Migration and reproduction in an urbanizing context. Family life courses in 19th century Antwerp and Geneva.

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Abstract

This paper investigates the reproductive life course of native and immigrant women in 19th century Antwerp and Geneva, two contexts characterized by rapid population growth, urbanization and immigration. Using data from the COR*-sample of Antwerp and from a family reconstitution of Geneva, we analyze individual family life courses in a sequential data perspective. We conceptualize the reproductive life course as a sequence of 4 states: the phase between the entry into reproductive age and marriage (1), the interval between marriage and first birth (2), the period of childbearing (3) and the phase of completed family size (4). The analysis shows an opposition between local immigrants (characterized by long childbearing periods) and long-distance immigrants (longer periods of completed family size) in Antwerp. In Geneva, natives married at a much younger age than immigrants, which explains why their life course was characterized by a longer period of completed family size.

1 Introduction

During the last decades a plethora of studies have analyzed the decline of fertility in late 19th century and early 20th century Europe. Whereas micro-demographic research has concentrated on the transition of reproductive behavior, macro-demographic research has shown particular interest in the geographic diversity of the decline in fertility. Before and during the demographic transition, substantial differences in family formation and reproduction could be observed at national, regional and even local levels. Before the transition, the European demographic landscape was shaped by the regional diversity of demographic systems (Livi Bacci 1999). Depending on the components of the system (notably mean age at marriage and the proportion remaining single, infant and childhood mortality and migratory patterns), levels of pre-transitional fertility could vary substantially (Flinn 1985). The process of the demographic transition amplified this regional diversity. Due to differences in the timing of the onset (Coale and Treadway 1986) and in the speed (Chesnais 1992) of the fertility decline, the previously existing regional differences in reproduction further increased.

The puzzle of regional diversity in fertility during the demographic transition was also affected by migration. The historical setting of the secular decline in fertility was characterized by the processes of industrialization and urbanization. During the demographic transition, European populations went through economic modernization and witnessed the formation of urban agglomerations. Industrialization was the trigger for increasing rural-urban migration between demographically distinct areas. Individuals who migrated from pre-transitional areas to regions and cities where the decline in fertility had already started were confronted with new reproductive behavior (Schumacher 2010), whereas individuals who migrated from transitional regions to places where the fall in fertility was still to come could spread the new behavior to the local population (Oris 1996; van Bavel 2004a).

In this paper we analyze the impact of migration and urbanization on family formation and reproduction in 19th century Antwerp and Geneva. Whilst both cities experienced high rates of immigration, demographic growth and urbanization throughout the 19th century, they were characterized by two distinctive demographic and urban profiles. In the city of Geneva, fertility started to decline in the late 18th century, whereas in Antwerp the decline did not start before the end of the 19th century. Therefore, immigrants settling in Geneva originated mostly from regions where the demographic transition had not yet started (remaining Switzerland, Savoy, Germany and Italy). On the contrary, in Antwerp immigrants could originate from regions where the decline had already started as well as from pre-transitional regions (Flanders, Netherlands, Germany and France). The two cities to compare in this paper also differed in their economic orientation and as a result in the socio-economic profile of their immigrants. Specialized in the production of luxury goods, Geneva mainly received skilled workers, whereas the port city of Antwerp mainly accommodated lower skilled and unskilled workers.

The objective of our paper is twofold. First, we want to explore the differences in reproductive behavior between natives and immigrants in the two towns under study and assess how the diverging contexts of Antwerp and Geneva affected demographic differences between locals and in-migrants. We also want to analyze to what extent individual heterogeneity in reproductive behavior in 19th century Antwerp and Geneva can be explained by individuals' migration status. To do so, we adopt a life course perspective. Unlike several recent studies analyzing the behavior of natives and immigrants, we do not concentrate our analysis on fertility or the timing of marriage, but look at complete reproductive life courses. That means that we restrict our analysis to individuals who can be observed over a long period. We believe that the drawbacks of this approach, namely

the non-consideration of incomplete life courses and temporary migrants, are more than compensated for by its advantages. Complete family life courses allow a holistic view on reproductive behavior and are particularly well suited for a simultaneous analysis of starting, spacing and stopping of fertility. In order to analyze heterogeneity in family life courses, we apply descriptive and mining techniques of sequence analysis (Gabadinho et al. 2011b). These techniques allow us to identify, in a first step, subtypes of reproductive life courses and to assess, in a second step, to what extent these subtypes can be related to individuals' migration status. The second objective of this paper is therefore to explore the potential of this new analytic approach for demography in general and for historical demography in particular.
In the following sections we first conceptualize the reproductive life course and then shortly describe the historical setting of our study. In further sections we present the data we use and introduce the techniques of sequence analysis we apply. After the presentation of our results, we discuss the contribution of our comparative study design as well as the strength of the sequential data approach.

2 The reproductive life course

The life course concept has emerged from the confluence of different disciplines and approaches and relates social change to social structure and individual agency. It has become an important paradigm in the social sciences in general (Giele and Elder 1998) and in demography in particular (Courgeau and Lelièvre 1996; Billari 2003). The life course can be understood as a sequence of states, of transitions and of events which shape individual life trajectories (Levy et al. 2005). According to various authors, several organizing principles characterize the life course. Following Giele and Elder (1998), the life course can be seen as a process marked by its location in time and space, by its interaction with the life trajectories of significant others (linked lives), by human agency and by the timing of lives. Blossfeld and Huinink (2001) in turn have defined the life course as a multilevel, auto-referential and multi-dimensional process. Both conceptualizations consider the life course as a life trajectory shaped by the individual who acts depending on current and previous experiences and resources, by historically formed social institutions, by the individual's ties within personal networks, and by the interactions between the life course's different domains, or to use an expression due to Willekens (1991), by the "interdependence between parallel careers".
Following this general concept, the reproductive life course can be conceptualized as the timing and the sequencing of events relating to reproduction, such as marriage and first and consecutive births. In a pre-transitional demographic context characterized by a high mean age at marriage and by the absence of parity-specific fertility control, the reproductive life course typically starts with a long silent phase between the beginning of the potentially reproductive or marriageable age and the entry into sexual union, mostly marriage. The interval between marriage and the first birth is the next stage of the reproductive life course. The childbearing period is marked by the rhythm of successive

births and is long in a pre-transitional context. It is followed by the last stage of the reproductive life course, a period of potentially reproductive age during which no more births occur. This last subsequence is short in pre-transitional populations where no parity-specific fertility control is practiced. In the absence of fertility stopping, the length of this last state is determined by decreasing fecundability and coital frequency and by the onset of sterility. The pre-transitional reproductive life course is influenced by the configuration of the regional demographic system which can be considered a historically shaped social institution defining the social restrictions and opportunities for individual agency (de Brujin 1999). Several studies have indeed shown that individual agency had an impact on the pre-transitional reproductive life course. Birth spacing has been identified as a deliberate family strategy (van Bavel 2004b) and a way to cope with temporary economic hardship (Bengtsson and Dribe 2006). The organizing principles of linked lives and parallel careers also apply to the pre-modern family life course. Women's timing of marriage for instance has been shown delayed when their mothers were widowed and the family's youngest daughter often had to refrain from getting married to take care of the parents (Alter 1988). The interaction between the timing of births and the family economy cycle (van Bavel 2003), as well as the interdependence between the timing of births and individuals' migration history (Kulu 2005) are examples of the effect of parallel careers.

