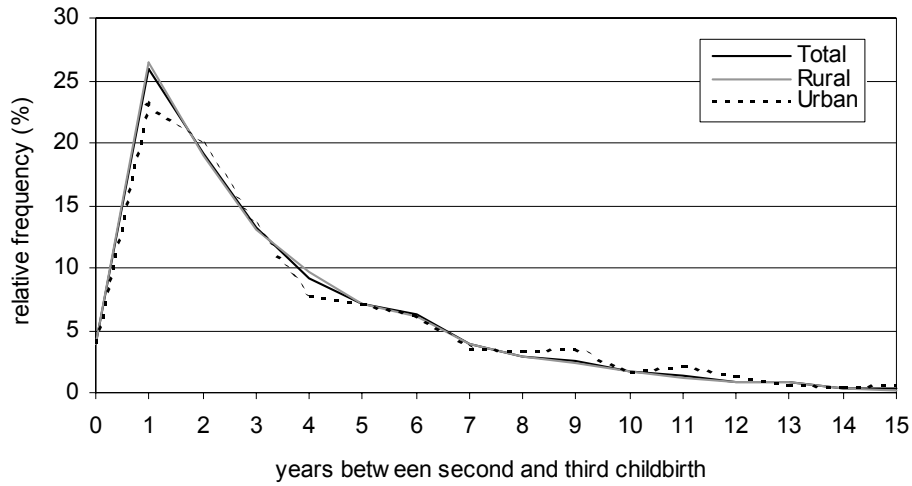
6.2 The Spacing between Second and Third Births

Analyzing the time difference between second and third births, we find that the sample size decreases considerably, which is indicative of the aforementioned 'two-child norm' prevailing in Austria.

Figure 6.3 provides an overview of the time distance between second and third births. As seen before, the graph peaks at year one, indicating that most women get their third child immediately after their second one.

Similar to the observations made with regard to the time difference between first and second births, there are only minor variations between women in rural and urban municipalities. These minor differences may arise from the fact that the municipality type refers to the place where the individual lived at the age of 15, and thus totally ignores migration flows.

Figure 6.3: Spacing between second and third childbirths for different municipality types (in years)



Again, an interesting question concerns the fact of whether the highest education completed influences the spacing between births. Table 6.2 shows this relation in terms of statistical figures.

Table 6.2: Statistical measures quantifying the spacing between second and third births (in months) subject to the highest education completed

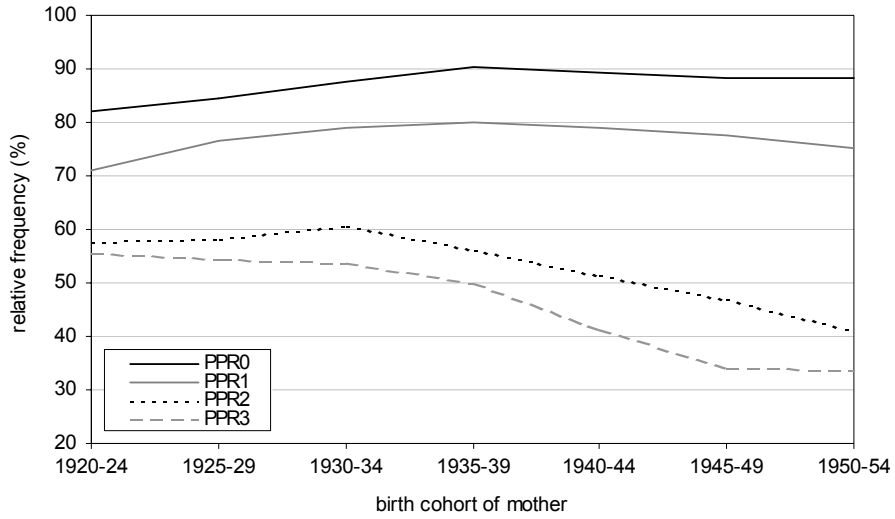
Highest education	n	Mean	5% Percentile	25% Quartile	Median	25% Quartile	95% Percentile
Compulsory	1216	49.3	13	20	37	68	122
Apprentice	630	52.6	13	24	41	70	136
BMS	318	48.7	14	23	38	65	114
AHS	39	56.4	15	26	38	73	166
BHS	74	52.8	14	24	46	70	129
Colleges/Academies	79	52.3	16	24	37	77	120
University graduate	34	42.9	16	22	35	51	111
University drop-out	17	43.4	15	23	36	83	---

Considering first the median, which represents the point where 50% of the observations lie below and 50% above, we find that the lowest value (35 months ≈ 3 years) applies to university and the highest (46 months) to BHS graduates. Looking at the 5% upper percentile, individuals graduating from AHS exhibit the highest value, thus 90% of the observations are between 15 and 166 months.

