ACTA UNIVERSITATIS CAROLINAE
2001 GEOGRAPHICA, NO. 1, PAG. 53–68

Demographic perspective and changing analytical paradigms: observations from the Estonian FFS[1]

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Abstract: During the recent decades demography has witnessed considerable spread of multivariate methods. This development ensues from the introduction of event history framework which has been recurrently conceptualised as a shift of analytical paradigm. The present article points to some pitfalls related to the application of event history framework in demographic perspective and ways to enhance contribution of the framework to the understanding of population development. The disccusion is accompanied by illustrative examples based on Estonian Family and Fertility Survey.

Key words: population development, event history analysis, family and fertility surveys, Estonia.

1. Introduction

As a scholarly discipline demography has traditionally excelled in measurement and description of its object. It has been recurrently noted that the quantitative approach, focus on large numbers of people and events distinguishes demography from related disciplines and the sound empirical basis is often used as a starting point or general background for subsequent research in other fields (Caldwell 1996; Preston 2001). Also, planners and policy makers are used to rely heavily on population perspective and accounts. For these reasons, demography has sometimes been regarded as a basic social science, fundamental to understanding society.

The toolkit to which demography owes much of its merits has evolved in the course of a long period which took start from the times of John Graunt. Along this road demographers as well as many distinguished scientists who are today better known for their accomplishments as mathematicians, astronomers etc. have developed a large family of analytical tools (comprehensive summaries can be found in for example in (Pressat 1961; Bogue *et al* 1993)). A salient feature of demographic toolkit has been an established link between the methods and the general perspective in which framework substantive processes are studied. In other words, the trial and error of scientific endeavour have selected indicators and their systems, geared to the measurement of population processes. To provide an example, life expectancy and total fertility rate could be referred as classic generalisations of mortality and fertility levels. Against that background, the techniques based on formal statistical associations have enjoyed noticeably lesser popularity among

[1] This arcticle has been prepared in the framework of research project 050143s00. The authors gratefully acknowledge support from ETF grant No. 4796.

demographers, particularly in comparison to disciplines with less established quantitative tradition.

During a couple of recent decades, and particularly in the 1990s, however, demography has witnessed considerable infiltration of multivariate methods. This development has been closely related to the life course approach and event history analysis which have been by many voices heralded as no less than a paradigm shift in demography (Courgeau and Lelievre 1997; Willekens 1999). The present article aims neither at extending the discussion about the merits of the new framework nor at addressing numerous technicalities related to corresponding methods. Instead, the article seeks the ways how the advanced analytical potential of event history framework could harnessed better to the service of demographic perspective, pre-occupied with the mainstream of modern population development. The material illustrating this search has been based on Estonian Family and Fertility Survey which was carried out in the frame of European FFS.

The article is structured in three main sections. Following the introduction, the second section concisely outlines the fundamentals and major merits of event history analysis, the third then discusses on the pitfalls which are frequently encountered in the demographic application of corresponding techniques. The fourth section gives an example how these pitfalls have been tackled in the case of Estonian FFS. In particular, the section describes the dataset and models, and presents a selection of findings, focused on comparability across life careers, population groups and over time.

2. Fundamentals of event history analysis

Modern event history analysis was born from the union of classic demographic methods and multivariate statistical techniques. The invention of event history analysis is commonly associated with David Cox who was the first to combine traditional life table and regression models (1972). The decades following his seminal work have been characterised by the rapid advancement of corresponding methodology and growth in the number of applications. Aside demography, frequently cited fundamental texts on event history analysis have drawn on epidemiology, econometrics and sociology (Kalbfleisch and Prentice 1980; Lawless 1982; Allison 1984; Tuma and Hannan 1984; Blossfeld, Hamerle and Mayer 1989; Yamaguchi 1991; Courgeau and Lelievre 1992, Blossfeld and Rohwer 1995). Understandably, the applications of event history analysis could be found in a significantly broader spectrum of scholarly disciplines.

The concept of event history analysis is centred around observable outcomes of processes, referred as events or transitions. In this framework, an event signals a transition or change from one discrete state (origin) to one or more mutually exclusive states (destination); taken together, these possible states constitute a state space. In case an individual forms the principal unit of analysis, marriage, entry into the labour force, promotion in a job, change of employer, divorce, death of a spouse, migration, major personal injury or illness could be but a few illustrations of life events. The events addressed typically connote considerable changes in person's situation and require substantial adjustments to be made in lifestyle. For that reason, events are generally regarded as milestones in people's lives which mark transitions between stages or episodes of life, thus defining the temporal structuration of life course. Despite seemingly

trivial, the role of such properly defined building blocks, which allows to reduce the complex phenomena to the combinations of fairly simple elements, can be hardly underestimated in the progress of science (Holland 1995).

Time forms another basic element of event history framework. The time span that an individual spends in a specific state is defined as an episode, or interchangeably as interval, spell, waiting time or risk period. Although the occurrence of events deserves attention, the timing of events forms the very heart of event history analysis. The most simple but convincing example about the role of the timing can be probably derived from mortality where the ultimate outcome has been always the same, with all the development, differentiation and societal implications of the process being reduced to the timing of an event. To this end it needs to be stressed that the introduction of time perspective into multivariate framework opened the path towards modern event history analysis. Put in another way, namely the incorporation of time dependence has allowed event history analysis to go beyond the limits of standard multivariate techniques.

