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THE ANALYSIS OF EARLY LIFE COURSES: COMPLEX DESCRIPTIONS OF THE TRANSITION TO ADULTHOOD

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The quantitative analysis of life courses has to deal with a complex pattern of interrelated events and trajectories. Such a complex pattern needs complex measurement tools, even if only to describe the experience of cohorts. This paper addresses the methodological issue of describing the transition to adulthood from a life course perspective, following an event-based definition. New proposals are developed and traditional approaches are discussed, using Italy as an example. A generalization of survivor functions for the analysis of the temporal relationships between two events is introduced and applied. The paper then deals with the problem of describing the process of transition to adulthood as a whole, making use of the sequence analysis approach with special emphasis on the empirical analyses of the 'standardization vs individualization' hypotheses.

The transition to adulthood can be viewed as a process associated with social and demographic passages from the educational system to the labour market and from the parental household to the individual's own household. The period around the transition to adulthood is demographically 'dense', that is it encompasses a high density of demographic events (Rindfuss 1991). The transition to parenthood – with the birth of the first child – is ordinarily defined as the final stage of the process. Such passages, which are also associated with related events (Modell, Furstenberg and Hershberg 1976), are considered to be markers for the entry into roles considered typical for adults. Clearly, such an orientation calls explicitly for the adoption of a life course perspective.

Using Italy as an example, this paper addresses the question of how best to analyse the transition to adulthood as it is commonly defined. There is no standard view in the literature, either as concerns the description or the analysis of this process. In particular, when one analyses more than one event simultaneously, the picture becomes complex and many different approaches are feasible. Some methodological proposals are introduced or discussed in this paper from an applied perspective: most of the emphasis is placed on building a general framework for the description of the transition to adulthood.

The paper is structured as follows. First is a brief introduction to an event-based demographic life course approach to the study of the transition to adulthood. Second is a description of the data and of the Italian situation. Third, the paper discusses a traditional way of analysing the transition to adulthood. A new graphic tool for the

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analysis of the temporal relationships between two events in the life course is then presented and applied. The problem of describing the process of transition to adulthood as a whole is addressed, using the sequence analysis approach; and the standardization vs. individualization view in life courses is investigated. Finally, some conclusions and directions for future research are outlined.

A life course perspective

The life course approach has only been under development since the mid-1960s. Giele and Elder (1998) identify four chief elements as fundamentally shaping life courses: development of the individual (human agency), history and culture (location in time and place), social relations (linked lives), and the intersection of age, period and cohort (timing). While in this view, time is explicitly present along only one or perhaps two dimensions, it nevertheless constitutes a valid starting framework for the present investigation. In the life course approach, trajectories lie at the heart of the analysis, and trajectories are themselves shaped by events. It is therefore natural to view the process of becoming an adult as a trajectory characterized by a number of events. Moreover, events lie at the very heart of the tradition of demographic analysis. The human agency concept lies behind the use of age as a privileged time axis. Location in time and, to an extent, the idea of linked lives suggest cohorts or groups of cohorts as basic descriptive units for comparison.

The main issue is then the selection of events to be considered as markers for the transition to adulthood. The present analysis addresses the timing and sequence of the following events of the life course: 1, the end of formal education; 2, the first job; 3, leaving the parental home; 4, the first (married or unmarried) union[1]; 5, the birth of the first child. Such a view of the transition to adulthood was presented for the first time in an influential article by Modell *et al.* (1976). There, the authors expressed the opinion that contemporary societies do not explicitly provide for the rites of passage to adulthood, something that is said to be typical of more traditional societies. In fact, the number of events considered as markers of the transition to adulthood is quite varied in the literature.[2] While Corijn (1996) studies as many as eight events (including the first sexual intercourse and the first regular partnership; he also distinguishes between first union and first marriage), Liefbroer and de Jong Gierveld (1995) study only leaving the parental home, the first union, and the birth of the first child. This limited number of events notwithstanding, the latter authors state in their conclusion that

> no answer has been given to the question of how social class differences are reproduced. To do so, information on the transition from educational system to the labor market needs to be included in the analysis (Liefbroer and de Jong Gierveld. 1995:71).

1 This includes unions beginning informally as well as those that lead directly to marriage. Such a choice assigns a central role to the concept of *union formation*: direct marriage and informal unions may be simply thought of as two different ways of initiating a union (Manting 1994).

2 In a later book, Modell (1989) himself also considered other events.

It should be recognized that a significant degree of subjectivity is present in selecting the trajectories to be studied and in choosing a specific definition for an event (Marini 1987). Any study considering only demographic events or only educational and work events is incomplete from the perspective of a transition-to-adulthood approach.

The study of the transition to adulthood can be said to generalize the analysis of the processes of household formation, family formation, and childbearing. In the traditional demographic literature, these are studied separately, and mainly from the female viewpoint. Given that education and working careers are highly interconnected with family and household demographic histories, a unifying approach encompassing all the processes can give greater insights into the underlying processes.

This analysis also starts from the operational hypothesis that the events characterizing passages of status are non-repeatable. While this hypothesis is open to question, and other directions might have been taken, there are two main justifications for this chosen starting point. First, from a theoretical point of view, to study the entire process of transition to adulthood taking a consistent approach, the initial event of each trajectory can be chosen as a unique marker:[3] It is clear that events such as the first union and the first child have a unique definition. For events that are not so clearcut, such as the first job or leaving the parental home, the statements of interviewees are normally used. Second, and more practically, full information about schooling and residential trajectories is not easily available in demographic surveys. This is the case for the Italian Fertility and Family Survey (FFS) used in this analysis, as will be seen from the description of the questionnaire that follows.

Features of the Italian pattern of transition to adulthood and data

The transition to adulthood in Italy can be seen as sharing some traditional features with that in other Southern European countries (see Reher 1998; Billari *et al.* n.d). Schooling levels were low immediately after World War II, and female labour force participation had traditionally been limited. Such schooling and labour force patterns are now changing, and youth unemployment is rising. There is, however, persistence in certain family and household formation patterns: leaving the parental home late has been the tradition for centuries, and in some regions some children stayed at the parental home after marriage. Leaving home has also traditionally been coincident with marriage, with the exception of migratory movements, which are, however, becoming less important. The first union is still almost coincident with the first marriage, and marital fertility is predominant.[4]

The data came from the Italian Fertility and Family Survey (De Sandre *et al.* 1997). The survey was part of the Family and Fertility Surveys program implemented by the Population Activities Unit (PAU) of the United Nations Economic Commission for Europe (UN/ECE). The interviews were conducted between November 1995 and

3 The same choice was made by Modell *et al.* (1976), who called for the 'commitment' connected to the first event.

4 A full account of the Italian transition to adulthood is given by Billari and Ongaro (1998) and Billari (2000).

January 1996.[5] A brief description follows of the data available for the transition to adulthood.

1. *Formal education*: highest educational level reached is available, together with the month and year of its achievement. It is also known whether education was continued thereafter and if so, the month and year the person stopped studying, even without having completed a further level. If respondents were engaged in studies at the time of the interview, educational level at which they were enrolled is available: in this case only, this may be vocational training. In general, the questionnaire reflects commonly held views: that formal education continues without interruptions during youth, sometimes only part-time, and that vocational training is not an important option. For comparative reasons, neither programs leading to doctoral degrees nor other postgraduate courses are considered as being part of formal education.[6]
2. *Occupational career*: a full occupational life history is contained in the questionnaire. It includes month and year of the beginning and end of each job, together with supplementary information. An important matter is the survey definition of a job: 'every job carried out for periods of at least 3 consecutive months or every seasonal activity if carried out during 2 years or more. These jobs may concern paid employment, own-account work and unpaid work in family business'.
3. *Leaving the parental home*: the respondent is asked whether he or she had ever left the parental home to start living alone. If the answer was yes, then the month and year were recorded. Neither a complete residential history nor specific retrospective information on military service[7] is available.
4. *Partnerships*: the survey contains a complete history of cohabiting unions. It includes month and year of the beginning and end of each union, type of union (married or unmarried), month and year of marriage, and the age of the partner at the start of a union. For the purposes of this analysis, the first union is used.
5. *Childbearing*: as the survey has a special emphasis on fertility, a distinctive focus is placed on children. Full birth histories are available, with month and year of each birth, as well as a full history of pregnancies. Information about foster or adopted children is also present. In this paper data on first (non-adopted or foster) child are used.

