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Types of Birth Schedules in Cohorts with Completed Fertility in Industrialized Countries

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Introduction

Theories and empirical studies on fertility in the industrialized world focus on the main vector of change, declining average level of fertility and its determinants. Inter-individual variability plays only an instrumental role in this research by being used for identifying factors influencing the final outcome of births. However, the inter-individual diversity is important itself. In respect to number of children they have (quantum), inter-individual diversity among women was found to be increasing across cohorts beginning from cohorts born in the 1930s (Shkolnikov et al 2004). It means that a kind of "specialization" could be emerging among women in a way that different fractions of female population are making more and more different contributions to the overall production of offspring.

The present study analyzes a large set of completed birth histories of women born in the 1950s from 19 industrialized countries. First, we show how chosen countries differ in terms of average level of fertility and the amount of diversity in number of children. We perform then on the mainstream analysis of diversity along the tempo dimension of fertility (birth schedules). Cluster and regression analyses help to reveal some regular and peculiar patterns in the variety of birth schedules.

The study relies on pooled FFS data from 19 industrialized countries, which include basic demographic characteristics and histories of births and some other information about women aged 40 to 44 at the moment of surveys. The data largely reflects fertility experience of the 1980s and the early 1990s. The original country-sets are transformed to comply with the weighted distribution by number of births by means of random sampling. Then all the country-sets are pooled into one data set with about 12 thousand observations. Country-specific fractions of women vary from 287 in the Czech Republic to 1,666 in the USA. For general tabulations and descriptive statistics the full data set is used accounting also for individual's weights. To avoid over- or under-representation of countries in cluster analysis we use data set with relatively equal representation of countries with country fractions varying from 300 to 500 women (400-500 for most of the countries).

Diversity of birth histories

Figure 1 shows birth trajectories of US and Bulgarian women aged 40-44 in the mid-to-late 1990s. Birth trajectories run across years of life from age 15 until age 45. Colors correspond to life with no, one, two, three, four, and 5+ children. Trajectories are sorted in ascending order of ages at first, second, and third births. The left panel is clearly contrasting to the right one. Indeed, US women experience much more variability than their Bulgarian counterparts in respect to both the quantum and the tempo dimensions. American women are much more variable in respect to number of children they have. Many of them remain childless, but many other have three or more children. In Bulgaria greater proportion of women take part in reproduction and their contributions are more equal with majority giving two births. In the USA ages at birth are also much more variable than those in Bulgaria.

Figure 1. Birth trajectories of about two hundred women randomly selected from the US and the Bulgarian birth cohorts of 1954-56.