During the demographic transition the reproductive life course changes significantly. In some regions the first subsequence between the entry into reproductive age and marriage shortens simultaneously with the decline of marital fertility, whereas in other regions the mean age at marriage decreases only after fertility achieved post-transitional levels (Coale and Treadway 1986). Due to the decline of marital fertility and the diffusion of parity-specific birth control, the childbearing period in the reproductive life course shortens considerably, whilst the last stage of the family life course, the period of potentially reproductive age during which no more children are born, lengthens substantially. Even though the impact of individual agency in terms of timing of marriage and subsequent births may increase during the demographic transition (Wrigley 1978), the modernizing reproductive life course remains influenced by social institutions. The demographic transition has often been considered a period during which the power of social institutions weakened (Lesthaeghe 1980; McQuillan 2004). It can be argued, however, that during the process of the demographic transition the new fertility behavior, respectively the new family form becomes itself a social institution (Montgomery and Casterline 1996). Of course, the principles of linked lives and parallel careers also apply to the transitional and post-transitional reproductive life course. In contexts of changing fertility, for example, the diffusion of birth stopping through social learning within personal networks (Bongaarts and Watkins 1996) or in the neighborhood (van Bavel 2004a) can be considered an effect of linked lives.

Migration affects the reproductive life course in several ways. In a variety of contexts, the age at marriage of immigrants has been found higher than that of natives (Alter 1988; Lynch 1991; Oris 2000; Moreels and Matthijs 2011). Delayed marriage among newcomers has usually been explained by the disruption immigrants experience through their mobility and by their lack of social networks in the new place. The length of the first sequence in migrants' reproductive life course certainly also depends on the age at which migration takes place and on the motivation to migrate (Oris 2000). Depending on the demographic contexts at origin and at destination, migration can have an important impact on the length of the childbearing period, on the spacing of births within this period as well as on the length of the last stage of the reproductive life course. Given the high degree of geographic diversity in demographic behavior before and during the fall in fertility, migrants can be socialized in a high-fertility setting and start their family life course in a social context marked by low fertility and stopping behavior. Or, migrants born and raised in a setting of transitional fertility move to a place where the demographic transition has not yet started and find themselves confronted with traditional behavior. Whether newcomers behave according to the implicit rules of their region of origin (socialization hypothesis) or whether they adapt to the behavior that is predominant at the place of destination (adaptation hypothesis) (see Kulu 2005), depends on a variety of factors. George Alter (1988) has shown for 19th century Verviers that female immigrants who arrived at their place of destination as adolescents or children had the same fertility behavior as the natives. Based on social-psychological thinking and on the concepts of social influence and behavioral confirmation (Nauck 2001), one can also argue that short-distance immigrants, keeping in touch with their community of origin, may have greater difficulty in adapting to new behavior than long-distance immigrants. Similarly, immigrants whose community of origin is important in the city of destination may less interact with the local population. Their behavior is therefore more likely to remain under the influence of the normative context of their place of origin (Schumacher 2010).

3 The historical setting

In this paper we compare the reproductive life courses of natives and immigrants in two different historical settings. Even though the two cities to be compared here share a series of commonalities, both are characterized by a specific socio-demographic profile. The city of Antwerp experienced rapid urbanization and important socio-economic transformation during the 19th century. The population increased from 55'000 inhabitants in 1800 to 88'000 in 1846. During the second half of the 19th century, the city literally exploded and became the biggest city of Belgium with 273'000 inhabitants in 1900. Although part of this rapid population growth was due to natural increase, most of it can be explained by immigration. After the originally predominant textile sector collapsed during the first half of the 19th century, Antwerp became an international port city in the second half of the 19th century. Much of the city's economic activity was concentrated on the port and it is precisely the expansion of the harbor that explains the important immigration of people, mainly men, from the province of Antwerp, from other Belgian provinces as well as from the Netherlands and Germany. The constant flux of immigrants directly affected the composition of Antwerp's population. Whereas at the beginning of the 19th century 78 % of the population was born in Antwerp, only 56 % of the city's population was born in town at the end of the century. Predominantly employed as workers in the port, immigrants had in general a low socio-economic status. As to the demographic context of 19th century Antwerp, it was characterized by high levels of marital fertility until the 1880's, by rapid decline in fertility between 1890 and 1920, and by a loosening Malthusian preventive check during the fertility transition (Coale and Treadway 1986) (see table 1). Infant mortality remained at high levels throughout the period under study, and especially so between 1880 and 1910 when the infant mortality rate was constantly greater than 200 per thousand (Vandezande et al. 2010).

Like Antwerp, the city of Geneva experienced rapid population growth and urbanization during the 19th century. Yet, its population was clearly smaller and the rhythm of growth slower than in Antwerp. The population rose from approximately 22'000 in 1800 to 59'00 in 1900. The overwhelming majority of this population increase was due to regional, national and international immigration. The proportion of the locally born population decreased from about two thirds at the beginning of the century to less than 30 % at the turn of the 20th century. The growth was highest during the first decade of the second half of the century, immediately after the medieval city wall was destroyed and new land was freed for construction. The construction sector was the main employer for newly arriving immigrants during this period of important growth. Before and after the middle of the century, immigrants also found work in the proto-industrially organized network of the watch-and-clock industry and the jewelers, in the trade sector and in domestic service. During the second half of the 19th century, light industry and services also gained considerable importance, for natives as well as for immigrants. The immigrant population originated from French-speaking Switzerland, Savoy (Kingdom of Sardinia until 1861, France afterwards) and the neighboring French departments (Ain, Jura, Doubs), but also from German-speaking Switzerland, Southern Germany and, towards the end of the century, from Northern Italy. Although their socioeconomic status was on average lower than that of the local population, only about one third of the economically active immigrants were unskilled workers. Unlike Antwerp, Geneva must be characterized as a transitional demographic context throughout the 19th century. The decline of fertility started in the second half of the 18th century (Perrenoud 1988), was then interrupted by a period of stagnation between the 1820s and the 1880s and continued at the end of the 19th century (Schumacher 2010). Access to marriage was clearly more restricted than in Antwerp, and did not increase during the decline in fertility (see table 1). Infant mortality was clearly lower than in Antwerp, with levels oscillating between 120 and 150 per thousand during the 19th century (with the exception of 1870 when 180 per thousand were reached).