The Italian FFS data thus provide all the information necessary to establish the five events outlined by Modell and his colleagues as markers of the transition to adulthood. The quality of data for these events is quite high (see De Sandre *et al.* 1997).

5 A total of 6030 Italian males and females, a nationally representative sample of residents born between 1946 and 1975, were interviewed. Given the emphasis on fertility, more females were interviewed than males. The final sample consisted of 4824 females and 1206 males. Weighting was used to control for selective non-response, though its effect is minor.

6 Official doctoral programs were established in Italy only in 1984, though postgraduate courses existed long before, especially in the medical field. The diffusion of such programs is still limited.

7 The importance of the role of military service in the process of transition to adulthood has been repeatedly stressed in the literature (e.g. Hogan 1978; Marini 1985).

Using survivor functions for single events: the sequencing fallacy

Describing a process such as the transition to adulthood requires the use of complex descriptive techniques if one is to draw a satisfactory picture. The most common way of doing this in the literature is by computing Kaplan-Meier survivor functions for each of the events. This is, of course, unproblematic when we take into account only a single event at any given time. It is however often used to give an overall view of the transition to adulthood. The simplest description of the whole process is made by simply comparing median ages – or quartiles of the survivor function or its value at specific ages – for all events.[8] The results obtained from using this approach are shown in Table 1.

Table 1 Summary measures from survivor functions for specified events

	Male			Female		
Event	1946-55	1956-65	1966-75	1946-55	1956-65	1966-75
	Median age (years)					
End of education	17.7	18.7	19.7	15.4	18.3	19.5
First job	17.8	19.0	20.4	20.6	20.9	21.5
Leaving home	24.9	26.7	>30	22.6	23.6	26.2
First union	25.9	28.3	>30	22.7	23.9	27.2
First child	28.9	31.9	>30	24.9	26.7	>30
	Survivors at 25 (proportions)					
End of education	0.22	0.20	0.25	0.14	0.18	0.23
First job	0.15	0.21	0.25	0.37	0.36	0.36
Leaving home	0.49	0.61	0.78	0.29	0.40	0.59
First union	0.61	0.71	0.86	0.29	0.42	0.66
First child	0.78	0.88	0.95	0.49	0.60	0.80
	Survivors at 35 (proportions)					
End of education	0.05	0.02		0.05	0.03	
First job	0.03	0.05		0.25	0.21	
Leaving home	0.14	0.17		0.11	0.12	
First union	0.12	0.21		0.07	0.11	
First child	0.23	0.38		0.12	0.18	

Note: Survivors are proportions not experiencing the event by the specified age.

A clear hierarchy seems to be established when median ages are examined. For males, there has been a marked increase in time lapse both between the median ages at end of formal education and start of first job, and between the median ages at start of first job and leaving the parental home. For females, however, the time between the median ages at end of education and start of the first job has shortened. This is mainly due to the decreasing percentage of females not entering the labour market: as Table 1 also shows, at the age of 35, 25 per cent of females in the older cohort have never had a job, and the figure drops to 21 per cent for the 1956-65 cohort. The time between the median age at leaving the parental home and first union increases, indicating at

8 This approach is used, for example by Klijzing (1995), Corijn (1996) and Baizán Muñoz (1998) in order to come up with an overall pattern of the transition to adulthood.

least an increasing tendency of females to live as singles; a circumstance that is also observed for males.

However, a picture drawn using only a measure of central tendency can be misleading. The temptation to read the sequence of median ages as a picture of standard sequences in real life courses is very strong. This is a well-known aggregation fallacy of family life cycle analyses, but it continues to be an issue in the analysis of the transition to adulthood. One could call it a 'sequencing fallacy'. For instance, it would seem from Table 1 that for Italian females the first job happens after the end of formal education, but a significant proportion of them never experience a first job.[9] In addition, for the vast majority of Italians, leaving home and entering the first union coincide, as shown later in this paper, but this cannot be seen in a description based only on median ages. Figure 1 shows the survivor functions for each event by sex and cohort, thereby presenting a more informative picture. However, the problem emerges again: there is a great temptation to read the sequence of survivor functions as representing an ideal-typical sequence at the individual level. Again, this is a sort of 'ecological' fallacy.

Another approach is to compare transition rates or densities. This may be less problematic, because there is no evident connection with a sequencing fallacy. The level of the rate also reflects the quantum. Figure 2 shows transition rates computed using the life table method with three-year intervals. Both the end of formal education and the start of the first job appear to happen for the majority of people before the household and family formation events. This suggests that, apart from timing, Italy is closer to a pattern where the educational and working transitions are clustered together and separate from residential-familial transitions which are also roughly clustered together. This pattern, which was emphasized by Kerckhoff (1990) for the United Kingdom, runs counter to the typical US pattern, where all the events are clustered together (Marini 1984, 1985, 1987).

Synchronization vs desynchronization and the order of events

The analysis of multiple events is more problematic than the analysis of single events. Among other things there is a lack of synthetic tools such as simple graphical representations. If we wish to analyse the duration between pairs of events or the rank order of a group of events within the life course, we might more easily experience problems such as an 'anticipatory observation plan' (Hoem 1985). Consider the study of the duration between two events or the sequence of two events. For this to be examined in a retrospective study, both events need to happen before the interview. This requirement can be weakened, as will be shown, by the adoption of a graphical tool for the temporal relationship between two events, here termed 'mirrored' survivor functions. One strategy is to consider only attention to situations in which at least one event occurred before a fixed age, and this fixed age must be lower than the lowest age reached by the cohort at the time of the interview, so as to avoid any bias, for example in inter-cohort comparisons. An alternative strategy would be to truncate life histories at this fixed age and to study only this part. When dealing with two events, the first strategy has the advantage of minimizing the loss of information. If, however, one wishes to analyse a whole sequence of, say, five events, the second strategy seems the only choice, even if the fifth event is necessarily specified (if it happens at all) when we know the sequence up to the fourth event.