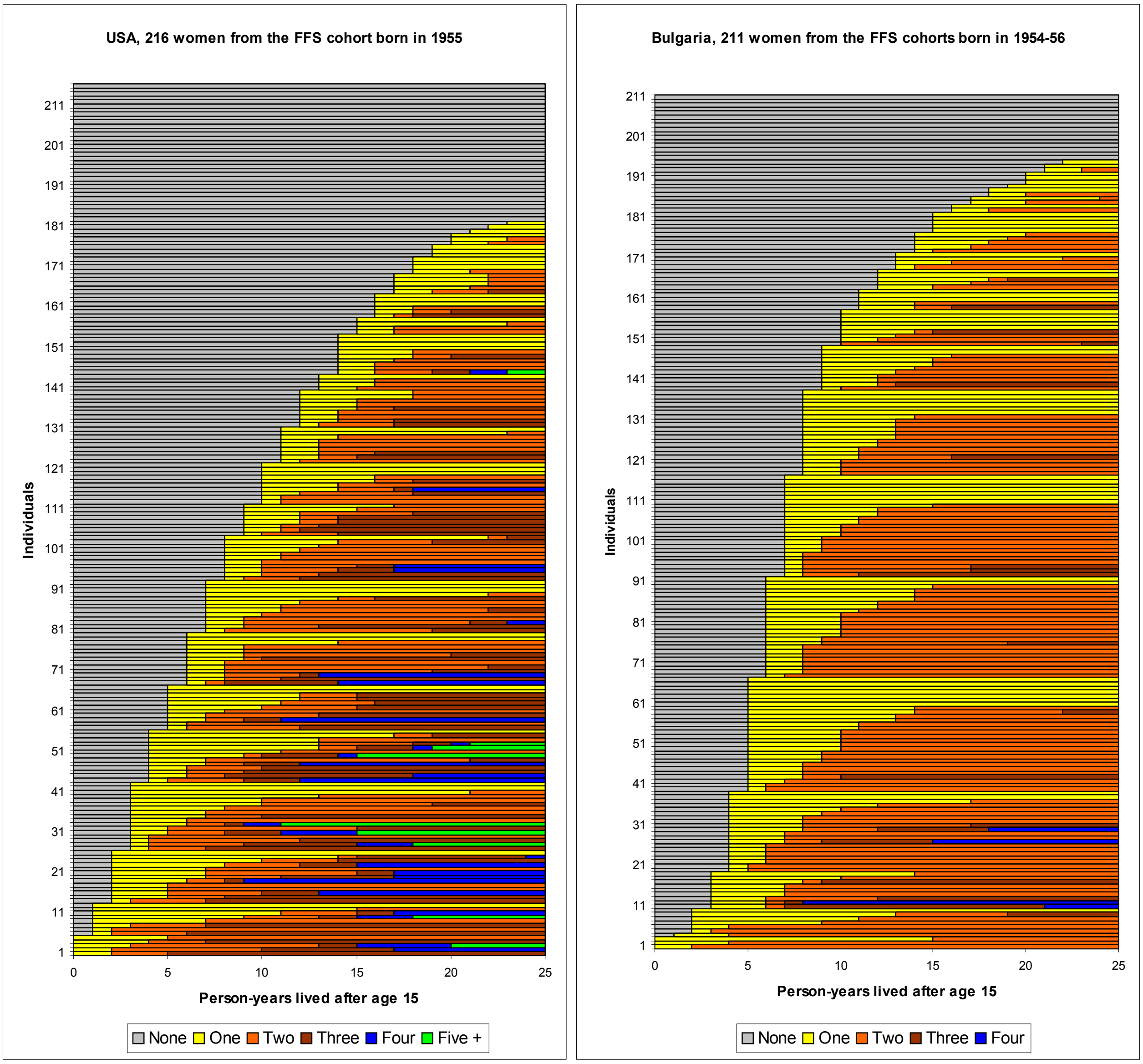


Table 1 presents very some simple characteristics of birth histories of women aged 40-44 at surveys. These are percentages of women according to number of children born, average completed fertility (CF), concentrated ratio (CR) and average inter-individual difference in number of births (AIID) in 19 countries included in most of our further analysis. CF varies from 1.7 in Switzerland and Bulgaria to more than 2 in France, Poland, Norway and New Zealand.

Table 1 also shows high proportions of final parity of 2 children, especially in the countries of the former socialist block (excepted Poland) but also in Italy, Spain, and Portugal. Countries in Table 1 are sorted in descending order of CR (called also Gini coefficient). Its highest values are observed in the USA, Canada, and Switzerland, while the lowest values are characteristics of Eastern European countries and Norway. AIID measures average inter-individual difference in number of children among women and is equal to CR multiplied by CF. The highest AIIDs of about 0.7 children are observed in the USA and Canada while the lowest AIIDs close to 0.4 children are observed in Slovenia and Bulgaria.

Table 1. Distribution of women according to total number of births (%), competed fertility (CF), concentration ratio (CR), and average inter-individual difference (AIID) in births by countries. Calculations made for all women aged 40-44 and based on weighted data.