4 Data and methods

In this paper we make use of two existing historical-demographic databases. For Antwerp we use the COR*-database which is an alphabetical sample of the population of 19th century Antwerp constructed by the Research Group of the Family and Population of the K.U. Leuven (Matthijs and Moreels 2010). The two main sources on which this sample has been drawn are the population registers and the vital registration records. The Belgian population registers are continuously updated longitudinal records containing demographic and socioeconomic information on individuals and households and are therefore particularly well suited for demographic research. Vital registration has been used to check the completeness of event registration in population registers and has allowed identifying in particular individuals who died before they could be recorded, mostly infants. The COR*-database covers the period 1846-1920 and contains information on 30'000 individuals whose surname began with the letters C-O-R as well as their relatives. For the purpose of this study, we use information on 616 women whose family life course can be observed until the 45th birthday and who celebrated their first marriage before that age. In order to compare the life courses of natives and immigrants, we distinguish women born in the city of Antwerp from those born in the district of Antwerp and from those born in any other region. The Antwerp district is an area encompassing 62 municipalities of urban, rural and semi-rural character. We therefore further distinguish between women born in rural, semi-rural or urban areas of the Antwerp district. Table 2 shows that natives of the city represent one third of the sample, whilst about 45 % of the sampled women were born in the district of Antwerp. With less than a fourth born outside the Antwerp district, female immigration was overwhelmingly local.

For the city of Geneva we use a family reconstitution database elaborated by Schumacher (2010). The dataset contains information on couples whose family name (the groom's surname) began with the letter B and who got married in the city of Geneva between 1800 and 1880. Their reproductive life courses have then been reconstructed until 1900 using alphabetical registers of civil birth and death records, immigration permits, local censuses of the first half of the 19th century, as well as nominative yearbooks of the second half of the century. Among the 2200 birth histories usable for fertility analysis, 1045 are complete, which means that they are neither left nor right censored and can be observed until the bride's 45th birthday. For the purpose of this paper, we distinguish native women from the city of Geneva from women born in the canton of Geneva (an administrative unit existing since 1815 and comprising villages belonging to the ancient Republic of Geneva, villages formerly belonging to the Département de l'Ain as well as formerly Savoyard villages), from women born in the neighboring Swiss and French speaking canton of Vaud, from immigrants born in Upper Savoy, from native French as well as from women born in other regions. Table 2 shows the distribution of the sampled women by region of birth. About 54 % originated from the city or the canton of Geneva, about 14 % were born respectively in upper Savoy and in the canton of Vaud and only a little more than 10 % were natives of other and potentially non French speaking regions, such as the German speaking Swiss cantons. As in Antwerp, female immigration had therefore a local character, although the immigration basin was clearly larger in Geneva.

In order to analyze the reproductive life courses of natives and immigrants in 19th century Antwerp and Geneva, we apply techniques of sequence analysis. Contrary to the widely used techniques of survival or event history analysis which focus on the occurrence and timing of single or multiple life events, sequence analysis represents life trajectories as sequences of states and allows thereby a holistic perspective on the life course. This technique has been frequently used in sociology and other social science disciplines (Abbott 1995; Abbott and Tsay 2000) but has only recently entered the field of population studies (Aassve et al. 2007; Elzinga and Liefbroer 2007; Bras et al. 2010).

In this paper we focus on female life trajectories from ages 15 to 44 years and concentrate on one specific representation of the reproductive life course. We look at the entire family life course defined as a sequence of 30 yearly states from ages 15 to 44. In this perspective on the family life course, we distinguish in principle 4 different states, each corresponding to the four main phases of the classic reproductive life course (see section 2), namely "not yet married" (1), "married, no children" (2), "married with children" (3), "no more births observed" (4). Phase 1 represents the starting component of the family life course, phases 2 and 3 stand for the spacing component, whilst phase 4 corresponds to the stopping component. While these four states are enough to represent the family life sequences of the Geneva sample, they do not suffice to characterize the trajectories of the Antwerp sample. The Geneva dataset has been created to study marital fertility and contains only few premarital births, in principle only those mentioned and legitimized in the marriage certificates. Among the 1045 sampled women in Geneva, no premarital birth has been recorded in the dataset. The Antwerp database has been created in a different, more encompassing perspective and contains therefore many illegitimate children. Illegitimacy was high in 19th century Antwerp. At the end of the century, Coale's index of illegitimate fertility Ih added up to 0.07 to 0.08 (Coale and Treadway 1986), which means that illegitimate fertility represented about 11 % of the overall fertility rate. Among the 616 sampled women in the Antwerp dataset, almost 30 % had their first birth before they got married. In order to take these premarital births into account, we further define the state "not yet married, with children" (5).

The analysis of these state sequences is carried out in two steps. In a first step, we describe the sequences of natives and different categories of immigrants using the graphical analysis tools available in TraMineR, a recently developed R package for sequence analysis (Gabadinho et al. 2011a). In a second step, we identify life course subtypes and assess by means of regression analysis whether these subtypes can be related to different migration statuses. To do so, we first need to compute distances between all individual sequences. In this study we opt for optimal matching distances with constant substitution costs of 2 and insertion/deletion costs of 1 (see Gabadinho et al. 2011b). Based on these distances, we then identify subtypes of trajectories by means of a Ward cluster analysis. To analyze how the clusters are related to the women's individual profile, we run a series of logistic regression models. For the sake of comparability, we include the same three predictors in all models: women's region of birth, women's birth cohort and the couples' social status. The latter is defined as the groom's regrouped occupational title. We opt for the groom's occupational title rather than for the bride's occupation because the variability of the latter is low and because brides' titles are often missing. All occupational titles have been coded using the HISCO classification and then regrouped according to the HISCLASS scheme (van Leeuwen and Maas 2010). The predictors used in the regression analysis represent recoded versions of HISCLASS.

5 Results

Figure 1 shows the transversal age distribution of the five distinguished family life course states in 19th century Antwerp by regions of birth. It can be seen that the general structure of the reproductive life course does not differ substantially between these five regions. All panels show a transitional reproductive life course with a relatively long childbearing period. The lengths of the three main subsequences of the family life course do however differ between natives and immigrants (see also table 2). Women born in the city of Antwerp married clearly at a younger age than immigrant women, with a mean age at marriage of approximately 23 years. The life course of native women is further characterized by a shorter-than-average childbearing period and a long period of completed family size. With a median age at last birth of less than 36 years, the reproductive life course of native women must clearly be qualified as transitional. We have to bear in mind however that all groups of origin embrace different birth cohorts among which some must be considered pre-transitional with respect to reproductive behavior, whereas others are characterized by already low levels of fertility.