9 The problem is that tempo and quantum effects are being confused.

Figure 1 Five survivor functions on the same age axis

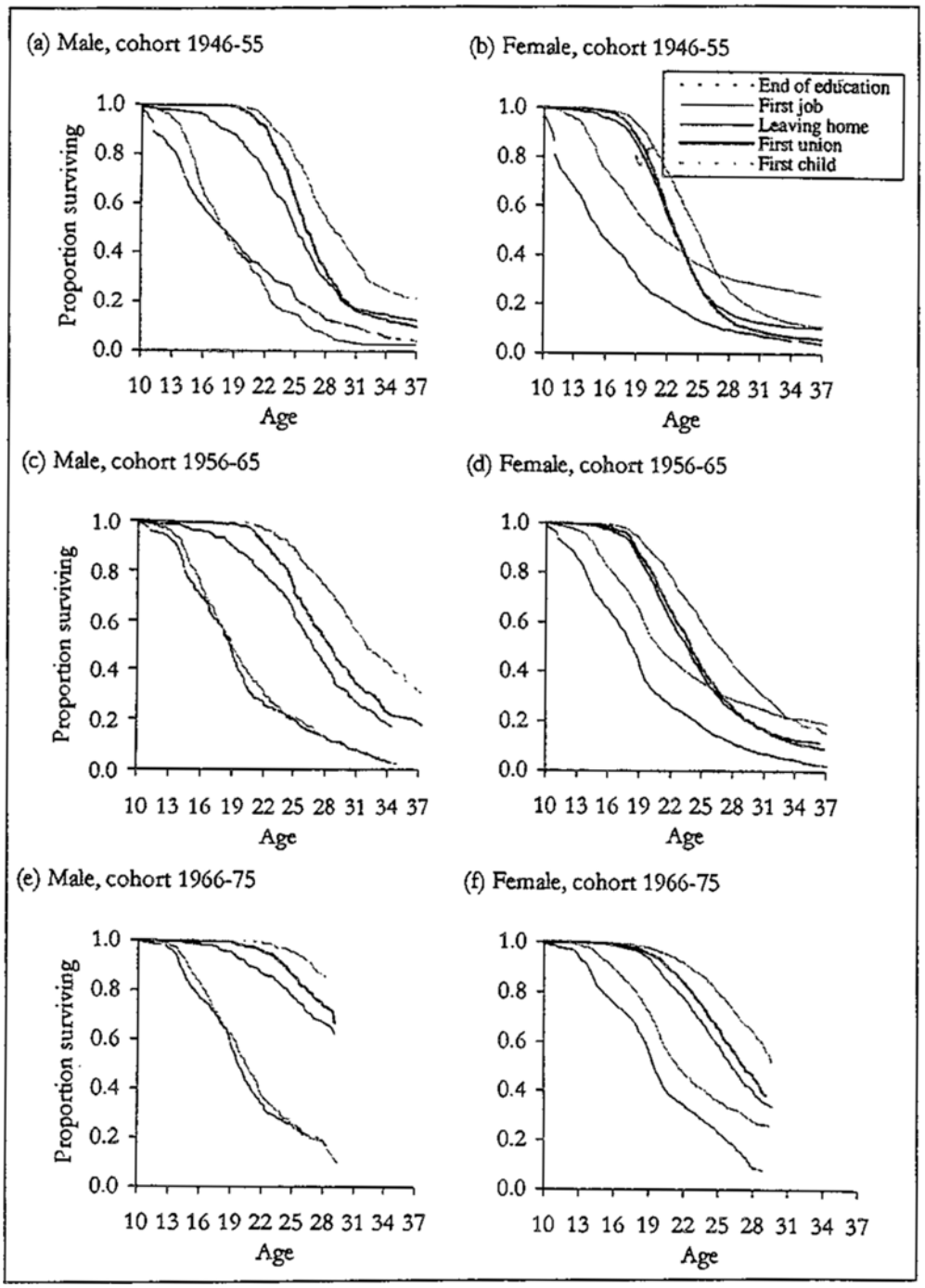
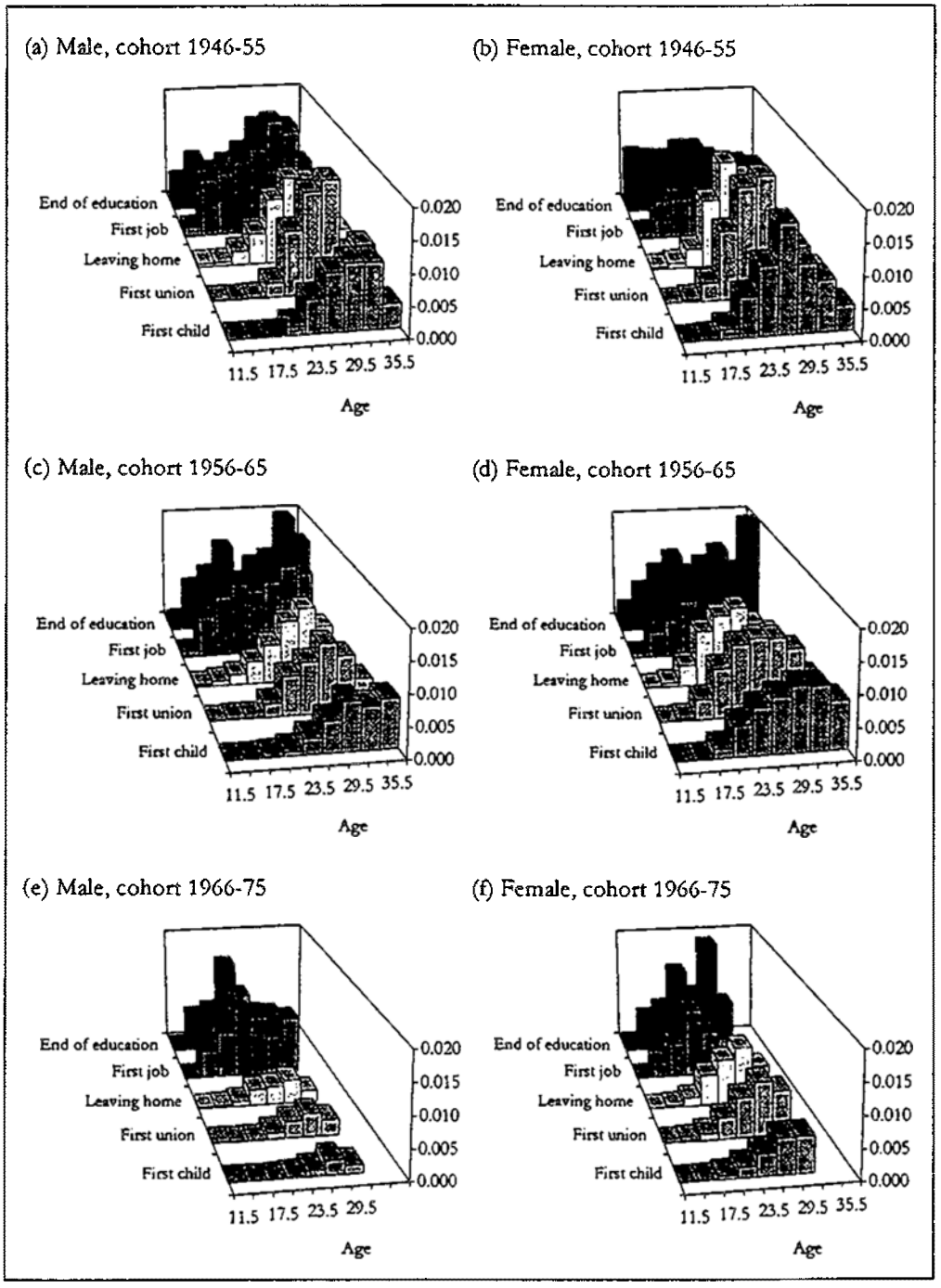


Figure 2 Estimated rates (life table method) for all events



One possible direction is to estimate survivor functions with a duration variable other than age, for example the time distance from the end of formal education to the first job. In that case, however, the ordinary survivor function representation only provides for non-negative distances: for example, two survivor functions must be represented separately for each pair of events. Another option would be to add a large enough constant (say, 40 years) to the distance between two events and then calculate the survivor function. Using this strategy, however, it is necessary to treat one of the events as 'privileged'; the strategy cannot provide for cases where only the 'unprivileged' event has happened and such censoring must be taken into account.

Simultaneity is often an important issue. For example migration often takes place in connection with starting a job, beginning higher education, getting married, or starting cohabitation (Mulder and Wagner 1993). The timing of first home-ownership has also been studied in connection with other life course events (Mulder and Wagner 1998). In fact, most of the literature concerning the transition to adulthood is interested in studying simultaneous occurrences of those events considered to be markers of the transition. Since available data often exhibit insufficient accuracy, it is of course difficult to decide whether two events occur simultaneously or not. Furthermore, there is the problem of how to find a reasonable definition of simultaneity. Based on the concept of 'fuzzy time', Courgeau and Lelièvre (1992) proposed to extend the notion of simultaneity to events happening within a range of six months. In spite of this interest in simultaneously occurring events, there has been a lack of tools for describing the synchronization of events. A proposal originally made by Billari (2000) is presented below. This proposal constitutes a generalization of the traditional concept 'survivor functions' in order to visualize temporal relationships between events.

Graphing temporal relationships between two events by 'mirrored' survivor functions

Consider two non-repeatable events, F and S, which may happen simultaneously. Both events are measured on the same time axis (say, age), and some observations might be right-censored. Let t_{Fi} be the time of occurrence, or censoring, of F and t_{Si} the time of occurrence, or censoring, of S, for individual i $(i=1,2,3...n)$, where n is the number of cases with the occurrence of at least one of the events. Let

$$n_F = \sum_{i=1}^{n} v(t_{Si}, t_{Fi}), n_S = \sum_{i=1}^{n} v(t_{Fi}, t_{Si}) \text{ and } n_{FS} = n - n_F - n_S$$

where

$$v(a,b) = \begin{cases} 1 & \text{if } a<b \\ 0 & \text{otherwise} \end{cases}$$

Thus n_{FS} is the number of people experiencing simultaneous events, n_F the number of people experiencing S before F, and n_S the number of people experiencing F before S. Let $G_F(t)$ be the survivor function at t for F, with the time of occurrence of S taken as the origin $(t=t_F-t_S>0)$; $G_S(t)$ is the survivor function at t for S, with the time of

occurrence of F taken as the origin $(t=t_S-t_F>0)$. Both functions can be estimated with ordinary Kaplan-Meier procedures. The mirrored survivor function for both events is defined as:

$$M(t) = \begin{cases} 1-\frac{n_F}{n} \cdot G_F(-t) & t<0 \\ 1-\frac{n_S}{n} \cdot G_S(t) & t\geq 0 \end{cases}$$

The function $M(t)$ is right-continuous for $t\geq 0$ and left-continuous for $t<0$. Its interpretation is comparable to that for ordinary survivor functions. $M(t)$ indicates the share of people experiencing S at least t periods after having experienced F for $t>0$, and the share of people experiencing F at least t periods after having experienced S for $t<0$. The magnitude of the jump at zero indicates the proportion of people simultaneously experiencing F and S and of those experiencing at least one event; this might be interpreted as a first measure of the share of synchronization:

$$\lim_{t\to 0}[M(t) - M(0)] = \frac{n_{FS}}{n}$$

Ordinary survivor functions are obtained as a special case, when $n_S=n$. The measure of synchronization for other time intervals may also be used, for instance a one-time unit interval $M(1)-M(-1)$.