Country, Year of survey	n	0	1	2	3	4+	CF	CR	AIID
USA, 1995	1666	19.2	17.3	35.3	18.1	10.1	1.88	0.39	0.73
Canada, 1995	546	20.7	16.1	36.6	18.7	7.9	1.78	0.39	0.70
Switzerland, 1994-95	565	22.9	15.4	41.4	14.8	5.7	1.66	0.39	0.65
Finland, 1989-90	777	13.4	21.8	39.8	17.4	7.7	1.90	0.34	0.64
France, 1994	392	8.1	21.0	29.6	27.4	13.9	2.26	0.31	0.70
Lithuania, 1994-95	398	12.2	23.5	48.0	12.2	4.1	1.73	0.31	0.53
New Zealand, 1995	682	11.1	8.5	39.6	25.7	15.2	2.35	0.30	0.69
Poland, 1991	708	6.1	21.1	39.5	19.7	13.6	2.23	0.30	0.65
Sweden, 1992-93	667	11.5	13.5	45.3	22.0	7.6	2.04	0.30	0.60
Portugal, 1997	755	8.1	22.0	45.5	16.3	8.2	2.04	0.29	0.58
Spain, 1994-95	504	10.5	13.5	48.6	19.4	7.9	2.04	0.29	0.58
Italy, 1995-96	411	9.6	20.9	46.4	18.1	5.1	1.90	0.29	0.55
Austria, 1995-96	583	6.7	22.6	41.9	21.2	7.5	2.05	0.28	0.58
Norway, 1988-89	299	6.6	14.4	43.1	25.4	10.4	2.22	0.27	0.60
Estonia, 1994	464	6.0	20.1	48.8	16.4	8.7	2.11	0.27	0.56
Latvia, 1995	547	6.9	27.8	48.1	13.4	3.9	1.81	0.27	0.49
Bulgaria, 1998	379	10.8	23.0	56.5	8.2	1.6	1.67	0.26	0.43
Czech Republic, 1997	287	4.7	14.5	52.8	23.1	4.9	2.09	0.22	0.47
Slovenia, 1994-95	494	2.7	18.3	60.0	14.4	4.6	2.02	0.20	0.41
19 countries, Total	11124	19.2	17.3	35.3	18.1	10.1	1.88	0.39	0.73
19 countries, Unweighted average		10.4	18.7	44.6	18.5	7.8	1.99	0.30	0.60

Countries with the high variability in number of children such as the USA, Canada, Switzerland, and Finland there is a significant contrast between large numbers of women with no children and numerous women with 3+ children, whereas in countries with low variability in number of children (Eastern Europe), childlessness is generally low and a large majority of women have two children.

Further consideration will be devoted to birth schedules. The analysis will include their descriptive characteristics, their classification by cluster analysis, and identification of some of the underlying factors.

Birth intervals

It has been known for some time that succession of births among female population follows a clear pattern, to the point that some authors even speak of an "engine with its own momentum" determined by early motherhood and education (Rodríguez et al. 1984). One of the most robust findings that arise from the literature is the positive correlation between early marriage and childbearing (age at first birth or at first partnership) on accelerating and subsequent childbearing (Bumpass et al 1978; Finnas & Hoem 1980). This means that the length of a given birth interval can be at least partly determined by lengths of previous intervals (Heckman et al 1985). Another important set of results deals with the disturbing effect of divorce on this "engine" of childbearing. Thornton (1978) actually showed that for White US women marriage dissolution had no effect on final number of children because these women had remarried and had lengthened their childbearing period accordingly. Thornton hypotheses that there may exist a norm to have children in each marriage in societies where fertility is low, childbearing is planned and where remarriage is rapid, a hypothesis that was recently confirmed in the Swedish context (Vikat et al 1999). These authors refer to a "new union commitment effect" on childbearing for couples who undertake a new partnership, even with the presence of children from former unions. Many other circumstances can affect childbearing timing patterns. One of these is employment experience (for a short review, see Ram & Rahim 1993), but this will not be addressed in the present work.