7 Parity Progression Rates

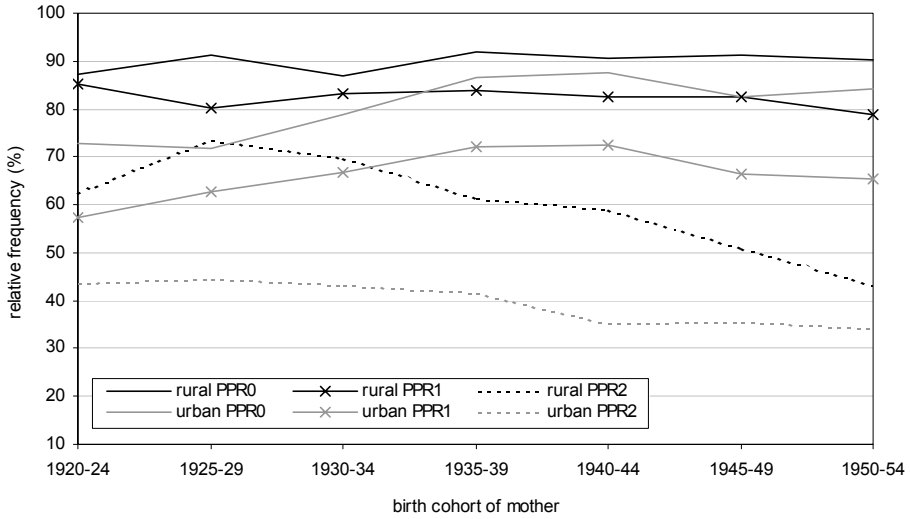
In this section we will consider parity progression rates, which represent the probability of having a(nother) child by current parity (for a brief mathematical description of conditional probabilities see the Appendix). Figure 7.1 shows parity progression rates for females born between 1920 and 1954. The graph labeled PPR0 indicates the probability for a still childless women to get her first child. Over the whole period investigated, the graph ranges from 80% to 90%. The graph PPR1, illustrating the probability for a women already having a child to get another one, has a similar course, yet runs around 10 percent points lower. However, the graphs PPR2 and PPR3 are considerably lower and – above all – decrease for all females born after 1930. Thus, much of the fertility decline can be attributed to a drop of higher order parity progression rates.

Figure 7.1: Parity progression rates by birth cohort of mother



In a next step we are interested in whether the parity progression rates differ for different municipality types. Figure 7.2 shows that for each parity, the progression rates and thus the risk of getting another child are higher for women in rural municipalities. While the probabilities of getting a first and a second child (PPR0 and PPR1) are almost constant on quite a high level for females in rural regions, they are considerably lower for women in urban regions. The corresponding urban parity progression rates increase until the 1940-45 birth cohort of mothers and decrease afterwards. This might be attributed to changes of norms – i.e. to and from the two-child norm – which seems to be more pronounced in urban areas. An extremely large disparity between rural and urban areas can be found when looking at the PPR2 graphs. However, for the last cohorts the PPR2 graph depicting rural municipalities shows a decrease to 43%, reducing considerably the formerly vast differences between urban and rural municipalities.

Figure 7.2: Parity progression rates for different municipality types



As in the previous sections, we are interested in whether the parity progression rates differ for the types of education defined[1]. We suggest that in this context educational attainment plays a crucial role, as it is a central indicator of labor-market behavior and income-potential, which in turn influences the number of children a woman bears (if any at all). Figures 7.3 to 7.5 below summarize our findings.

When looking at Figure 7.3 one can see that in the course of time the parity progression rates are – with exception of university graduates – relatively stable. Over all cohorts investigated the conditional probability for childless women with compulsory education as their highest education to get a child is around 90%. Women who did an apprenticeship training exhibit similar probabilities of getting a first child, especially those born in the 1940s. A quite high probability of becoming a mother can also be observed for females who went to colleges or academies. For those who graduated from vocational and technical colleges (BHS) the probabilities lie slightly above 80% for the first three cohorts and exhibit a notable increase to 92% for the cohort 1950-54. Clearly declining parity progression rates can be found for childless university graduates in the past. However, for the last cohort a reversal of the trend can be discovered.