When speaking about major scientific merits of event history framework, its universality, inherent interdisciplinary nature and the linkage between macro- and micro-level are usually referred (Hareven 1978; Elder 1995; Dykstra and Wissen 1999). Life events are universal, they are found everywhere, and irrespective of time and place, the timing, sequencing and spacing of life events always constitute a skeleton of human life. At the same time interdisciplinary capacity of event history framework allows to cross the borders of scholarly disciplines, link and integrate the insights from various fields. For its focus on the way how individuals live their lives, event history analysis and life course approach also provides a convenient link between micro- and macro-level. Individuals experience events and organise their lives around these events. When aggregated, however, these individual transitions are smoothly translated into processes on population/societal level.

In the practice of research, event history framework has demostrated its usefulness particularly in uncovering or mapping out causal relations which forms an essential although difficult part of scientific endeavour. The link to causal understanding is natural because in event history framework future behavioural outcomes are related to conditions in the past. In this view, event history analysis is clearly opposed to cross-sectional designs which by the very nature of observational plans do not allow the distinction between correlation associations and causation. Regarding the latter, aside the cumulative impact of earlier experiences on later ones event history theorists have pointed to causality between interdependent processes since life domains do not exist in isolation but often interact and operate in parallel. Interdependence of life events or parallel careers suggests that an event in one domain may influence – reduce or increase – the probability of another life event in related domain. In such situations, event history framework undoubtedly makes a valuable contribution to the understanding of inter-career influences.

Aside growing recognition among social scientists that life course perspective and event history analysis is often the most appropriate empirical framework for the study of substantive processes, rapid increase in the range and number of applications during the past 10–15 years has been supported by several complementary developments. Most importantly, new paths have been opened up by the wealth of longitudinal surveys, retrospective as well as prospective which have become available and provide the central

empirical basis for event history analysis. Taking start in national settings, corresponding exercise of survey-taking has grown vigorously into large-scale international enterprise. The most remarkable achievement in this arena has evidently been the European Fertility and Family Survey, coordinated by United Nations Economic Commission for Europe. Through comparative surveys the FFS has resulted in a unique set of interlinked biographies of adult men and women from in 24 industrialised countries (UNECE 1992; 1993; Festy and Prioux 2001). It is interesting to note that as a result of such achievements, event history framework made an inportant contribution to the rising importance of survey statistics in compariosn with vital statistics and census.

From the technical viewpoint, the spread of event history modeling has been also facilitated by the development of both soft- and hardware. The tools required for the analysis are presently available, in their simplest forms, in major commercial software such as SPSS, SAS and STATA, complemented by various professional packages. And the astounding progress of PC-computing has made the estimation of even most sophisticated models efficient as well as easily accessible.

3. Event history analysis in demographic framework: methodological considerations

Starting from its early stages of formation, population science has looked at events in people's lives from birth to death, addressing questions about their intensity, prevalence and timing. Since event history analysis was born as a multivariate extension of classic demographic tools, it is not surprising that it fits the demographic research tradition like a glove (Dykstra and Wissen 1999). Event history analysis offers a framework for the analysis of virtually all processes that are of interest to demography, and in a broader view, for all phenomena occurring in the population which can be conceptualised in terms of transitions from one discrete state to another.

The methodological compatibility of event history framework and demographic perspective is demonstrated by the continuously expanding body of analyses addressing fertility and reproductive processes, family formation and dissolution, departure from parental home, household dynamics, migration and residential mobility, labour market transitions and career advancement, mortality and morbidity, educational enrollment and many other population-related processes. Evidently it has for already some time ago become a hopeless task to keep an eye on and provide systematic references to demographic research, based on event history framework[2]. Although the application of event history methodology took start in the countries with advanced demographic schools and solid basis of survey statistics, it has gradually spread to the entire professional community. As the knowledge of the methods has improved, scientific contribution of the framework is to an increasing extent determined by the content and quality of relevant databases.

As referred in the previous section, an important merit of event history framework stands in its capacity to support a common perspective for substantively very different

[2] *Popline* bibliographic database (December 2000 issue) provides more than 2,700 references related to keywords of event history analysis.

processes. In this view, the adoption of event history framework has a capacity to foster the integration of research results and expertise, both within demography as well as across disciplinary boundaries. Most importantly, such common perspective makes it possible place specific findings into general context of population development, significantly enhancing the scope of generalisations across demographic processes. In certain contrast to the methodological capacity, the existing practice of event history modeling, however, indicates that the referred potential is often insufficiently harnessed. Out of various circumstances which may have contributed to such situation, this article concentrates mainly on two problems.

The first problem relates to general orientation of event history modeling. Typically, if not overwhelmingly, event history framework is being used to measure the effect of certain characteristics – dependent variables or covariates in technical terms – on specified substantive process. In that sense, event history analysis is related to long-established tradition of differentiation studies in demography. Put in another way, in such context the focus of event history analysis is concerned with the heterogeneity of population whereas the development of demographic processes are addressed by other means.

The application of event history framework tends to overlook the systemic nature and certain hierachy of demographic (sub)processes which, taken together, make up population development. As a rule, only one (sub)process is selected for the analysis without relevant reference to related processes forming the context. Thus it is not surprising that some (sub)processes such as first birth, departure from parental home or first partnership are overrepresented are overrepresented in event history analysis leaving the processes of no lesser importance, for example the completion of fertility career, partnership dissolution and repartnering or residential career poorly covered, not speaking about processes like menarche or menopaus.