Among immigrant women born in the Antwerp district, the median age at last birth is close to 40, which indicates low to very low diffusion of stopping behavior. Differences between women born in rural, semi-rural and urban areas in the district of Antwerp stem mainly from differences in the timing of marriage and the onset of childbearing. The family life course of women born in rural areas of the Antwerp district started on average at age 25. The childbearing period was of similar length as among natives, but the phase of completed family size was clearly shorter, resulting from the higher age at marriage. Women born in semi-rural areas of the Antwerp district married at an even later age and gave birth during almost 12 years. The last period of their reproductive life course was therefore the shortest among the five groups of origin. The family life course of women born in urban areas of the Antwerp district is characterized by a low age at marriage (23 years) and by a childbearing period of more than 12 years. This is the longest observed childbearing sequence among the five regions of origin and its lengths also explains why immigrants of urban areas of the Antwerp district gave birth to the highest average number of children.

The reproductive life course of women born outside the district of Antwerp contains clear elements of modernity. The median age at last birth was around 36 years, which indicates some prevalence of stopping behavior. The age at marriage was similar to that of immigrants born in the district of Antwerp, whereas the childbearing period was clearly shorter than in any other group of origin. The limited length of the childbearing subsequence (8 years) also explains why the mean number of births was lowest among women born outside the Antwerp district.

Figure 2 shows the transversal age distribution of the family life course states among five clusters of individual reproductive life courses. The clusters have been identified by means of a Ward cluster analysis on the matrix of OM distances between individual sequences. Cluster 1 mostly contains sequences shaped by modern reproductive behavior:

age at marriage is low, the childbearing subsequence is short and the period of completed family size is long. In this cluster the median age at last birth is as low as 32 years. The results of a logistic regression analysis shown in table 3 highlight that this "stopping cluster" must be associated with later birth cohorts and with higher social status. The variable region of birth does not contribute much to the explanation as to whether an individual life course belongs to this cluster or not, even though women born outside the district of Antwerp tend to belong to this cluster in higher proportions than native women (significant at the 10% level). Clusters 2 and 3 contain sequences shaped by traditional fertility behavior : in both "non-stopping clusters" the childbearing subsequence is very long, whereas the period of completed family size is short and the median age at last birth clearly over 40 years. The regression analysis shows that cluster 2 is associated with early birth cohorts and with immigrant women born in the Antwerp district who are between two and three times as probable to belong to this cluster as natives and immigrants from outside the district. Cluster 3 must be associated with lower social status and with urban origin. Immigrants from the rural and semi-rural areas of the Antwerp district as well as women born outside the district are clearly less likely to belong to this "early-marriage-no-stopping cluster". Cluster 4 is characterized by a very high age at marriage: the median age at first marriage is as high as 35 years. Given the lower fecundability among women starting their reproductive life course at a high age, the waiting time between marriage and first birth is longer than in the other clusters. The late age at marriage also explains the short subsequence of childbearing. This cluster of late marriage is mainly associated with early birth cohorts and with rural origin. Among women born in rural and semi-rural areas of the Antwerp district as well as among women born outside the district, the probability to belong to this cluster is 3 to almost 5 times higher than among natives. The last cluster contains untypical reproductive life courses, characterized by illegitimacy and very low numbers of births. According to the results of the regression analysis, this cluster seems to be related with families living at the margins of the society: women married to men with unknown occupation (probably men of unstable or precarious employment) are very likely to belong to this cluster.

Figure 3 shows the transversal age distribution of the main four family life course states in 19th century Geneva by region of birth. As in the case of Antwerp, the six panels do not differ dramatically from each other with respect to their general structure; they all show a transitional pattern of the reproductive life course. It can be easily seen that the average shape of the reproductive life course in 19th century Geneva differs clearly from that found in 19th century Antwerp. The "silent phase" between the entry into reproductive age and marriage is much longer in Geneva, and so is also the waiting time between marriage and first birth. The average length of the interval between marriage and first birth was more than 4 years in Geneva and can be explained by an important number of couples remaining childless (Schumacher 2010). Given the high age at marriage and the long waiting period until first birth, the childbearing period is clearly shorter than in Antwerp. The subsequence of completed family size is also shorter in Geneva, but longer than one would expect given the high age at marriage. The short childbearing period must clearly be related to the high prevalence of stopping behavior in 19th century

Geneva (Schumacher 2010).
The reproductive life courses of women of different regions of birth differed between each other mainly with respect to age at marriage. Among native women of the city of Geneva, the mean age at marriage was 26.9 years. This is clearly lower than in all other groups of origin of the Geneva sample, but it's still one year higher than the highest mean age at marriage recorded in the Antwerp database (among women born in semi-rural areas of the Antwerp district). Given the relatively low age at marriage of the natives, it is not surprising to find that the median age at last birth was, with approximately 37 years, also lowest in this group of origin. Women born in the canton of Geneva and in France had a very similar reproductive life course, with a mean age at marriage of about 28 years and a median age at last birth of about 38 years. The reproductive life course of women born in Upper Savoy, in the canton of Vaud and in other regions (namely other Swiss cantons and Southern Germany) was determined by a high age at marriage (29 to 30 years) and, consequently, a higher age at last birth.
Figure 4 shows the transversal age distribution of four family life course states among 5 of 7 clusters retained by a Ward cluster analysis on optimal matching distances between individual life sequences. Cluster 1 represents a typical post-transitional family life course, characterized by a low age at marriage, a short childbearing period and a long subsequence of completed family size, due to systematic parity-dependent birth control. According to the results of a logistic regression analysis given in table 4, this "early-marriage-stopping" cluster is associated with a high social status and with nativity in Geneva. All things being equal, immigrant women from outside the canton of Geneva were clearly less likely to be member of this life course cluster. It is also interesting to note that the probability of being member of this cluster does not significantly increase across successive birth cohorts. This finding demonstrates that stopping behavior was already widespread among native Genevans of the first half of the 19th century. Cluster 2 is characterized by a high age at marriage, a short childbearing period and, given the high age at marriage, a relatively long period of completed family size, which indicates a certain degree of birth stopping. This second cluster is only weakly associated with the independent variables included in the model predicting its membership. Yet, immigrant women from the canton of Vaud and from other regions were overrepresented in this cluster. In cluster 3, age at marriage is low, whereas the childbearing period is clearly longer than in the two first clusters. The period of completed family size is definitely longer than what would be expected in a pre-transitional population. This cluster is associated with later birth cohorts and with higher and middle social status. Cluster 4 is determined by a very high age at marriage and is associated with lower social status and with nativity in the canton of Vaud and in Upper Savoy. Cluster 5 finally is characterized by a relatively low age at marriage, a short waiting time between marriage and first birth and a long childbearing period. Membership to this cluster of rather traditional behavior is not related to women's region of birth, it is however surprisingly frequent in the last birth cohort.