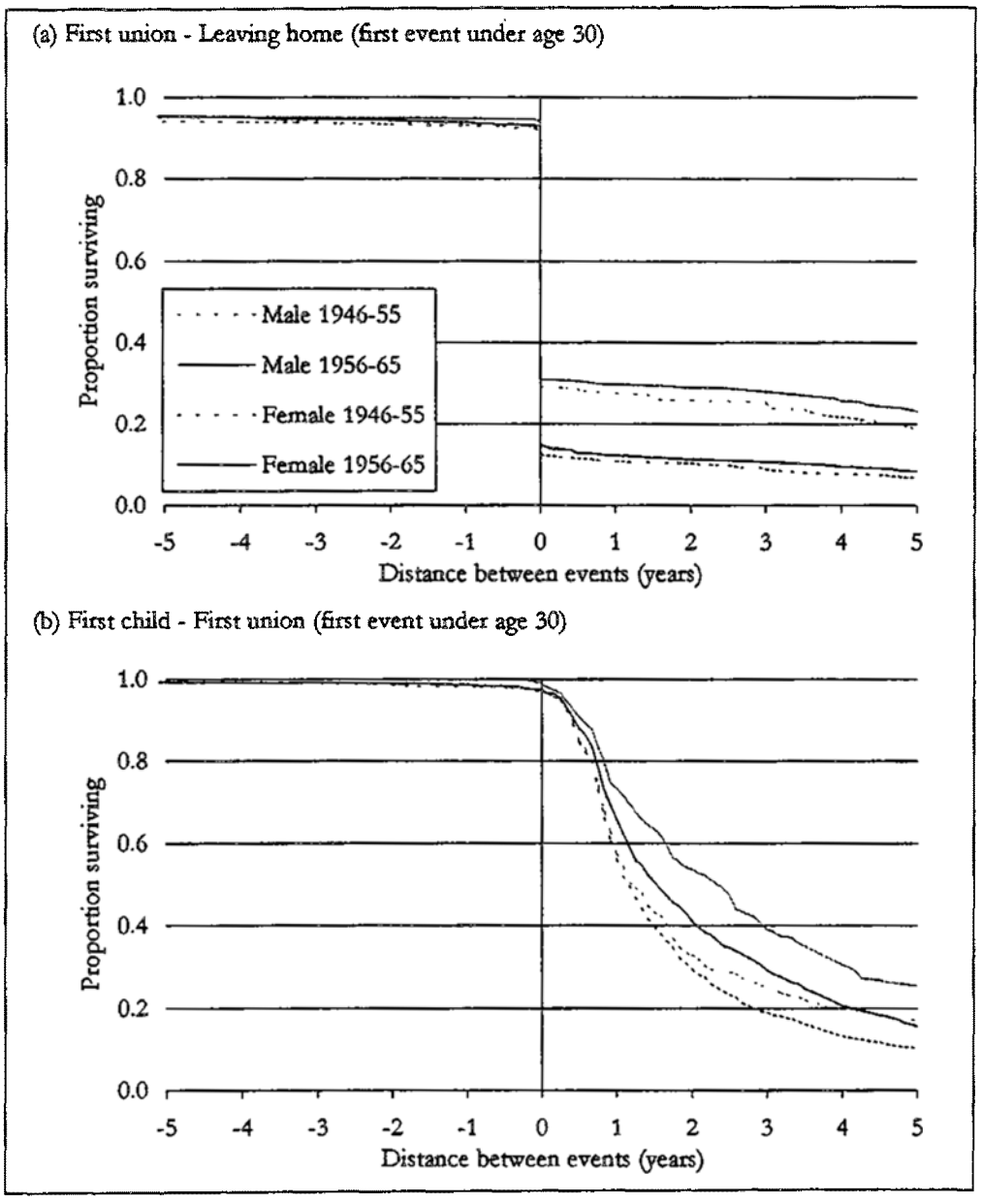
In order to avoid the problem of anticipatory observation plans when using mirrored survivor functions, one can restrict the analysis to groups having experienced at least one event in a certain age interval, which is the interval for which all cohorts of interest are observed. Here to have a more complete picture of the transition to adulthood, the study was restricted to the two oldest ten-year cohorts, with a first event before the age of 30. Figure 3 shows mirrored survivor functions for two of the more methodologically interesting pairs of events.

The relationship between the first union and leaving the parental home (Figure 3a) probably gives the best illustration of the clarity of mirrored survivor functions when a pair of events is highly synchronized. It is clear that for the majority of Italians belonging to the selected cohorts, leaving the parental home coincides with the first union. There are, however, perceptible sex differences, with a higher level of synchronization for females. In addition, the younger cohort has a lower level of synchronization, but the change appears to be very slow. Finally, if after leaving home the transition to a union occurs at a certain pace (for positive abscissae the function shows a marked decrease), it appears that people entering a union while living in the parental home do not leave, by and large, within five years (negative abscissae).

Figure 3b represents a case where this tool is not really necessary. The birth of the first child takes place almost universally after the first union. This encouraged demographers to define the first birth interval as the interval between first marriage

(or more generally, first union) and parenthood. It is also clear that the use of mirrored functions does not hamper this interpretation. The postponement of the first child within unions is indeed clear, as is the longer first-birth interval for males (ordinarily in a union with a younger woman).

Figure 3 'Mirrored' survivor functions

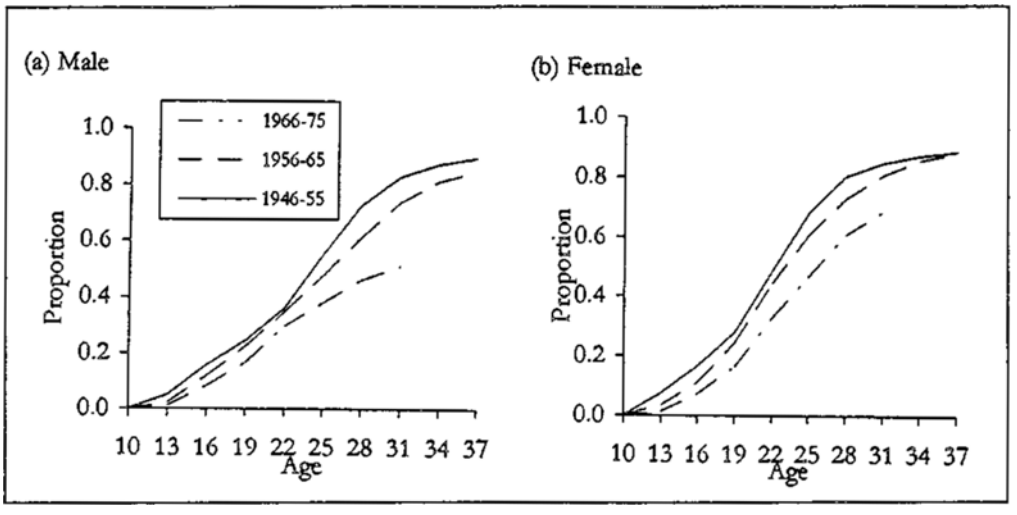


Describing the whole process: life courses as sequences

A rather crude overall view of the whole process of transition to adulthood can be derived by summing the values of the five cumulative distribution functions, dividing the sum by the total number of events and plotting the result against age as in Figure 4. The interpretation of this plot[10] could be given by asking: what proportion of events have already been experienced on average by a given age? This measure is rudimentary because it gives the same weight to all events, but it still provides two perceptible observations. First, the difference in the overall timing of the transition to adulthood between the oldest and middle cohorts is greater than the difference between the middle and youngest cohorts. This is especially the case for females. Second, while the oldest cohort had a specific 'turning point' at around the age of 22 for males and 20 years for females, no clear turning point seems to be present for the other two cohorts.