In many cases such disbalance has been justified by the lack of approriate data although this lack is often introduced in the stage of survey design by researchers themselves. From the experience of collaboration at the preparatory phase of Estonian FFS we learned that such orientation can be explained as a remedy against needless fragmentation of research focus. Understandably it is much easier to design a survey with narrower focus, however, the cost of fragmentation resulting from it is too high to pay. Given the fragmentation of the focus, it is not surprising that there is only limited overlap between the covariates included in various process-oriented models which in turn contributes to the heterogeneity and incomparability of conclusions.

The second problem relates to time perspective. Surprisingly often event history models consider the differentiation of population processes from static perspective. Although the cohort – cohort data form the most common basis for event history analyses – is included in the model, it is treated much like any other covariate. From the demographic perspective, however, it is obvious that differentiation in successive cohorts should not be mixed and the transformation of patterns over time properly addressed. From the technical point of view, this calls for systematic exploration of interactions between the covariates and cohort. From substantive view it is clear that the longer is the cohort range considered, the more stimulating could be the results. And conversely, the neglect of dynamic perspective gives way to crude simplifications, if not misconclusions. The latter is particularly likely when demographic system undergoes change – in such

circumstances the average estimates derived from static models are typically nothing but a statistical artifact.

In the context of population development, the change in differentiation elucidated by dynamic view frequently points to pioneering groups or forerunners of demographic development who devise and introduce new behavioural patterns which are subsequently absorbed by and spread to the main population (Livi-Bacci 1986). When the long-term trend of the process alters course, for example switching from juvenation to ageing, the position of forerunners vis-a-vis general population is also likely transformed. In such cases static models typically fail to capture any differentiation. Such failure may alike occur due to changes in socio-historical context which shapes the range of choices and constraints faced by successive cohorts during their life course (Elder 1974; Easterlin 1980).

Both referred problems in the application of event history framework – fragmentation across behavioural domains and the lack of dynamic perspective – have been considered in the preparation and implementation of the Estonian FFS, starting from early stages of the development. In the survey the application of event history analysis has been targeted to providing an integrated account of population development in the country, the task which cannot be supported by narrow substantive scope and static perspective. Of course, these assertations are neither original nor new but for the countries where the demographers are of incorporating the new analytical framework into their toolkit, these considerations are probably worth of reiterating. If neglected, the fascination with expanding technical possibilities cannot substitute loos theoretical perspective.

The following sections of the article provide a brief illustration how the discussed methodological considerations have applied in the Estonian FFS. The completion of analytical stage of the survey allows to conclude that merging the demographic perspective and new analytical framework is not only feasible but could also add value to scientific results.

4. Event history analysis in demographic framework: illustration from Estonian FFS

4.1. Data and models

Estonian Family and Fertility Survey forms a national part in the framework of the European FFS[3]. The survey was based on event history approach with an explicit aim to cover major life careers of the population and relate them in event history framework. In case of Estonia, this general orientation was strengthened additionally by at least two reasons. First, the resources which are available for survey statistics in a small country, moreover undergoing economic transition, required the consideration of a broader scope of issues/topics than necessary in the countries with extensive programmes of survey statistics. Second, the position of FFS as the first nationally representative survey

[3] Due to funding reasons the data collection of Estonian FFS was accomplished in two parts: women were interviewed in 1994 (n=5021) and men in 1997–1998 (n=2511). Detailed descriptions of survey methodology, procedures and results are available from the volumes of methodological reports, standard tabulations, country reports and analytical publications (EKDK 1995a; 1995b; 1999). The analyses included in the present article are based on the female survey of Estonian FFS.

following the discontinuity of statistical system added another set of tasks from bridging the information gap to capacity-building.

Compared to UN ECE core questionnaire, the programme of Estonian FFS was extended in several directions. In particular, the extensions if the programme concerned the modules of pregnancy, abortion, migration, parental home and socialisation environment, thus increasing the spectrum of life careers to be addressed (EKDK 1995a; 1999). On another hand, the broadened focus of Estonian FFS was reflected also in the definition of target population. In this view, most importantly the survey extended the cohort range of significantly beyond the currently fertile age-span[4]. Compared to standard recommendations the upper limit of target population was increased by twenty years, up to the 1924–1928 birth cohort which had reached age 65–69 in the period of data collection. Following the standard approach, the lower limit of the target population was set to cohort 1969–1973 (aged 20–24).

From societal perspective the extended cohort range already embeds a considerable alteration in itself, however, in case of Estonia the turbulence has been further enhanced by repeated systemic changes which have shaped the context of population development. Starting from the recent transition, still far from being completed, one refers to fundamental changes in Central and Eastern Europe that have accompanied the fall of Iron Curtain. Compard to tha latter, however, the preceding transition – which dates back to the aftermath of WWII when the existing geopolitical arrangements and principles of societal organisation were violently replaced – has been no less important (Misiunas, Taagepera 1993). Both transitions have had multiple effects on the life courses of generations addressed by the survey. From individual perspective the broadened cohort range allowed to follow life careers of the population into much fuller length than would have been possible otherwise.