6 Discussion and conclusion

The aim of this paper was to compare the reproductive life course of natives and immigrants in two urbanizing contexts of 19th century Europe and to explore the potential of sequential data analysis for the study of reproduction. The comparison of Antwerp and Geneva is particularly relevant because the two cities share a series of commonalities and represent at the same time two distinct socio-demographic profiles. Both cities experienced rapid population increase and urbanization during the 19th century due to high rates of immigration. The port city of Antwerp received mostly lower skilled and unskilled workers, whereas Geneva - specialized in the production of luxury goods - accommodated manly skilled workers. Most importantly, immigrants in Geneva usually originated from regions where fertility was higher than in Geneva, whilst in Antwerp immigrants originated from regions with similar or lower fertility. To study the reproductive life course of natives and immigrants in Antwerp and Geneva, we used the recently elaborated COR*-database for Antwerp (Matthijs and Moreels 2010) and a family reconstitution database for Geneva (Schumacher 2010). We conceptualized the reproductive life course as a sequence of four main states, corresponding each to four main phases of the family life course, namely the phase between entry into reproductive age and marriage (1), the interval between marriage and first birth (2), the period of childbearing (3), and the period of completed family size (4), a phase of potentially reproductive age during which no more births occur.

The analysis of the family life trajectories of 616 women of the Antwerp sample has shown an opposition between women born in the city of Antwerp on the one hand and women born in the district of Antwerp on the other hand. The life course of local immigrants, in particular of women born in rural and semi-rural areas, was characterized by a higher age at marriage, a longer period of childbearing and a clearly shorter period of completed family size. Whereas the life course of natives can be considered as transitional (over the full period under study), the life course of local immigrants has a predominantly pre-transitional shape. Because local immigrants spaced their births in higher proportions than natives (Moreels et al. 2010), the longer period of childbearing did not necessarily result in higher fertility. The life course of immigrant women born outside the Antwerp district clearly shows elements of a modern family trajectory. The age at marriage is higher than among women born in the city, but the childbearing period is shorter and the sequence of completed family size is equally long. The analysis of life course subtypes obtained from the clustering of optimal matching distances between individual sequences has confirmed this opposition between local and long-distance immigrants. A life course cluster marked by stopping behavior is associated with women born outside the district of Antwerp, whilst a cluster shaped by high age at marriage and the absence of birth stopping has been found related with local immigrants. The resistance against modernization among women born in the district of Antwerp might be explained by the close ties short-distance migrants sustained with their community of origin. The absence of such ties might also explain why long-distance immigrants showed a different reproductive behavior. However, it is not impossible that what we interpret as modern reproductive behavior was in truth the result of disruption and lack of integration of long-distance migrants into the urban structure.

In 19th century Geneva, the general structure of the reproductive life course was characterized by a high age at marriage, a short childbearing period and a relatively long period of completed family size. Among all six distinguished groups of origin, the last phase of the family life course was longer than the childbearing period. In Antwerp, only the life course of long-distance immigrant women was structured as such. Previous work has shown that immigrants in 19th century Geneva, and in particular immigrants who started their reproductive life course in the city, largely adapted their fertility behavior to the pattern of low fertility of the native population (Schumacher 2010). What this new analysis has revealed is that reproductive life courses of natives and immigrants differed from each other with respect to age at marriage. Native women married clearly earlier than immigrant women, what explains why the period of completed family size was longer in the family trajectory of the local population. The analysis of life course clusters obtained from optimal matching distances has confirmed the opposition between natives and immigrants along the line of age at marriage. A cluster of early marriage and marked stopping behavior has been found associated with women born in the city or in the canton of Geneva, whereas another cluster of late marriage and birth stopping is significantly related to women born in the canton of Vaud, in upper Savoy and in other regions.

The analysis of the reproductive life course by means of sequential data analysis allows us a new and holistic perspective on reproduction and family formation. The simultaneous consideration of the starting, the spacing and the stopping of fertility highlights the "endogenous causality" (Mayer 1987) or the "biographic opportunity costs" (Birg et al. 1991) of the reproductive life course: late marriage automatically shortens the last sequence of the family life course and can also have an impact on spacing behavior. The data mining approach applied in this paper is particularly promising because it allows us to reason in terms of heterogeneity and to assess the significance of the generally used social categories in multivariate demographic analysis. The conceptualization of the reproductive life course applied in this paper must be seen as a starting point for future research. The present definition of four family life states gives a general conspectus of the reproductive life course. It shows the importance of the starting and the stopping component of the family life trajectory, but at the same time it treats the childbearing period as a black box. Future conceptualizations of the reproductive life course should therefore develop on the spacing component.

7 References

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8 Figures and tables

Table 1. The decline of marital fertility in Antwerp and Geneva: Coale's indexes

	Antwerp (district)		Geneva (city)	
year	I_g	I_m	I_g	I_m
1816			0.421	0.358
1843			0.425	0.361
1860			0.490	0.380
1870			0.380	0.401
1880	0.810	0.463	0.399	0.414
1890	0.713	0.466	0.336	0.401
1900	0.584	0.485	0.322	0.413
1910	0.419	0.519	0.244	0.416
1920	0.330	0.527	0.184	0.379

sources : Coale and Treadway (1986) (Antwerp); Schumacher (2010) (Geneva)

Table 2. Mean times per life course state in Antwerp and Geneva, by region of birth

		life course state					number of
	n	1	2	3	4	5	births
city of Antwerp	205	7.8	1.0	10.5	10.6	1.1	5.2
district, rural	83	10.3	1.1	10.2	8.4	1.0	5.4
district, semi-rural	103	10.9	0.8	11.9	6.9	0.5	5.7
district, urban	88	8.0	0.5	12.3	9.4	0.8	6.5
outside district	135	9.7	1.0	8.0	10.6	1.7	4.4
city of Geneva	410	11.9	4.2	6.1	8.8		2.6
canton of Geneva	152	13.0	4.2	5.7	8.1		2.5
canton of Vaud	150	15.3	3.9	4.8	7.0		2.1
upper Savoy	142	14.3	3.4	6.0	7.3		2.8
France	77	13.2	4.9	5.3	7.6		2.4
other regions	114	14.6	4.9	5.1	6.4		2.4

1 not yet married
2 married, no children
3 married, childbearing
4 childbearing completed
5 unmarried, childbearing

Figure 1: Transversal distribution of family life states, Antwerp 1846-1920 by region of birth