Figure 7.4 presents the parity progression rates for parity one, that is, the conditional probability for women who already have one child to get another one. Considering females with compulsory education only, a clear downward trend can be found, with the probability of getting a second child declining from 85% for females born between 1935-39 to 79% for females in the last cohort. Women who did an apprenticeship training again show a stable behavior, although in this respect their probability of getting a(nother) child is considerably lower than the probability of women with compulsory education. For secondary academic school (AHS) graduates no real trend can be found.

[1] Due to their small sample size and their erratic fertility behavior, university drop-outs were omitted from the following analysis.

Figure 7.3: Parity progression rates for parity 0 and different types of highest education

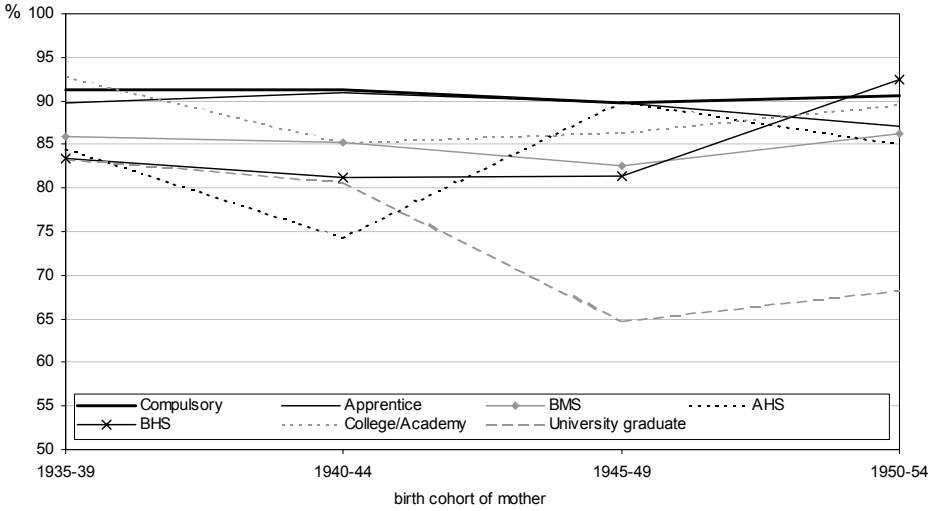


Figure 7.4: Parity progression rates for parity 1 and different types of highest education

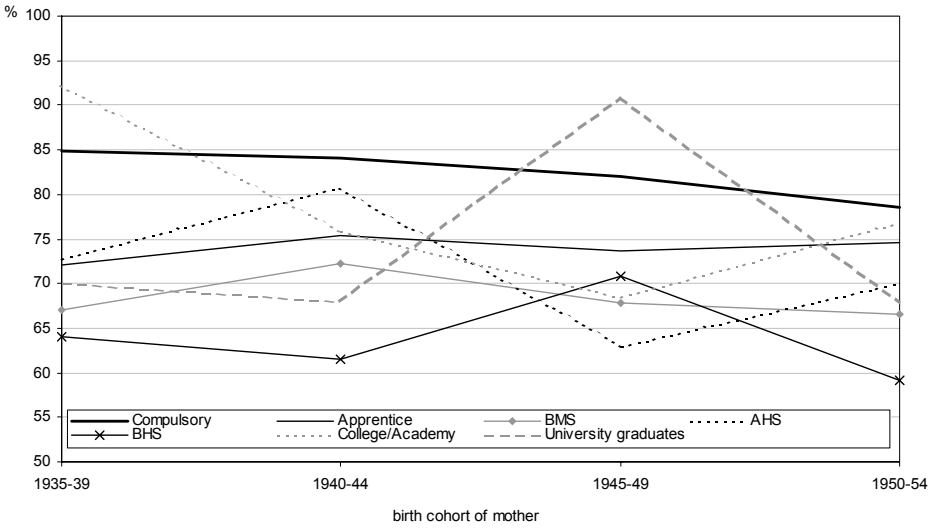
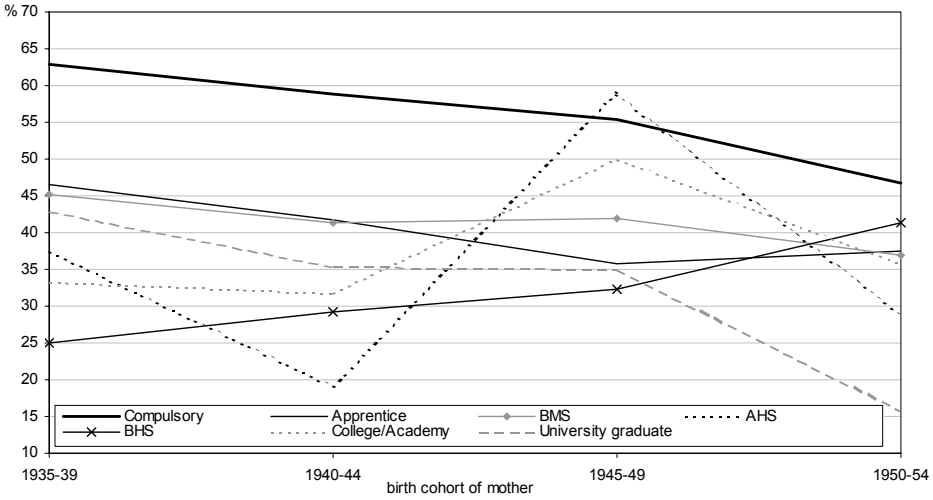