The extension of the programme and target population understandably implied strain on survey implementation, involving the risk of reduced cooperation of respondents in prolonged interviews, decrease in response rate/reliability of answers to sensitive topics, likelihood of recall problems in older cohorts etc. To avoid the pitfalls, considerable investment into quality supportive procedures was required. Aside devising these procedures, the working groups had to compete also with the scepticism of some foreign experts who strongly favoured the narrower focus of the survey. Appreciably, the data quality of the survey was not compromised and subsequent evaluations have confirmed the adequacy of taken precautions (Barkalov et al 1999; Festy and Prioux 2001; Katus *et al* 2000). Somewhat unexpectedly, in a later stage of the exercise the newly appointed European project coordinator choose to deny the obvious advantage of longer demographic perspective. As a result, the data for older cohorts were removed from the tables of Estonian standard country report, however, as an outcome of negotiated compromise maintained in the text (UNECE 2000).

In the course of analysis, event history models were fitted to more than twenty different life course events. The range of event covers all major biographical domains resp population processes, including union formation and dissolution, fertility, abortion, sexual

[4] Another major extension of target population concerned the inclusion of foreign origin population, including immigrants and their second generation.

initiation, departure from parental home, migration and residential mobility, school completion, entry into labour force and return to employment following childbirth. To ensure broader scope for generalisations the focus was not limited to early life course events but the models also addressed the events which occur at later stages. It should be noted that the latter events – for example second and third births in case of fertility – may prove ultimately more consequential for modern population reproduction than the onset of corresponding careers.

The underlying focus on population development implied the standardised set of covariates integrating the analyses of different processes. Although such standardised set was surely not optimal from the viewpoint of each particular process, the preference was given to comparability between models and to the possibility to compare the differentiation across life careers. In addition to time-axis and birth cohort, the models included five time-constant covariates: settlement type, educational attainment, religion, social origin and locus of control[5]. With the exception of locus of control which captures the psychological personality traits – the level of personal independence – the remaining characteristics represent the fundamental aspect of population heterogeneity and are used commonly in census and vital statistics. From the life course perspective, the selection of covariates emphasises the role of cumulative influences. Thus social origin, religious disposition and locus of control are all typically formed at early stages of life course or directly inherited from parental home. Also, educational attainment is seldom changed in mature ages and the same holds largely for settlement type as the likelihood of migration moves decreases rapidly following the peak in late teens/early twenties.

To place the differentiation of life careers into dynamic perspective and address the transformation over time, all the models were run separately for successive birth cohorts. To compensate the steep decrease in the number of cases and loss of statistical significance, dynamic modeling followed the principle of moving average – at each step three consecutive birth cohorts were selected – except at the extremes of cohort range. In running the model for birth cohort 1929–1933, for example, the records belonging to adjacent cohorts 1924–1928 and 1934–1938 were also used. From the technical point of view, the applied scheme is equivalent to systematic consideration of interactions between cohort and the covariates included in the model.

The referred multivariate work was accomplished by means of piecewise constant transition rate models which assumes constant hazard rate within each interval of time axis. In addition, logistic regression analysis was used to study the type of first partnership, parity progression and educational career. The fitting of the latter was done by using TDA software package whereas the logistic regression models were estimated using SPSS. In the following, the illustrative findings are presented in two directions. The first direction focuses on the general patterns of population heterogeneity, the second section extends the discussion by adding a dynamic perspective[6]. Readers interested in a systematic

[5] Detailed information about the operationalisation of the covariates is available from other publications (EKDK 1995b; Katus, Puur and Poldma 2002). The latter source also provides an account on the technical aspects of model building.

[6] The analysis is focused on native population which includes Estonians and national minority populations. The development and characteristics of immigrant population with its diverse demographic, social and cultural is addressed elsewhere (Viikberg 1999; Katus, Puur and Sakkeus 2002).

discussion of findings can refer to a series of thematic analyses (Katus, Puur and Põldma 2002).

4.2. Comparability across life careers and population groups

The results of modeling have been consolidated into the table. Model estimates are presented in the format of relative risks which indicate how many times larger or smaller the likelihood of an event in a certain category is when compared to the reference category. In the table the latter – 'urban' for type of residence, 'secondary' for educational attainment, 'indifferent' for religion, 'blue-collar' for social origin and 'neutral' for locus of control – are not shown. In the upper panel of the table relative risks are non-adjusted and represent the gross differentiation related to a given category, in the lower panel relative risks are adjusted for the effects of other covariates in the model, representing the net differentiation. In addition, the table provides an indication of statistical significance levels.

The presented information supports concurrently two perspectives of exploration. On one hand, the rows indicate about the differentiation across specific life course events resp population processes. In other words, it allows to set the question about the extent and direction to which various processes are differentiated. Columnwise exploration, on another hand, supports the generalisations across characteristics resp population groups. This perspective involves the issue of typical life course patterns, for example of university graduates as opposed to strata with lower educational attainment. It should be noted that both perspectives complement each other in showing the return way from analysis and decomposition to synthesis and integration. Leaving this path poorly charted forms a major risk of fragmentation in event history analysis.

A brief glance on the table, disregarding the details, is sufficient to reveal considerable amount of differentiation in life careers. To attest the presence of heterogeneity, the criterion of statistical significance is commonly used in event history framework. Regarding the life careers included in the analysis, on average more than a third (36%) of estimated risks attained statistical significance. The estimates based on non-adjusted models expectedly revealed even higher significance (48%). Against this background row-wise examination of the table also points to extensive departures from the average in respect to specific careers. Thus, stronger differentiation has been charateristic to first sexual intercourse, entry into first partnership and parenthood, migration and return to employment following childbirth. On another hand, lesser heterogeneity and comparatively standardised pattern is featured by menarche, departure from parental home, type of first partnership, partnership dissolution, second and third birth, re-partnering. Regarding the rest of events, the amount of differentiation proved close to average.