Continuing the description of the five events, the representation of life courses as sequences is now considered. As has already been argued, one can easily be wrongly driven to a sequence interpretation of survivor functions. In fact, the latter only trace the distribution of the population at various ages. At present, the literature does not agree on a solution to the problem of inferring the order of events in life courses; the issue was clearly posed in a study on the US by Hogan (1978). Among further works focusing on the sequence of events in the transition to adulthood, Marini (1984) and Rindfuss, Rosenfeld and Swicegood (1987) for the US, and Ravanera, Rajulton and Burch (1998) for Canada are worth mentioning. All such works rely on the analysis of what Abbott (1995) calls 'non-recurrent sequences', insofar as only the order of events is being analysed. 'Recurrent sequences' are at the basis of Abbott's other contributions, where both the order and the duration between events are considered. Each of these approaches is applied and discussed below.

Figure 4 Number of events already experienced by age



10 Calculations were done using actuarial method life tables.

Non-recurrent sequences or the order of events

A non-recurrent sequence is a sequence of events experienced by a certain age, where ties or simultaneous events are possible. The sequence pictured by the median ages in Table 1 account for 39.3 per cent of males and 33.5 per cent of females in the 1946–55 cohort, even if simultaneous events are allowed in the typical sequence.[11] As for pairs of events, for the purpose of inter-cohort comparison attention can be restricted to sequences observed at the age of 30 and to the two oldest cohorts, whose members are all older than 30. The results are given in Table 2. The 'traditional male' family sequence, with the end of formal education before the first job, leaving the parental home when forming a first union and then having a child (perhaps with a delay), accounts for 29.2 per cent of males and 29.9 per cent of females in the oldest cohort. These percentages drop for the next cohort to 24.9 and 26.3 per cent respectively. The 'traditional female' family sequence, without entering a first job, accounts for 1.5 per cent of males and 19.7 per cent of females in the 1946–55 cohort and 1.9 per cent and 15.7 per cent, respectively, for the youngest cohort. It is thus clear that the picture presented above based on median ages is misleading. In addition, the heterogeneity of sequences seems to be much higher than expected by previous analyses.

Some reflections on the treatment of simultaneous events are called for here. In the Italian FFS survey, respondents were asked for the month and year of occurrence of each event. In some instances, simultaneous events may be viewed as being truly simultaneous. This may be the case for the first union (marriage) and leaving the parental home, in keeping with the Southern European pattern. In some other cases (e.g. the end of formal education and starting the first job, or leaving the parental home and the first job) one can question whether or not there is 'real' simultaneity, and a temporal order may be imposed on the basis of the lack of precision in measures. For example, starting work the day or the week after the end of formal education will give a false impression of simultaneous events if they occur in the same month; the appropriate time scale might have been a single day, which obviously causes other problems. In fact, in the literature, either an *a priori* specific order has been imposed, or sequences have been analysed with the hypothesis that events are simultaneous if they happen within a defined time span. From a theoretical point of view, this approach may be justified by adopting the notion of 'fuzzy time' (Courgeau and Lelièvre 1988, 1992). According to Courgeau and Lelièvre, decisions take place during a time interval, and time need not be 'forced' into the analysis by the researcher. In their view, increasingly larger 'fuzzy time' intervals are used for the older female cohort. Using a 'fuzzy timeframe' of three months causes only slight modifications to the overall pattern. The end of formal education and the first job become simultaneous events to a larger extent and the dispersion in other sequences increases, as expected. Major changes become apparent using a six-month time interval[12]. Simultaneous end of education and start of work becomes increasingly prevalent, and leaving home, the first union and the first child become simultaneous events more often. The latter is probably due to the influence of some premarital conceptions, and this feeling is confirmed by the observed higher prevalence of premarital conceptions for the oldest cohort. If a one-year fuzzy time interval is used, sequences are increasingly diverse (as

11 If simultaneous events are not considered, these percentages drop to 3.1 and 1.1, respectively.

12 This was the time interval chosen by Corijn (1996) for the definition of 'connected' events.

Table 2 Observed orders of events before the age of 30 for selected patterns

	Male		Female	
Order of events	1946-55	1956-65	1946-55	1956-65
No event	0.0	1.0	0.5	1.4
Studies/job - no family	7.9	17.9	5.8	9.6
S	0.5	2.6	2.2	2.7
SJ	0.0	0.7	0.0	0.6
S-J	7.4	14.6	3.6	6.3
Job before finishing studies	5.7	8.9	1.5	4.2
J	2.0	2.5	0.9	1.8
J-S	3.7	6.4	0.6	2.4
Job before finishing studies then traditional family	9.7	12.3	6.1	8.2
J-S-LU	3.7	5.3	1.4	2.1
J-S-LU-C	6.0	7.0	4.7	6.1
Family 'traditional male'	29.2	24.9	29.9	26.3
S-J-LU	7.6	8.6	3.3	6.0
S-J-LU-C	21.6	16.3	26.6	20.3
'Independent' before family	3.9	4.6	1.2	1.7
S-J-L	0.9	1.3	0.3	0.4
S-J-L-U	0.7	1.1	0.1	0.7
S-J-L-U-C	2.3	2.2	0.8	0.6
Family 'traditional female'	1.5	1.9	19.7	15.7
S-LU	0.2	0.5	0.8	1.2
S-LU-C	1.3	1.4	18.9	14.5
Patri/matrilocal residence	3.6	1.3	1.6	1.7
S-J-U	0.9	0.4	0.1	0.2
S-J-U-C	2.7	0.9	1.5	1.5
Entering labour market late	2.2	0.9	4.7	4.2
S-LU-J-C	1.5	0.3	1.3	1.8
S-LU-C-J	0.7	0.6	3.4	2.4
Migrant	2.9	1.6	1.4	0.9
S-JL	0.2	0.5	0.2	0.4
S-JL-U	0.5	0.3	0.1	0.1
S-JL-U-C	2.2	0.8	1.1	0.4
Others	33.4	24.7	27.6	26.1
Total	100.0	100.0	100.0	100.0
N. cases	323	376	1399	1547

Notes: S is the end of formal education, J the first job, L leaving the parental home, U the first union, C the first child. A hyphen indicates temporal distance of at least one month; for example, S-J indicates that the end of formal education occurs at least one month before the first job. The absence of a hyphen (e.g. LU) indicates that the events occurred during the same month. Respondents with one or more missing duration were not considered in the analysis.

two events may be considered as simultaneous if they happen in a given time interval (of, e.g., 3, 6, or even 12 months). Table 3 shows observed orders of events when shown by increasing 'Others'), owing to the growing number of simultaneous events. Hence, the non-recurrent sequence approach for describing the transition to adulthood may

reveal some interesting and sometimes unexpected features. However, if one does not want to impose an order for tied events, the analysis becomes more complicated, and the time units become fundamental. In addition – and this is the main problem – the duration between events is disregarded completely.

Table 3 Observed orders of events before the age of 30 for selected patterns by length of simultaneity, females, 1946–55

Order of events	Same month	3 months	6 months	12 months
No event	0.5	0.5	0.5	0.5
Studies/job - no family	5.8	5.9	5.9	5.9
S	2.2	2.2	2.2	2.2
SJ	0.0	0.3	0.7	1.1
S-J	3.6	3.4	3.0	2.6
Job before finishing studies	1.5	1.4	1.4	1.4
J	0.9	0.9	0.9	0.9
J-S	0.6	0.5	0.5	0.5
Job before finishing studies then traditional family	6.1	5.9	5.0	3.5
J-S-LU	1.4	1.5	1.4	1.2
J-S-LU-C	4.7	4.3	3.3	1.4
J-S-LUC	0.0	0.1	0.3	0.9
Family 'traditional male'	30.0	27.4	23.9	19.3
S-J-LU	3.3	2.7	2.1	1.9
S-J-LU-C	26.6	24.1	19.4	10.5
S-J-LUC	0.1	0.6	2.4	6.9
'Independent' before family	1.2	1.1	0.9	0.6
S-J-L	0.3	0.2	0.1	0.1
S-J-L-U	0.1	0.1	0.1	0.0
S-J-L-U-C	0.8	0.7	0.6	0.5
S-J-L-UC	0.0	0.1	0.1	0.0
Family 'traditional female'	19.8	20.0	20.1	20.2
S-LU	0.8	0.8	0.8	0.8
S-LU-C	18.9	18.7	18.1	9.4
S-LUC	0.1	0.5	1.2	10.0
Patri/matrilocal residence	1.6	1.4	1.3	1.3
S-J-U	0.1	0.1	0.1	0.1
S-J-U-C	1.5	1.3	1.0	0.8
S-J-UC	0.0	0.0	0.2	0.4
Entering labour market late	4.7	4.3	3.7	3.4
S-LU-J-C	1.3	1.0	0.6	0.3
S-LU-C-J	3.4	3.3	2.6	1.0
S-LUC-J	0.0	0.0	0.5	2.1
Migrant	1.5	1.5	1.3	1.5
S-JL	0.2	0.2	0.2	0.2
S-JL-U	0.1	0.1	0.1	0.1
S-JL-U-C	1.1	1.2	1.0	0.6
S-JL-UC	0.0	0.0	0.0	0.6
Others	27.6	30.6	36.0	42.4
Total	100.0	100.0	100.0	100.0

Notes: S is the end of formal education, J the first job, L leaving the parental home, U the first union, C the first child. A hyphen indicates temporal distance of at least one month, for example, S-J indicates the end of formal education occurs at least one month before the first job. The absence of a hyphen (e.g., LU) indicates that the events occurred during the same month. Respondents with one or more missing durations were not considered in the analysis.