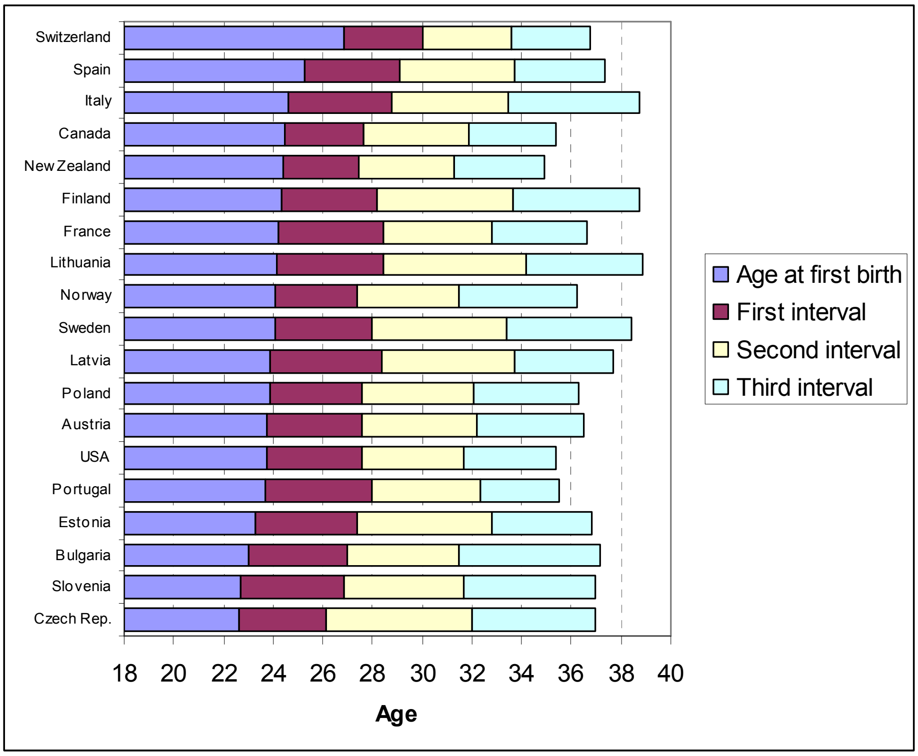
Preliminary analyses (not shown here) on the pooled data revealed the following retrospectively observed and expectable regularities across the birth schedules. First, higher total number of births is associated with earlier beginning of childbearing, and for every birth order, age at birth is younger in women with higher total number of births. Second, average length of inter-birth interval diminishes as the total number of births increases.

Table 2 and Figure 2 portray birth intervals for the 19 countries for women aged 40-44. These data do not show much variation across countries, especially for mean age at first birth (coefficient of variation of only 4%). Variability across countries increases with the rank of interval, but remains low. In total, women aged 40-44 with parities 2 to 4 reach their corresponding final parity by age 36.6 years on average. A striking feature that arises from figure 2 is the lack of relation between age at first birth and age at fourth birth. Actually, the more women advance in their childbearing experience, the less important the relation between age at first birth and number of children is. The examination of this relation for each parity confirms this pattern (see Figure A in annex 1).

Table 2. Age at first birth and length of inter-birth intervals (in years) in 19 countries for women aged 40-44, parities 2-4, with measures of inter-country variation

	Age at first birth	Length of 1st interval	Length of 2nd interval	Length of 3rd interval
Czech Rep.	22.6	3.51	5.84	4.99
Slovenia	22.7	4.17	4.82	5.32
Bulgaria	23.0	3.94	4.50	5.67
Estonia	23.3	4.08	5.40	4.07
Portugal	23.7	4.34	4.35	3.17
USA	23.7	3.80	4.11	3.70
Austria	23.8	3.80	4.67	4.24
Poland	23.9	3.68	4.51	4.23
Latvia	23.9	4.48	5.37	3.96
Sweden	24.1	3.96	5.38	5.02
Norway	24.1	3.33	4.11	4.72
Lithuania	24.1	4.32	5.75	4.70
France	24.2	4.24	4.38	3.83
Finland	24.3	3.83	5.49	5.05
New Zealand	24.4	3.04	3.81	3.66
Canada	24.5	3.15	4.20	3.53
Italy	24.6	4.16	4.67	5.31
Spain	25.2	3.87	4.58	3.63
Switzerland	26.9	3.13	3.62	3.13
19 countries, Total	24.1	3.83	4.57	4.11
19 countries, Unweighted average	24.1	3.83	4.71	4.31
Standard deviation	0.94	0.43	0.65	0.77
Coefficient of variation	0.04	0.11	0.14	0.18