Although the criterion of statistical significance forms a useful aid in analysis, it should not be given an absolute meaning since it depends on the number of population in relevant groups. This should be note particularly when dealing with life events which are known for considerable selectivity but concern relative small part of general population. In such case, some complementary criteria – for example the deviation of transition rate compared to reference group – could be useful. In our case, the cut-off level of 25 per cent (relative risks higher than 1.25 and lower than 0.75) reduced the proportion of strong differentials

to 26 per cent on average. Against this generally more conservative estimate the criteria, however, points to a noticeably strong differentiation of higher order births (4+) which are highly selective but limited in numbers under modern fertility.

Table 1. Differentiation of population life careers Estonia, female birth cohorts 1924–1973

	Settlement type	Educational attainment		Religious affiliation		Social origin		Locus of control	
	rural	primary	tertiary	religious	following customs	self-employed	white-collar	internal	external
	Relative risks (non-adjusted estimates)								
Timing of first partnership	1.20**	1.31**	0.65**	0.91	1.02	0.91*	0.90	1.05	0.89*
Type of first partnership	1.14	1.33**	0.96	0.76	0.91	1.00	1.04	0.92	0.53**
Dissolution of first partnership	0.94	1.06	0.84*	1.19	0.91	0.89*	1.12	1.01	0.80*
Re-partnering	1.16	1.14	0.77*	0.87	0.93	0.92	0.85	1.02	0.86
0 birth ⇒ 1 birth	1.83**	1.61**	0.58**	0.68*	1.16	0.91	0.68*	1.18	0.95
1 birth ⇒ 2 birth	2.43**	1.70**	0.86	0.77	0.98	1.06	0.84	0.92	0.96
2 birth ⇒ 3 birth	2.92**	1.96**	0.77	1.37	1.02	1.03	0.82	0.79*	0.87
3 birth ⇒ 4 birth	2.04**	1.94**	0.65	1.59	1.70**	0.81	0.83	0.71	0.44**
Timing of first birth	1.41**	1.41**	0.63**	0.91	1.07	0.92*	0.78**	1.05	0.95
Menarche	0.76**	0.82**	1.24**	1.00	1.01	1.05	1.26**	0.98	1.09
First sexual intercourse	1.20**	1.36**	0.67**	0.71**	1.01	0.90**	0.97	1.10*	0.94
Induced abortion	0.83**	1.00	0.77**	0.90	0.93	0.88*	1.01	0.99	0.90
Homeleaving	1.09*	1.08	0.77**	0.93	0.99	1.04	0.90	1.09*	0.94
First residential move	1.03	0.85**	1.00	0.91	1.08*	1.13**	0.95	1.10	0.91
First migration	1.15**	0.81**	1.12*	0.90	0.99	1.22**	0.93	1.10*	0.97
Primary secondary education	0.32**	1.00	6.82**	0.84	0.88	1.31**	4.52**	1.52**	0.98
Secondary tertiary education	0.58**	1.00	6.84**	1.40*	0.74**	1.27*	2.47**	1.84**	0.75
Timing of school completion	1.43**	1.00	0.45**	0.97	1.12**	0.90**	0.67**	0.83**	1.07
Entry into labour force	1.14**	1.52**	0.45**	0.85**	0.97	0.86**	0.76**	1.09*	1.02
Return to employment	0.96	0.77**	1.10*	0.83**	0.97	0.95	0.97	1.17**	1.03
	Relative risks (adjusted estimates)								
Timing of first partnership	1.20**	1.30**	0.64**	0.91	1.02	0.91*	0.90	1.05	0.89*
Type of first partnership	1.14	1.32**	0.94	0.76	0.91	1.00	1.04	0.92	0.53**
Dissolution of first partnership	0.94	1.02	0.92	1.19	0.91	0.89*	1.12	1.01	0.80*
Re-partnering	1.16	1.13	0.81	0.87	0.93	0.92	0.85	1.02	0.86
0 birth ⇒ 1 birth	1.83**	1.43*	0.62**	0.68*	1.16	0.91	0.68*	1.18	0.95
1 birth ⇒ 2 birth	2.43**	1.14	1.30*	0.77	0.98	1.06	0.84	0.92	0.96
2 birth ⇒ 3 birth	2.92**	1.40**	1.03	1.37	1.02	1.03	0.82	0.79*	0.87
3 birth ⇒ 4 birth	2.04**	1.53*	0.97	1.59	1.70**	0.81	0.83	0.71	0.44**
Timing of first birth	1.41**	1.32**	0.66**	0.91	1.07	0.92*	0.78**	1.05	0.95
Menarche	0.76**	0.92	1.14**	1.00	1.01	1.05	1.26**	0.98	1.09
First sexual intercourse	1.20**	1.37**	0.66**	0.71**	1.01	0.90**	0.97	1.10*	0.94
Induced abortion	0.83**	1.06	0.73**	0.90	0.93	0.88*	1.01	0.99	0.90
Homeleaving	1.09*	0.99	0.79**	0.93	0.99	1.04	0.90	1.09*	0.94
First residential move	1.03	0.75**	1.08	0.91	1.08*	1.13**	0.95	1.10*	0.91
First migration	1.15**	0.68**	1.23**	0.90	0.99	1.22**	0.93	1.10*	0.97
Primary ⇒ secondary education	0.32**	1.00	3.52**	0.84	0.88	1.31**	4.52**	1.52**	0.98
Secondary ⇒ tertiary education	0.58**	1.00	5.42**	1.40*	0.74**	1.27*	2.47**	1.84**	0.75
Timing of school completion	1.43**	1.00	0.52**	0.97	1.12**	0.90**	0.67**	0.83**	1.07
Entry into labour force	1.14**	1.53**	0.45**	0.85**	0.97	0.86**	0.76**	1.09*	1.02
Return to employment	0.96	0.76**	1.10*	0.83**	0.97	0.95	0.97	1.17**	1.03