In the framework of the analysis of the order of events, the rank of each event can be used. Table 4 shows ranks of events observed before the age of 30 for the two oldest cohorts. Rank is computed allowing for ties: when two (or k>2) events happen during the same month they are assigned the same rank r, and the next event (or tied events) is assigned rank r+2 (or r+k). Interesting and unexpected things can be observed. For example, there is a significant proportion of people whose first event is leaving the parental home (13% of males and 11% of females); this may happen for example for job reasons. The proportion is much higher than for the first union.

Table 4 Rank of events among all transitional events observed before the age of 30

	Male		Female	
Event / rank	1946-55	1956-65	1946-55	1956-65
Formal school completion is the:				
1st event	60.7	61.6	75.7	71.8
2nd event	23.5	29.0	11.4	17.4
3rd event	4.5	5.7	3.8	2.8
4th event	4.7	1.5	3.9	4.6
5th event	6.6	2.2	5.3	3.4
Total	100.0	100.0	100.0	100.0
No. of events	315	365	1376	1487
First job is the:				
1st event	36.2	35.9	23.5	29.5
2nd event	54.1	55.1	54.2	53.3
3rd event	5.5	6.2	4.2	4.2
4th event	2.6	1.1	6.4	4.9
5th event	1.6	1.7	11.8	8.1
Total	100.0	100.0	100.0	100.0
No. of events	314	355	1091	1219
Leaving the parental home is the:				
1st event	13.0	12.9	10.7	11.4
2nd event	21.8	16.4	39.3	33.8
3rd event	61.0	68.1	47.2	51.7
4th event	3.2	1.7	2.2	2.3
5th event	1.1	0.9	0.5	0.8
Total	100.0	100.0	100.0	100.0
No. of events	285	291	1272	1322
First union is the:				
1st event	0.9	0.4	5.9	4.8
2nd event	14.2	9.9	35.9	33.4
3rd event	65.6	72.2	49.5	53.6
4th event	18.8	17.1	8.4	7.7
5th event	0.5	0.4	0.3	0.4
Total	100.0	100.0	100.0	100.0
No. of events	297	270	1316	1329
First child is the:				
1st event	0.0	0.0	0.3	0.3
2nd event	0.7	0.4	1.6	1.2
3rd event	2.8	2.6	7.4	6.5
4th event	19.5	13.8	37.8	35.4
5th event	77.0	83.1	53.0	56.7
Total	100.0	100.0	100.0	100.0
No. of events	266	202	1237	1180

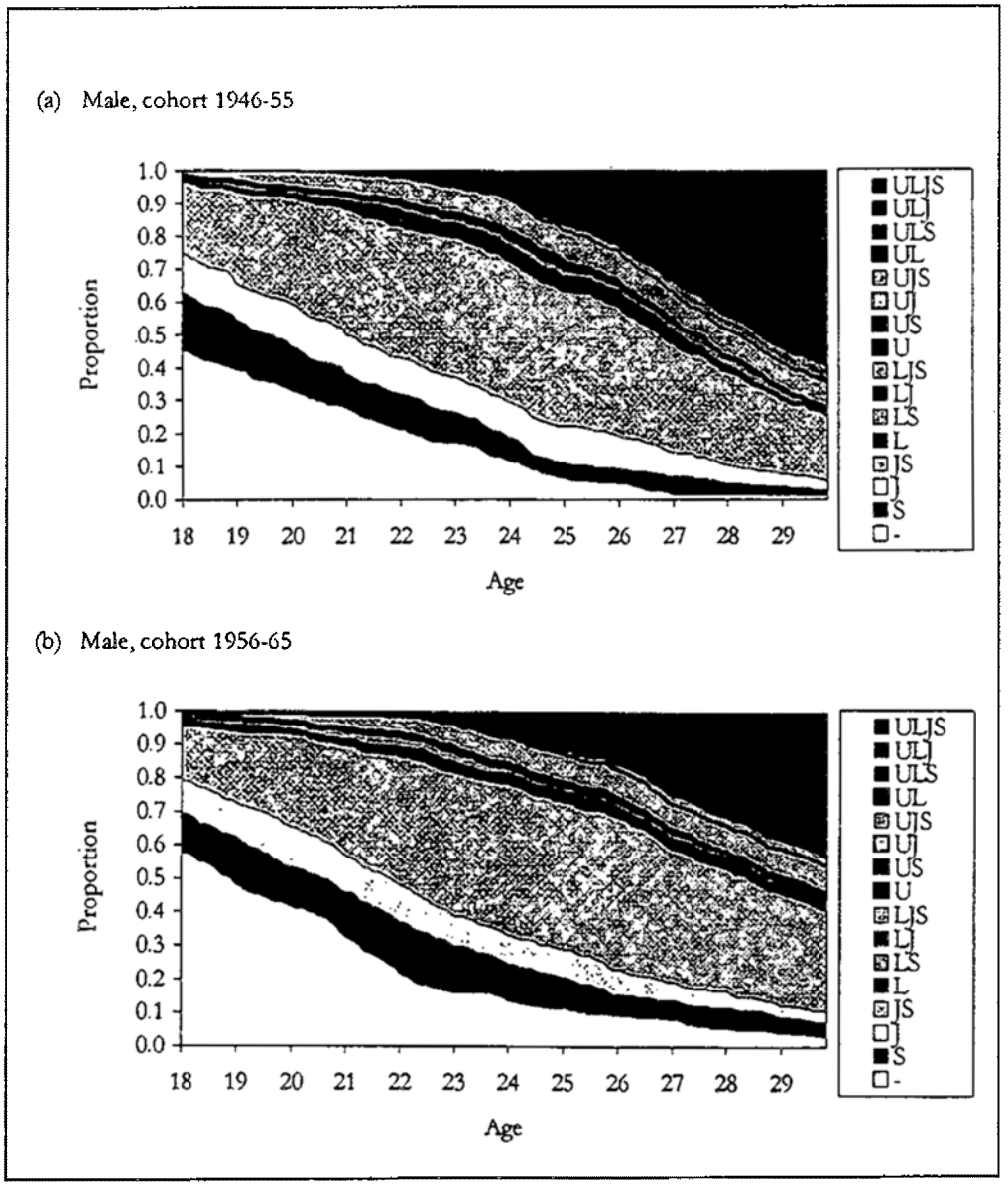
Sequence analysis and optimal matching

While an individual develops a life course, each new event changes his or her state. Instead of thinking directly in terms of events, a life course can be represented as a sequence of states. Let t refer to age measured in some discrete unit, say, months. Consider then a sequence of state variables, Y_t for $t = 1,2,3,4,...$, such that y_{it} represents the state of individual i at time t. Let us assume that there is an identical state space consisting of a finite number of discrete states for all state variables Y_t. The life course of individual i can then be represented by $y_i = (y_{i1}, y_{i2}, y_{i3}, ...)$. Now, assume a sample of individuals. Can a sensible approach be found to the description of such a collection of life courses? In the case of the transition to adulthood, the states represent role combinations, that is role transitions that have already been experienced, and role assumption is assumed to be irreversible. For the sake of simplicity, attention is focused here on four roles only. The domains considered are education, the labour market, living arrangement, and union. The same notation is used as previously (S, J, L and U) for events which have already been experienced. The first child is excluded in order to simplify the presentation; this exclusion is partly justifiable by the low proportion of children born before the first union, as noted above. If the order of experiencing the events does not count, 16 states referring to the role transitions already experienced can be defined. Sequences begin after the 18th birthday and end with the 30th birthday. Because observation ends at age 30, there is no right-censoring and no anticipatory observation plan; in fact, it is still a matter of debate how to deal with a sample of sequences some of which are right-censored. Thus the recurrent sequence approach, which is otherwise generally applied to single processes characterized by repeatable events, such as class careers or labour market behaviour, can also be applied to a series of processes each of which is characterized by one non-repeatable event.