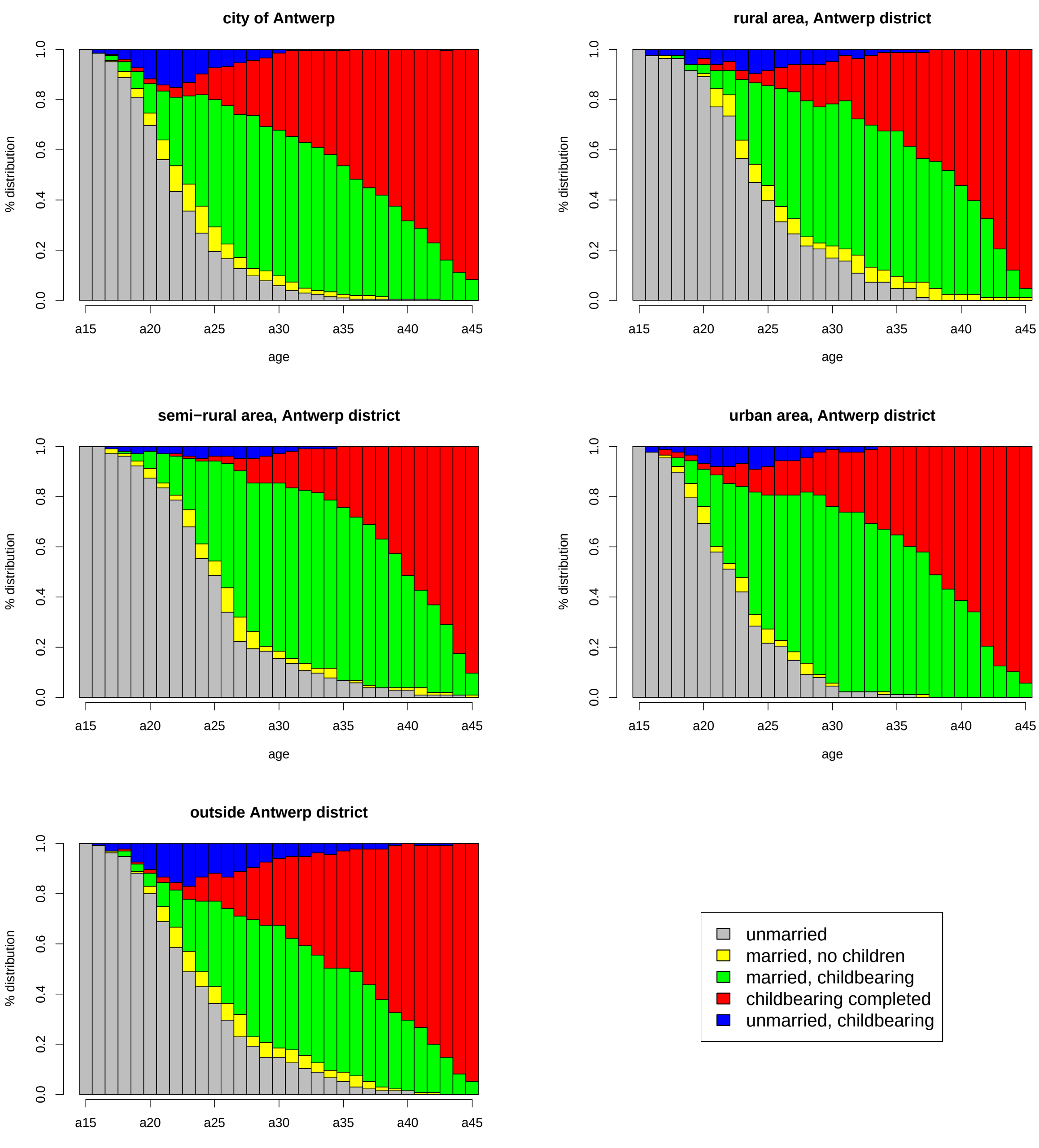

Figure 2: Transversal distribution of family life states, Antwerp 1846-1920, 5 life course clusters