** $p < 01$, * $p < 05$

Columnwise exploration of the table draws attention to a different kind of patterns which reflect the heterogeneity across population groups. Referring to general features of these patterns, particularly systematic differentiation can be found across educational and urban-rural divide. Prolonged educational enrollment is clearly dominated with the postponement and/or non-occurrence of events in other careers, including sexual initiation, partnership formation, first parenthood, homeleaving and entry into labour force. Similar direction of influence tends to prevail also for higher order events, particularly uneven appears the contribution of women with low and medium/high educational attainment to 3 and 4+ births. On another hand, however, there are also events in which case the educational differential runs in the opposite direction. Among the latter, earlier timing of menarche among more educated strata could refer to the existing correlation between physical and cognitive development.

Differences between urban and rural population offer a salient contrast to the claims of far-reaching societal homogenisation advertised by former regime. In three out of four life careers the analysis revealed persistent and statistically significant differences across urban-rural divide. Compared to their urban counterparts, generally urban residents tend to feature earlier timing and/or higher prevalence of life course events. Noticeably, only three events out of twenty – partnership dissolution, abortion and menarche – have featured the gradient distinctly in opposite direction. It is important to note that although the latter reflects partially the diverse composition of subpopulations, for example the concentration of highly educated strata in urban areas, the heterogeneity cannot be reduced to structural differences. In technical terms, this is attested by the considerable stability of relative risks in switching from non-adjusted to adjusted models.

The heterogeneity related to religious affiliation, locus of control and social origin is somewhat less systematic but still clearly discernible and worth of attention. It is interesting to note that despite long-term efforts of eradication, religion has evidently maintained its importance as a marker of ideational orientations. Although relative number of population who regard themselves religious is remarkably low – less than 10 per cent with the exception of oldest cohorts – adherence to religion is nevertheless manifested in the life course patterns[7]. Consistent with general expectations, religion tends to be related to somewhat more conservative patterns in family domain, including later timing of sexual initiation, partnership formation and parenthood, increased preference to direct marriage etc. An interesting contrast in this context, however, is the lower stability of unions among religiously minded subpopulation, inviting to further elaboration.

The gradient of differences along the locus of control indicates that the individuals who feature an internal locus of control tend to be self-contained and convinced about their ability to direct their own life course. In general, internals are characterised by earlier onset of reproductive careers and lesser adherence to prevailing norms etc. Individuals with external locus of control, on another hand, display less active stance in their life strategies. Compared to other characteristics, the heterogeneity across social origin appears less systematic. Evidently this stems from the repeated societal transitions which

[7] The intermediate group – population which identified themselves as following religious customs – is not systematically distinguished from the reference category. From the methodological point of view, the purpose of including this group was to reduce the heterogeneity in other categories.

have introduced serious discontinuity into social stratification in Estonia. But still, in several domains the differentials by social origin attain significance, even after controlling for other characteristics.

4.3. Comparability across time

Dynamic extension of event history framework implies considerable increase in the amount of modeling. In case of this study, each row presented in the previous table was supplemented by a series of models run separately birth cohorts. Despite the capacity of multivariate methods to condense the results into fairly small number of parameter estimates, the information generated by these hundreds of models cannot be incorporated in this section. Correspondingly, the following presentation is centred around two examples which illustrate the exigency of dynamic perspective in demographic applications of event history framework.

The first example concentrates on educational career with specific focus on the advancement from secondary to higher education. The applied framework – modeling the odds of attaining the tertiary diploma for those who have graduated the preceding level – resembles closely the conceptualisation of parity progression in fertility analyses. From substantive point of view the transition to tertiary education concentrates the bulk of hetero geneity which can be found in educational careers in contemporary societies.

On the argument side, the focus of the example is also on educational attainment but understandably the latter does not refer to the respondent but her parents[8]. The data presented in previous table revealed a remarkably strong differentiation of educational career, depending on educational characteristics of parental home. Thus, on average the population with (at least) one parent having higher education enjoyed 5.4 times higher chances of attaining tertiary diploma than the reference group with neither parent having secondary education. At the same time also the secondary education of parents increased the likelihood of attaining tertiary but not to a similar extent (2.1 times, not shown in the table). The application of dynamic perspective to this differentiation reveals considerable transformation of the pattern (Figure 1).

The data reveal that across the FFS cohort range, there has been a marked strengthening in the impact which educational characteristics of the parents exert on educational outcomes among children, or in other words, intergenerational transmission of education. In particular, this development has added the advantage of better educated population strata – comparing the oldest and youngest cohorts the increase in relative risks accounts for almost five times for the group with at least one parent with tertiary education. From another viewpoint, the observed trend points to considerable growth in the diversity of educational outcomes of children coming from different family backgrounds. For example in the cohorts 1964–1973, highly educated parents implied 7–8 times greater chances of children to proceed to tertiary education compared to less educated. Leaving aside the reasons behind the growing differential and societal implications, earlier studies

[8] The operationalisation of parental education categories was slightly different from that of the respondent: first (reference), both parents with less than secondary education; second, at least one parent with secondary education; third, at least one parent with secondary education.