The first analysis of sequence data might be conducted by representing state distributions by age or 'time budgets'. For the sake of space, the presentation is limited to the analysis for males shown in Figure 5. The importance of the 'no transition' state can be seen at the beginning of the age interval. Then comes the 'JS' state, which is that of young people who have experienced only educational and labour force transition. In the last part of the interval, the 'ULJS' state (with a completed transition) begins to emerge. It is also possible to see the area occupied by the 'LJS' state, which denotes a residential and financial autonomy without having formed a new family. A visual comparison of the two cohorts gives evidence of an expansion of the phase corresponding to no transition and a decrease of the completed transition area. A contraction of the 'L' state, typical of students living outside their parental home, is also noticeable. Sex comparisons are easily made in the same way.

By using ordinary survivor functions, one can determine the average lifetime by computing the area under the function. In the case of time budgets, when the area corresponding to a specific state is computed, one gets the average time spent in that state during the age interval under observation. This is something similar to what is known as 'state-specific life expectancy' in multistate demography, and it is computed without introducing any hypothesis to the multistate process. Average times are shown in Table 5, to synthesize the experience of the cohorts under examination.

Figure 5 State distributions by age



Comparing cohorts shows an increase in time spent in the no transition state. This also implies a convergence of the sexes: for males, a rise (to more than one year) is observed for time spent in 'S', while the opposite is true for females. The role of compulsory military service could be important for the male pattern. The role of 'working student living at the parental home' is decreasing in importance for males, whereas it is increasing for females. Common to both sexes is the augmentation of the 'JS' period, which, as we have seen, is the 'typical' state occupied by young Italians. The 'L' state is interesting, since it represents students (without any labour force experience) not living with their parents: the pattern here is converging by sex. As for other states with a significant share, the amount of time that males spend in the modern 'single'

state 'LJS' is decreasing, while it remains stable for females. For the completed transition states, including the no-labour market entry state for females, there is a contraction. To sum up, there is no evidence of a significant rise in the time spent in those states that should be emerging according to the well known 'Second Demographic Transition' (van de Kaa 1987) theory ('L', 'LS', 'LJ', 'LJS').

Table 5 Average years spent in different states between the 18th and the 30th birthdays

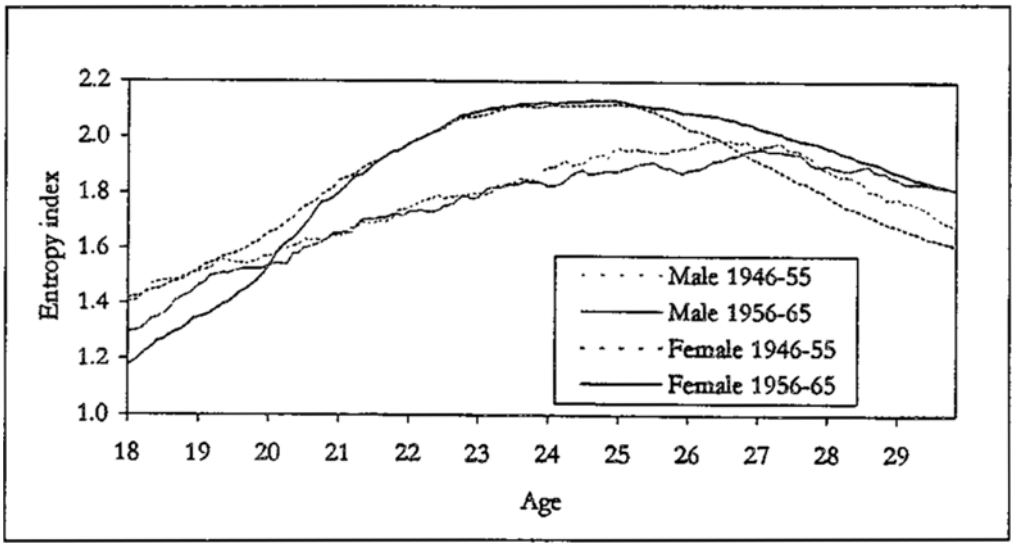
	Male		Female	
State	1946-55	1956-65	1946-55	1956-65
-	1.9	2.5	1.7	2.5
S	1.0	1.2	2.0	1.6
J	1.2	1.0	0.5	0.6
JS	4.0	4.2	2.3	2.5
L	0.4	0.3	0.1	0.2
LS	0.2	0.2	0.1	0.1
LJ	0.2	0.2	0.1	0.1
LJS	0.8	0.7	0.2	0.2
U	0.0	0.0	0.0	0.0
US	0.0	0.0	0.1	0.1
UJ	0.0	0.0	0.0	0.0
UJS	0.2	0.1	0.1	0.1
UL	0.0	0.0	0.2	0.1
ULS	0.1	0.1	1.6	1.4
ULJ	0.3	0.1	0.3	0.2
ULJS	1.7	1.2	2.6	2.2
No. of cases	323	376	1399	1547

Note: Results are unweighted because the sequences of sample individuals are used as input for subsequent analyses without allowing for weighting.

A major element in studies on the transition to adulthood is the dichotomy standardization vs individualization (Fuchs 1983; Buchmann 1989; de Jong Gierveld *et al.* 1991), which is connected with the Second Demographic Transition theory. The individualization hypothesis postulates that the proliferation of opportunities open to young people leads to a more individual-specific pattern in the transition to adulthood. Thus, a higher degree of heterogeneity is predicted for younger cohorts. Would it nevertheless be possible to describe such a pattern using individual histories and not combining quintiles for each event? A first analysis can be carried out by starting from time budgets. One might simply examine the heterogeneity of state distributions at each age and compare their values for different cohorts. An entropy index, such as the one proposed by Theil (1972), equal to $E = -\sum_{s=1}^{S} p_s \log (p_s)$, where S is the number of states and p_s is the relative frequency of the state s, might be useful for such a purpose. The entropy index by age for the two cohorts and the two sexes is represented in Figure 6. Still, upon visual inspection, one can accept neither the hypothesis that individualization has increased nor that standardization has. The ages where adulthood states are more heterogeneous, around 27 for males and 24 for

females, differ by sex. As for the cohort dimension, the picture is not clear for males; it seems that the older cohort has a more heterogeneous (individualized) distribution than the younger one, and this is reversed only at older ages. Looking at females, an increased standardization can be observed up to age 23 and a rising individualization at ages above 26. In other words, adopting a full life course perspective might imply that the individualization or standardization of life courses has to be seen as varying according to age. We may therefore accept the hypothesis of an increasing individualization for older ages, but we reject it at younger ages. An overall delayed transition seems necessarily to bring more standardization at younger ages (towards a delayed pattern that becomes increasingly diffuse), with a shift towards a greater degree of heterogeneity at older ages.

Figure 6 Heterogeneity of state distributions by age (entropy index, unweighted data)



To study the standardization vs individualization hypotheses in greater depth, one might make simplified use of the 'optimal matching' approach to sequence analysis (Abbott 1995) and compute distances between each pair of individuals. Optimal matching is based on the notion of similarity between pairs of sequences of states. It originates from the alignment of biosequences. The basic idea is to measure the dissimilarity of two sequences by considering the question of how much effort is required to transform one sequence into the other one. In the standard approach, one considers just three basic operations for transforming sequences: insertion (a state is inserted into the sequence), deletion (a state is deleted from the sequence), and substitution (a state is substituted for another one). To each elementary operation a specific cost is assigned, and the cost of applying a series of elementary operations is computed as the sum of the costs of single operations. The distance between two sequences can thus be defined as the minimum cost of transforming one sequence into the other. Specific dynamic programming algorithms ensure that the minimum cost is effectively sought out. The computed distance thus takes into account the entire sequence and not just present states. As a result, one obtains a distance matrix. This can

be used as an input for any kind of analysis requiring proximity data, for example clustering and multidimensional scaling. For demographic applications see Billari (2001). Wu (2000) gives a critical view on this approach.