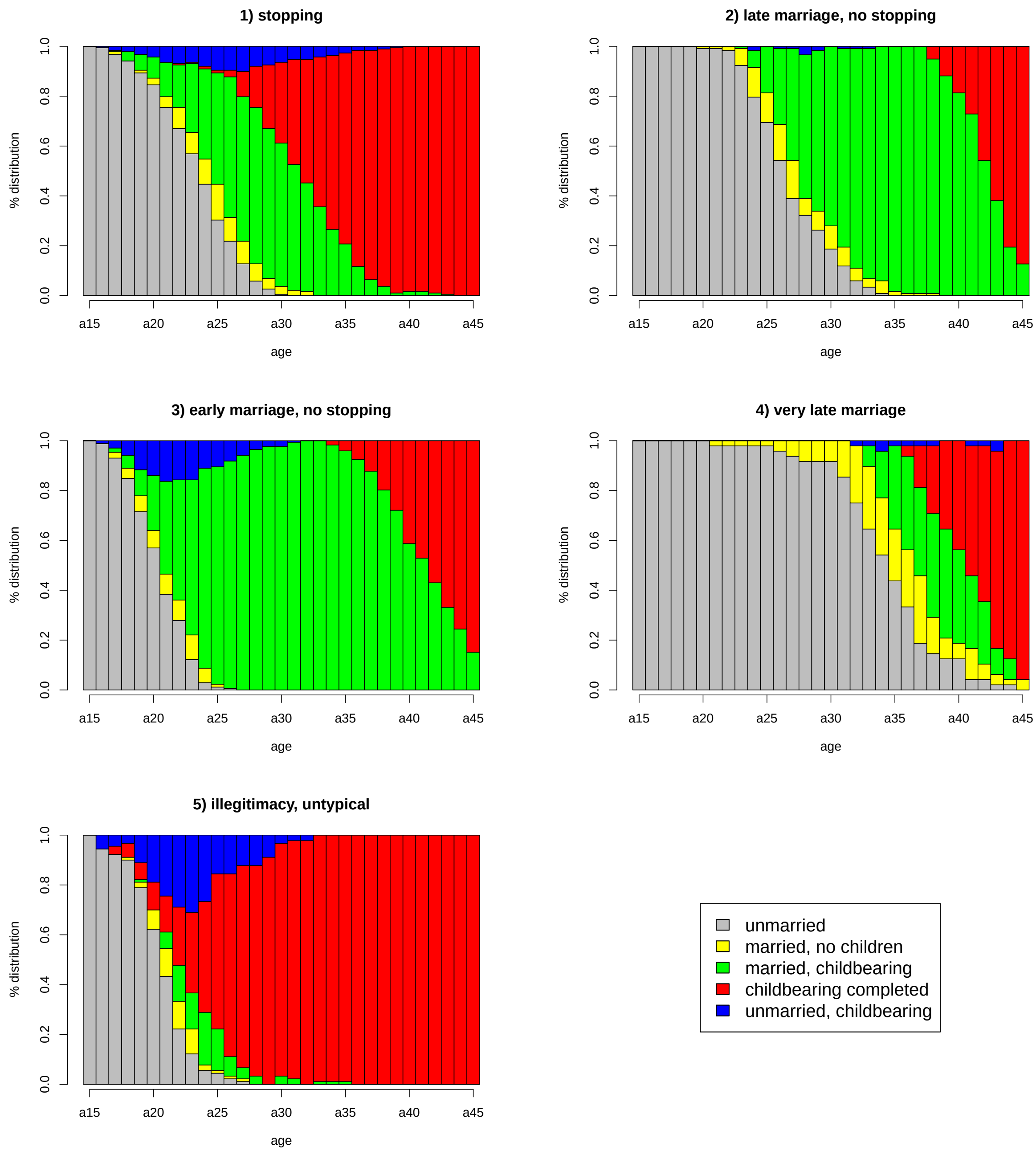

Figure 3: Transversal distribution of family life states, Geneva 1800-1900
by region of birth

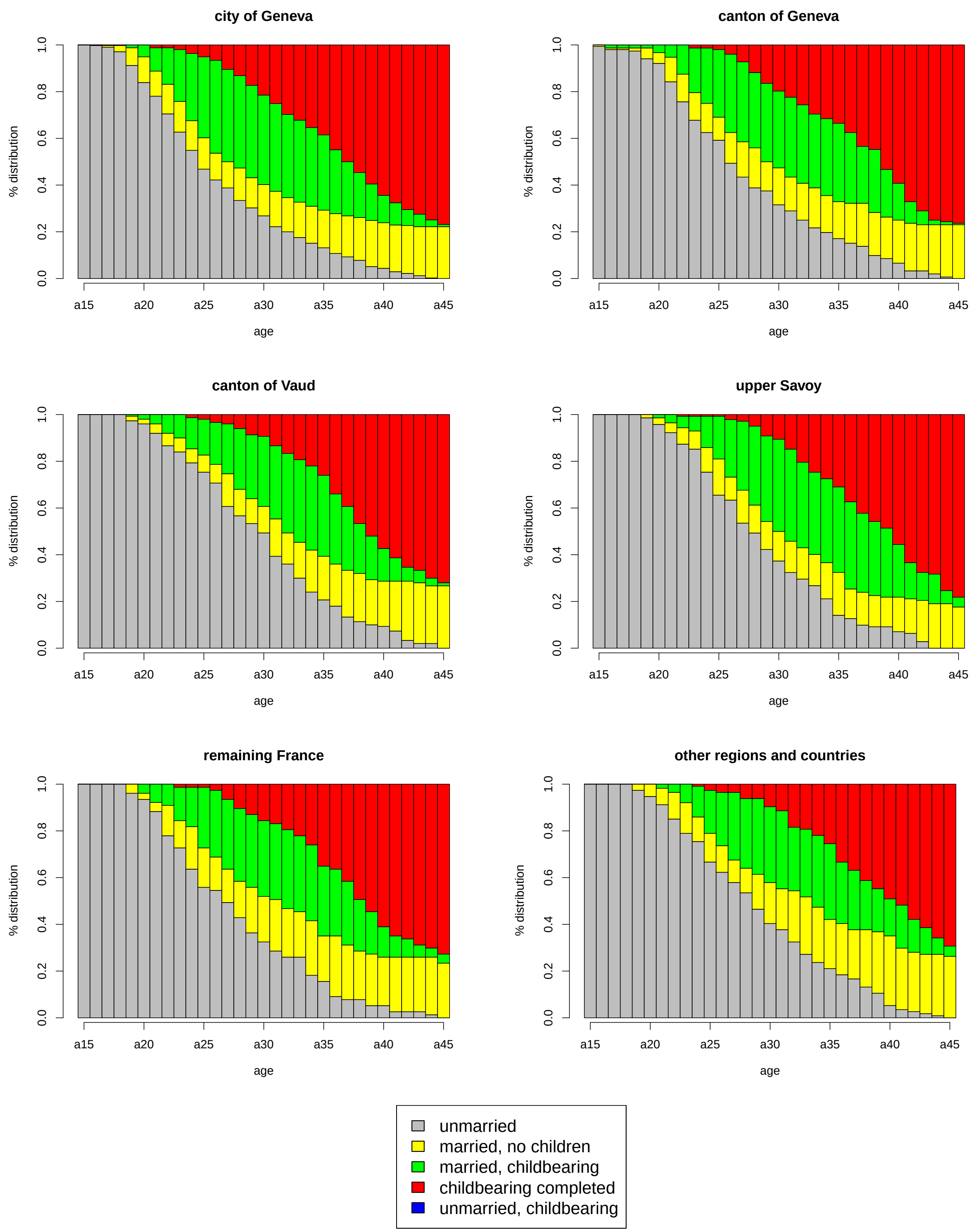

Figure 4: Transversal distribution of family life states, Geneva 1800-1900, 5 life course clusters