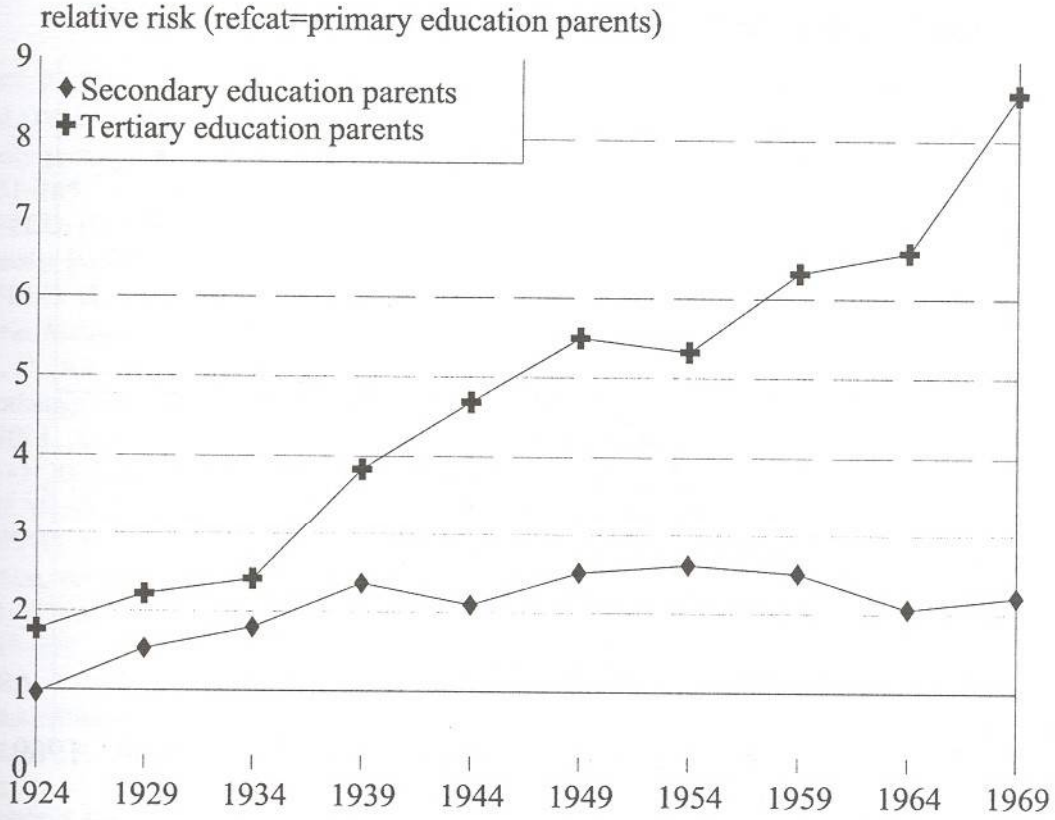

Figure 1. Progression to tertiary education Estonia, female birth cohorts 1924–1973

missing the dynamic perspective have completely overlooked the referred transformation (Titma 1999).

The second example concentrates on the timing of menarche which has received relatively lesser attention in event history framework. In particular, the attention is focused on the differential timing of menarche by religious affiliation. Understandably, the purpose here is not to convince the reader about the existence unexplored causal link which runs from religiosity to biological maturation of teenagers but rather to reiterate once again the benefits of dynamic perspective. The differentiation of menarche by religion suits for that purpose particularly for the pattern embedded in the data.

The static approach summarised in the preceding table revealed almost complete absence of differentiation of menarche across religious affiliation, the corresponding estimate of relative risk coincided with reference category at two digit level (1.00). The results of dynamic modeling presented on Figure 2, however, offer a significantly different perspective. In older cohorts 1924–1938 the religiously minded population has featured relatively later timing of biological maturation. In intermediate cohorts 1939–1963 the difference from reference group virtually disappeared while in younger cohorts 1964–1968 the heterogeneity re-appeared, however displaying the opposite gradient. Although the small proportion of religious population does not allow the relative risks to reach statistical significance, the principal transformation of the pattern is obvious. Evidently, the observed reversal of the gradient could denote a change in the selectivity of subpopulation, and hence, a shift in the societal meaning of religious adherence over time. Such an hypothesis is also supported by the evidence from other life careers, for example education (Katus, Puur and Poldma 2002).