In order to apply optimal matching techniques to individual life courses represented as sequences of states of the same length, it is sufficient to specify substitution costs between states. Indeed, the circumstance that sequences are of equal length makes unnecessary the task of treating insertions and deletions specifically: one substitution is considered equivalent to a deletion and an insertion. Two types of substitution cost matrices were used for this analysis. The first is defined to be *a priori*: the cost of substituting one state for another is defined to be equal to the number of operations necessary to transform one state to the other. For instance, from state 'JS' to state 'U', the substitution cost is 3, and from 'JS' to 'UL' the cost is 4. The second type of substitution cost is defined to be inversely proportional to transition frequencies and gives more cost to the substitution of states between which transitions are less frequent (see Rohwer and Pötter 2000).

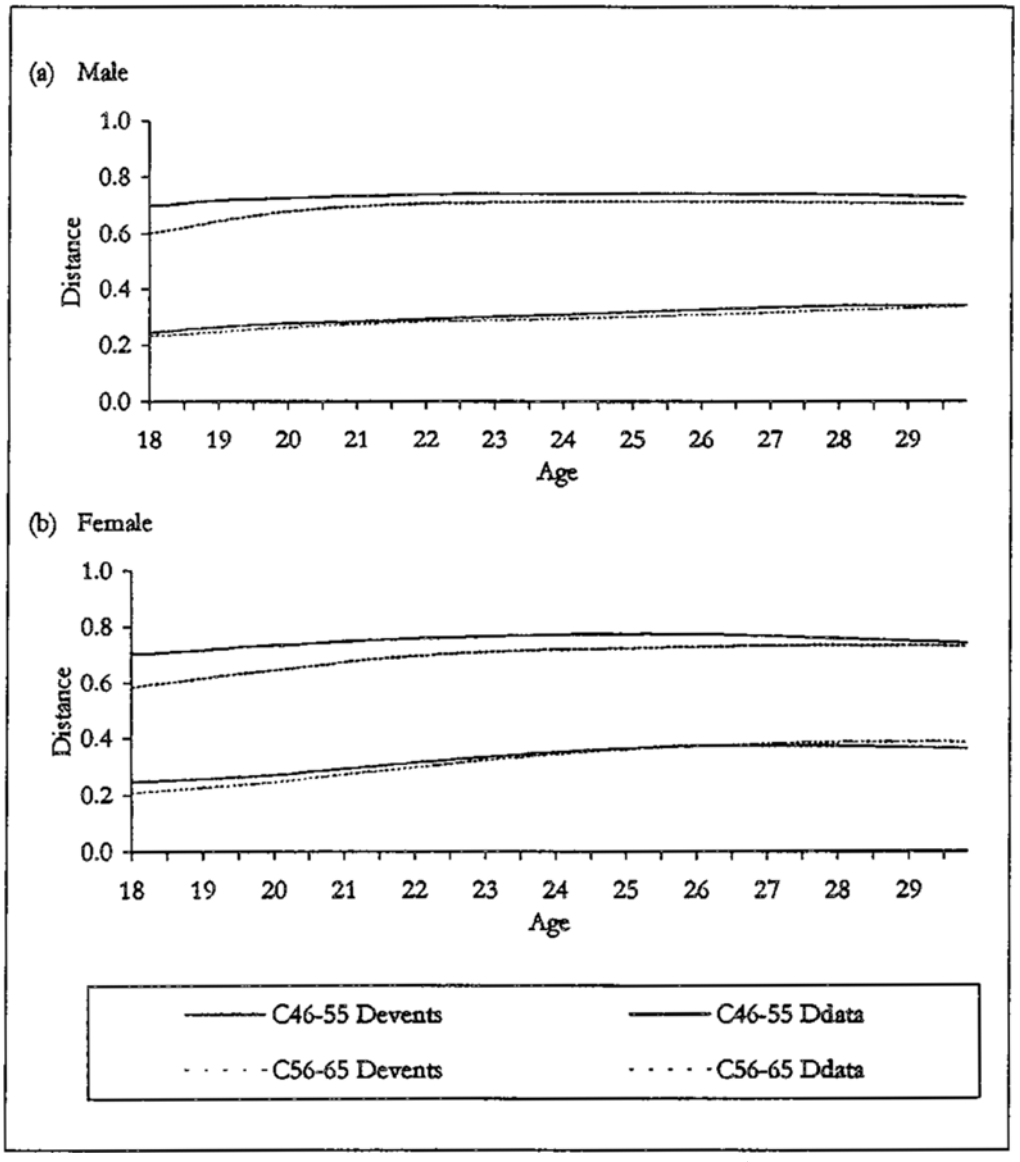
The average distance between sequences can then be analysed as an index of the individualization of the transition to adulthood. In fact, the concept of individualization calls for a different definition, which can be considered even more consistent with the life course approach than the one examined using heterogeneity indices. This idea of individualization can be evaluated at each point in time and it concerns the entire past life course. This can be termed 'cumulative experience individualization'. The analysis was performed using a sample of about a thousand distances for each comparison[13]. In the following analysis, optimal matching is also repeated for each month in order to illustrate the evolution of the distances. The results of the analysis are shown for males in Figure 7a and for females in Figure 7b. These results are concordant for the two types of substitution cost matrices and evidence a higher average distance between people in the older cohort than between those in the younger cohort at almost every age. Thus, when cumulative individualization is considered, the evidence up to the age of 30 indicates that there is increasing standardization of the transition to adulthood. The same approach (results not shown here) can be applied to analyse sex differentials across the life course, using an intra-cohort comparison of male and female transition to adulthood sequences. This does not provide clear evidence of an increased convergence of transitional behaviour between Italian males and females.

To sum up, the analyses confirm that the individualization-standardization of life courses can be analysed dynamically by using sequence analysis in a way that is consistent with the theoretical underpinnings of the life course approach, and that the results can differ according to the upper age limit used.[14] This approach can also be used to cluster observations (for multidimensional scaling), thereby enhancing the explanatory opportunities inherent in life courses (Abbott 1995).

13 The dimension of the sample of distances is not fixed *a priori*, because each distance is extracted according to a random number, so that the expected size of the sample is 1000.

14 Indeed, the lower age limit may also be important for the analysis.

Figure 7 Average distance between individual sequences by age



Note: Devents: the substitution cost is equal to the number of different events necessary to transform one state to another state. Ddata: the substitution cost is data-derived and inversely proportional to the frequency of transition between states. The maximum distance is 1. Computations are based on a sample of about 1000 pairwise comparisons.

Concluding remarks

Describing the transition to adulthood by taking seriously the definition given by Modell and his colleagues is indeed a complex matter. In this paper, some proposals moving towards a global descriptive approach have been put forward and applied to postwar Italian cohorts. It has been shown that the transition to adulthood in Italy has been globally postponed. This seems to be particularly evident when considering household and family formation events. The only thing that does not fit this pattern is

the labour market behaviour of females. However, it seems that this can be reduced to the question of whether or not a woman enters the labour market rather than of when she does so.

As for the techniques, survivor functions for each separate event and the measures derived from them are at present the only widely accepted framework. For more than one event, it seems that the risk of taking the sequence of survivor functions as descriptors of the individual sequencing is very high. Thus, one might question whether such graphs are useful at all. Joint transition rate graphs for all events seem to be more neutral in this sense and equally informative. When considering two events, mirrored survivor functions, which are a generalization of ordinary survivor functions, can serve as a clear graphical tool, and they also give special information on the topic of synchronization. Sequence analysis is useful when studying more than two events. The application of such techniques showed that the Italian transition to adulthood continues to be characterized by a strong synchronization of leaving home and entering a first union. However, when looking at the process of transition to adulthood as a whole, non ideal-typical sequences were present in both the younger and older cohorts. The individualization issue was examined from a new perspective, considering different ages. It seems that there is no real evidence for increased individualization at ages below 25; if anything, there is evidence for more standardization.

Another useful approach to explaining these processes is by means of complex, finely honed description. This approach calls for transition rate models which handle parallel and potentially interdependent processes and allow for simultaneous events. Dealing with the whole process as a dependent variable, with the idea of studying the determinants of life schedules, presents an even more significant problem, and the sequence analysis approach seems to be the better way to address this issue. Such techniques can then be extended to the whole demographic life course.

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