Figure 7.5: Parity progression rates for parity 2 and different types of highest education



Finally, Figure 7.5 presents parity progression rates for parity two and reveals probabilities of getting a third child for females with compulsory education. As the graphs move up and down, no clear predication can be made for women who attended colleges or graduated from AHS. However, females with a BHS degree show steadily increasing probabilities of getting a third child, whereas university graduates exhibit a contrary trend.

8 Summary

The aim of this paper was to study the quantum, timing and spacing of births in Austria by educational groups and school leaving age.

Over the last decades, the fertility behavior has changed considerably, leading to very low total period fertility rates. Changes have occurred both in quantum and timing of births. Regarding timing, we have observed an overall increase of age at first birth in all educational groups. As expected, parity progression rates vary considerably between different educational groups and follow different patterns of change. Changes of norms – i.e. to and from the two-child norm – seem to occur more pronounced in urban areas, where drops in parity progression rates were biggest for higher educated women.

As the educational composition of the population changes over time, this will considerably influence overall fertility rates in future, even assuming unchanged individual fertility behavior of women of given educational groups.

This paper is also understood as background paper in the context of the ongoing development of the FAMSIM+, family microsimulation model, that shows fertility decisions along with other life careers, such as education, partnership and job careers. Besides other applications, FAMSIM+ will serve to study the impact of various dynamics, like changes of timing and educational changes, on fertility changes.

9 Appendix

9.1 Sample Description

The micro census from June 1996 was answered by 28 376 women. 19 667 of them also answered the special program regarding fertility. Table 9.1 gives a brief overview of the composition of our sample.

Table 9.1: Sample description: absolute and relative frequency of occurrence

		absolute frequency	%
Age at time of the interview	15-19	1224	6.22
	20-24	1367	6.95
	25-29	1589	8.08
	30-34	1908	9.07
	35-39	1882	9.57
	40-44	1671	8.50
	45-49	1668	8.48
	50+	8358	42.50
	Total	19667	99.37
Municipality type	Rural	10146	69.93
	Urban	4362	30.07
	Total (valid)	14508	100
	Missing	5159	
Highest education (only first chance)	Compulsory	4712	36.25
	Apprentice	3735	28.73
	BMS	2026	15.58
	AHS	628	4.83
	BHS	818	6.29
	College/Academy	574	4.42
	University graduate	377	2.90
	University drop-out	130	1.00
	Total (valid)	13000	100
	Missing	6667	
Number of children	0	5231	26.60
	1	3873	19.70
	2	5687	28.92
	3	2853	14.51
	4	1086	5.52
	5	495	2.52
	6	233	1.18
	7+	209	1.06
	Total	19667	100

The table indicates that of all female respondents 10 146 (69.93%) live in rural, 4 362 in urban regions, while for 5 159 individuals no information is available in this regard. Regarding the highest education completed, it becomes clear that most women (36.25%) have compulsory education only, whereas there are disproportionally few females with higher (university) education.

All data analyses are done with the statistical software package SPSS.

9.2 Conditional Probabilities

The parity progression rate defines the conditional probability that a woman bears her first child, given that she has not yet has any children, that a mother gets a second child, given she has already born one etc. For computing the parity progression rates, conditional probabilities were used. The conditional probability of an event A on condition that event B occurs before (with P(B)>0) can be written as $P(A| B) = P(A \cap B) / P(B)$. In this case we consider event A to be a pregnancy leading to a childbirth, and event B the fact that a woman has already born one child before.

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Zu beziehen bei: Österreichisches Institut für Familienforschung (ÖIF)
Gonzagagasse 19/8, A-1010 Wien
Tel: +43-1-535 14 54-19
Fax: +43-1-535 14 55
Mail: edeltraud.puerk@oif.ac.at

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