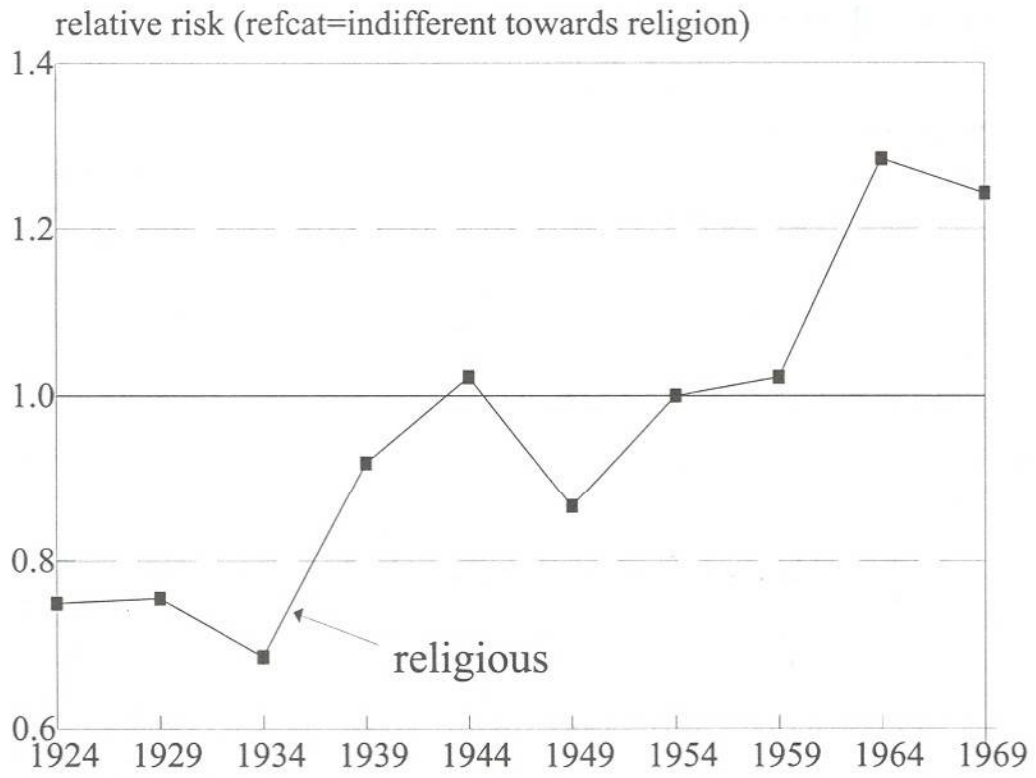

Figure 2. Timing of menarche Estonia, female birth cohorts 1924–1973

To sum up, these two cases have provided examples of situations where essential aspects of the process could be partially or wholly missed in static perspective. In the practice of demographic and social research such situations tend to form rather a rule than an exception.

5. Concluding remarks

During the recent decades demography has witnessed a considerable expansion of multivariate techniques. This development has been closely related to life course approach and event history methods often heralded as a paradigm shift, moving the discipline beyond description to explanation. In reality, however, the applications of the new framework have not outlived these great expectations, paving the way towards 'demography without population' as put so eloquently by David Coleman in his closing address to the FFS Flagship conference (2000).

A plausible reason behind such an outcome has evidently been the preoccupation with technical aspects of modeling and insufficient links with general context of population development. Above all, efficient application of new analytical frameworks requires thorough understanding of the theory of population development, as among others demonstrated also by the Czech school of demography, building on the mentorship of Zdenek Pavlik (1964; 1983; 2000). In other words, when grounded firmly in demographic thinking and geared to the understanding of population development, not on colliding course, event history framework could indeed make its significant contribution as modern tool in the hands of demographers.

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PERSPEKTIVY DEMOGRAFIE A MĚNÍCÍ SE ANALYTICKÁ PARADIGMATA: ZKUŠENOSTI Z ESTONSKÉHO FFS

Résumé

V poslední době se v demografii rozšířilo používání metod vícerozměrné analýzy. Zejména se jedná o rozvoj metod založených na klasických úmrtnostních tabulkách spojených s vícerozměrnou analýzou, které vedly k vypracování metody postupné analýzy demografických událostí a k analýze životních cyklů a sekvencí jednotlivých událostí (event history analysis). Použití těchto metod se však často omezilo na technické otázky a přitom nebyla věnována dostatečná pozornost propojení této analýzy s koncepcemi demografického rozvoje. V příspěvku se poukazuje na dva nedostatky tohoto postupu, jednak na nevyrovnanost a dílčí pohledy na celkové demografické chování, jednak na chybějící chápání heterogenity demografických procesů. Jako ilustrace těchto metodických problémů slouží příklady z estonského šetření rodin a plodnosti (FFS). Modely obsahovaly více než dvacet životních událostí týkajících se formování a rozpadu partnerství, plodnosti, potratovosti, první sexuální aktivity, odchodu z domova rodičů, fází studia, nástupu do zaměstnání a návratu do zaměstnání po narození dítěte. Byl učiněn pokus o ucelenou analýzu populačního vývoje Estonska v průběhu posledních pěti desetiletí v širším ekonomickém a sociálním kontextu s následujícími charakteristikami osob: žijící ve městě nebo na venkově, vyznávající náboženství, podle sociálního původu, zaměstnání a dokončeného vzdělání. Výsledky vyjádřené v podobě standardizovaných relativních rizik ukázaly na významné rozdíly v životní kariéře, tj. v prvním partnerství, prvních sexuálních zkušenostech a rodičovství. Prodloužené školní vzdělání znamená pozdější sexuální zkušenost a odlišnosti v partnerství, rodičovství, opuštění domu rodičů i nástup do zaměstnání. Překvapivě dřívější nástup menarché u vzdělanějších žen může souviset s pozitivní korelací mezi fyzickým a duševním rozvojem. S výjimkou rozpadu partnerství, potratovosti a nástupu menarché, ke kterým docházelo ve venkovském prostředí s nižší intenzitou nebo se vyznačovaly pozdějším nástupem, ke všem ostatním sledovaným událostem jako např. první sexuální zkušenosti, prvnímu partnerství a rození dětí docházelo ve venkovském prostředí dříve a ve vyšší intenzitě.