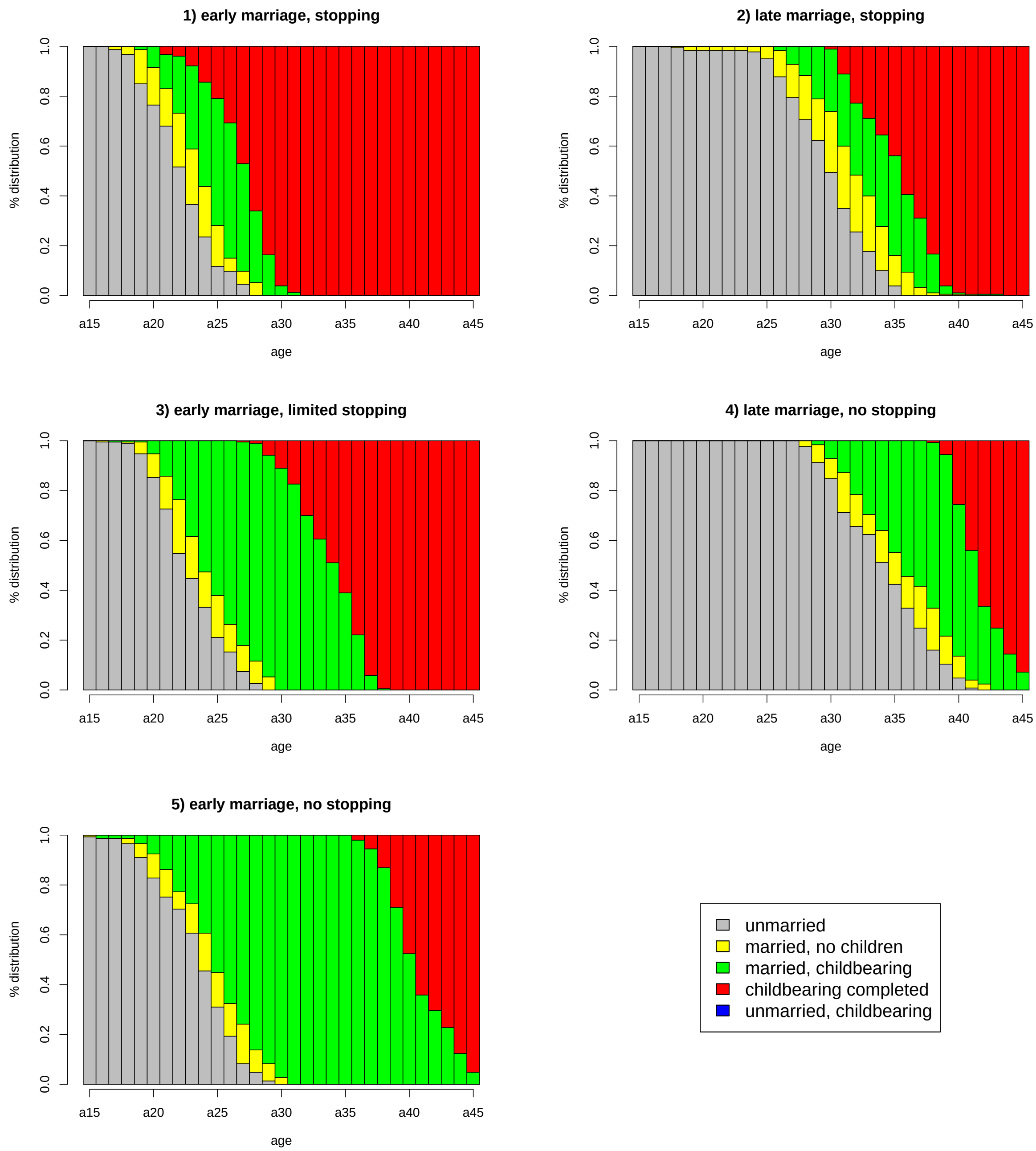

Table 3. Logit models predicting membership to several life course clusters. Antwerp, 1846-1920

	cluster1		cluster2		cluster3		cluster4		cluster5	
	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*
birth cohort	(22.9/3)	.000	(35.1/3)	.000	(2.8/3)	.417	(10.6/3)	.014	(12.8/3)	.005
before 1830	1	ref	1	ref	1	ref	1	ref	1	ref
1830-1849	2.54	.003	.53	.027	1.43	.211	.34	.026	1.08	.886
1850-1864	3.14	.000	.32	.000	.93	.804	.58	.184	2.75	.037
1865 and later	4.19	.000	.12	.000	1.13	.671	.21	.003	3.63	.007
social class	(18.6/3)	.000	(3.5/3)	.315	(28.7/3)	.000	(3.9/3)	.275	(81.0/3)	.000
upper, white collars	1.73	.043	1.07	.850	.57	.069	1.14	.803	.70	.431
blue collars	1	ref	1	ref	1	ref	1	ref	1	ref
lower	.94	.770	.89	.645	1.53	.045	.87	.729	.52	.090
unknown	.35	.002	.40	.073	.15	.000	2.21	.099	10.50	.000
region of birth	(6.8/4)	.148	(15.8/4)	.003	(23.1/4)	.000	(15.8/4)	.003	(7.8/4)	.101
city of Antwerp	1	ref	1	ref	1	ref	1	ref	1	ref
province of A., rural	1.17	.614	**2.11**	.031	**.40**	.005	**3.42**	.020	.75	.518
province of A., semirural	1.06	.840	**3.08**	.000	**.47**	.008	**3.12**	.030	.28	.017
province of A., urban	.67	.189	**2.06**	.041	1.32	.314	.66	.604	.52	.128
outside province of A.	1.50	.096	1.13	.728	**.45**	.004	**4.72**	.001	.56	.092
constant	.16	.000	.39	.001	.54	.018	.06	.000	.08	.000
delta chi-2 /df	49.60 / 10		79.60 / 10		64.20 / 10		33.30 / 10		133.30 / 10	
Nagelkerke R^2	.109		.194		.143		.125		.345	

Table 4. Logit models predicting membership to several life course clusters. Geneva, 1800-1900

	cluster1		cluster2		cluster3		cluster4		cluster5	
	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*	OR (Wald/df)	*sig*
birth cohort	(1.3/3)	.732	(3.6/3)	.310	(23.0/3)	.000	(13.1/3)	.004	(15.0/3)	.002
before 1800	1	ref	1	ref	1	ref	1	ref	1	ref
1800-1819	.99	.984	.70	.142	1.84	.017	1.08	.800	1.62	.073
1820-1839	1.17	.513	.77	.234	1.95	.007	1.70	.045	1.07	.795
1840 and later	1.30	.342	.64	.092	3.48	.000	.60	.142	2.46	.001
social class	(10.2/3)	.017	(0.7/3)	.865	(11.6/3)	.009	(15.9/3)	.001	(4.0/3)	.264
upper	1.60	.058	.95	.834	1.08	.745	1.02	.951	.88	.648
white collars	1.76	.021	1.12	.646	.77	.284	1.52	.167	.57	.062
blue collars	1	ref	1	ref	1	ref	1	ref	1	ref
lower	.76	.322	.88	.569	.41	.001	2.46	.000	1.07	.788
region of birth	(16.7/3)	.005	(10.4/3)	.066	(8.2/3)	.148	(8.1/3)	.152	(5.4/3)	.370
city of Geneva	1	ref	1	ref	1	ref	1	ref	1	ref
canton of Geneva	1.01	.983	1.23	.446	.63	.085	1.54	.165	.88	.635
canton of Vaud	**.44**	.010	**1.93**	.007	.68	.144	**1.88**	.034	.55	.058
upper Savoy	**.51**	.035	1.61	.096	.59	.061	**2.11**	.018	.89	.688
remaining France	.54	.103	1.30	.434	1.05	.862	1.66	.192	.52	.124
other regions	**.35**	.006	**1.99**	.015	.57	.058	1.18	.658	.78	.427
constant	.19	.000	.20	.000	.17	.000	.06	.000	.15	.000
delta chi-2 /df	33.30 / 11		13.10 / 11		45.30 / 11		42.90 /11		22.70 / 11	
Nagelkerke R^2	.055		.021		.069		.077		.039	