Figure 2. Age at first birth and length of inter-birth intervals (in years) in 19 countries for women aged 40-44, parities 2-4



Figures 3 and 4 display the distribution by duration in years of length of inter-birth intervals and its percentiles for the same 19 countries pooled together and where each country is more equally represented.. Similarity of the distributions for different parities is striking. It seems as if once started fertility goes on according to an internal schedule. After 1st, 2nd or 3rd births next births are very much concentrated within a narrow range of 1 to 3 subsequent years. Figure 4 shows that The median value of the distribution is 3 years for the first and the third interval, and 3.5 for the second interval. 75% of births take place not later than within 5-6 years after the previous delivery. After 8 years between 85% and 90% of births these women occur..

Figure 3. Distributions of inter-birth intervals in 19 countries by number of years since previous birth, for women aged 40-44 for the first three intervals.

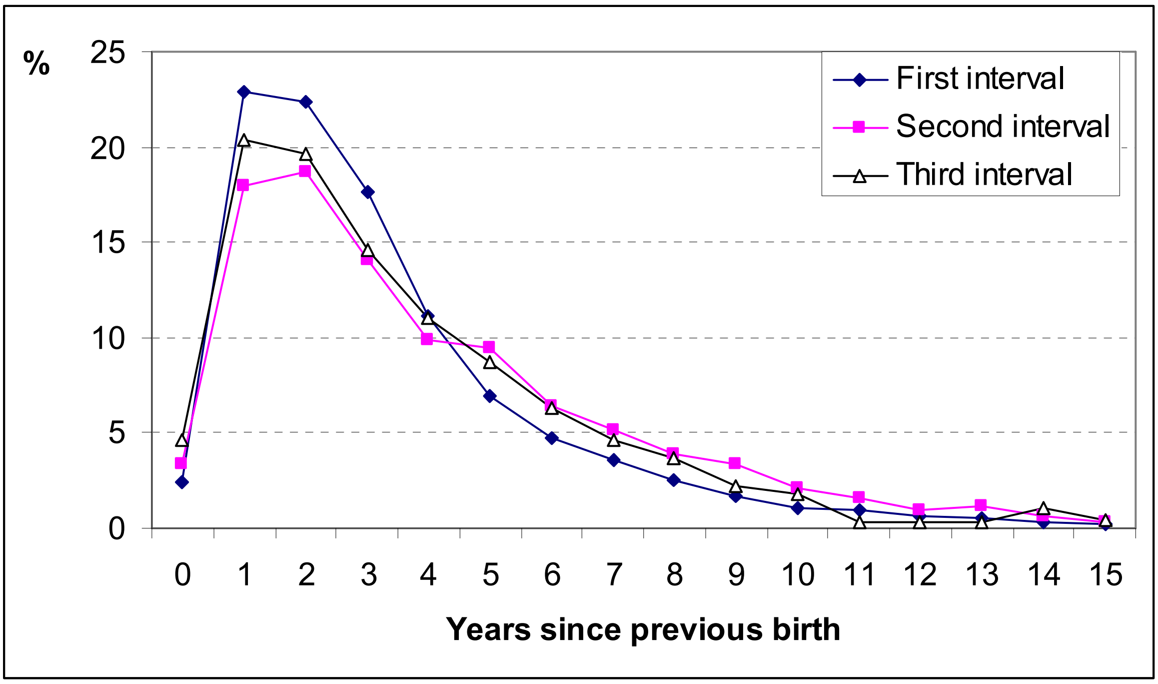
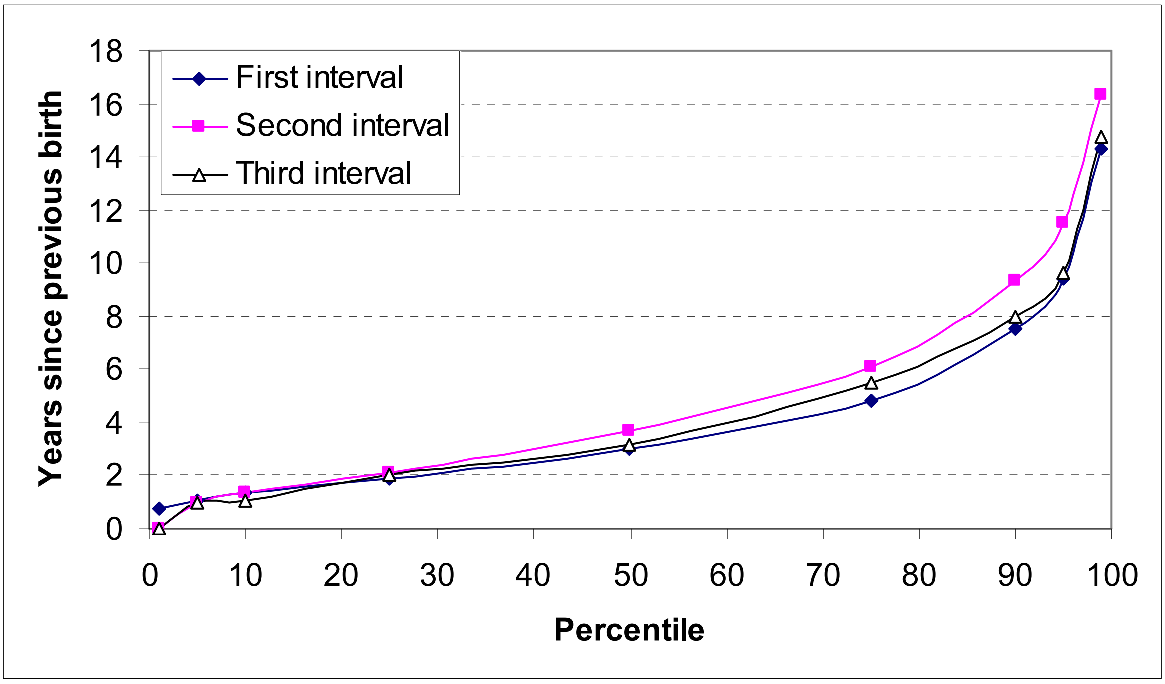


Figure 4. Selected percentiles of inter-birth interval distributions in 19 countries for women aged 40-44, for the first three intervals.



Types of birth schedules

These results point definitely to stability in inter-birth intervals across countries, but also across women, majority of whom tend to have their next child within a few years after the previous one. There exists, however, some variability across women, as some of them have a next child after a much longer waiting time period. Our question is whether this later pattern may equally affect all women irrespectively of their fertility pattern reflected by age at first birth or length of previous interval(s), social (education level) or context (country of residence) characteristics, or whether it correlates with some of these characteristics.

Our first intention is to identify among women major types of birth schedules of completed fertility.

K-means cluster analysis of birth schedules allows identifying their types. The calculations are made on the pooled data with equal representation of countries. Very peculiar algorithms have been used for measuring distances between birth schedules. For each birth order, distances between sequences of ages at birth can be classified by a simple cluster analysis based on the Euclidian distance. Women with each number of birth (from 2 to 4) are thus clustered according to their timing or schedule (expressed by their age) of fertility. Number of clusters for each total number of births was chosen (optimized) according to statistical procedures (see annex 2 for more details). The final number of clusters is five for schedules with 2 and 3 births and four for schedules with 4 births.

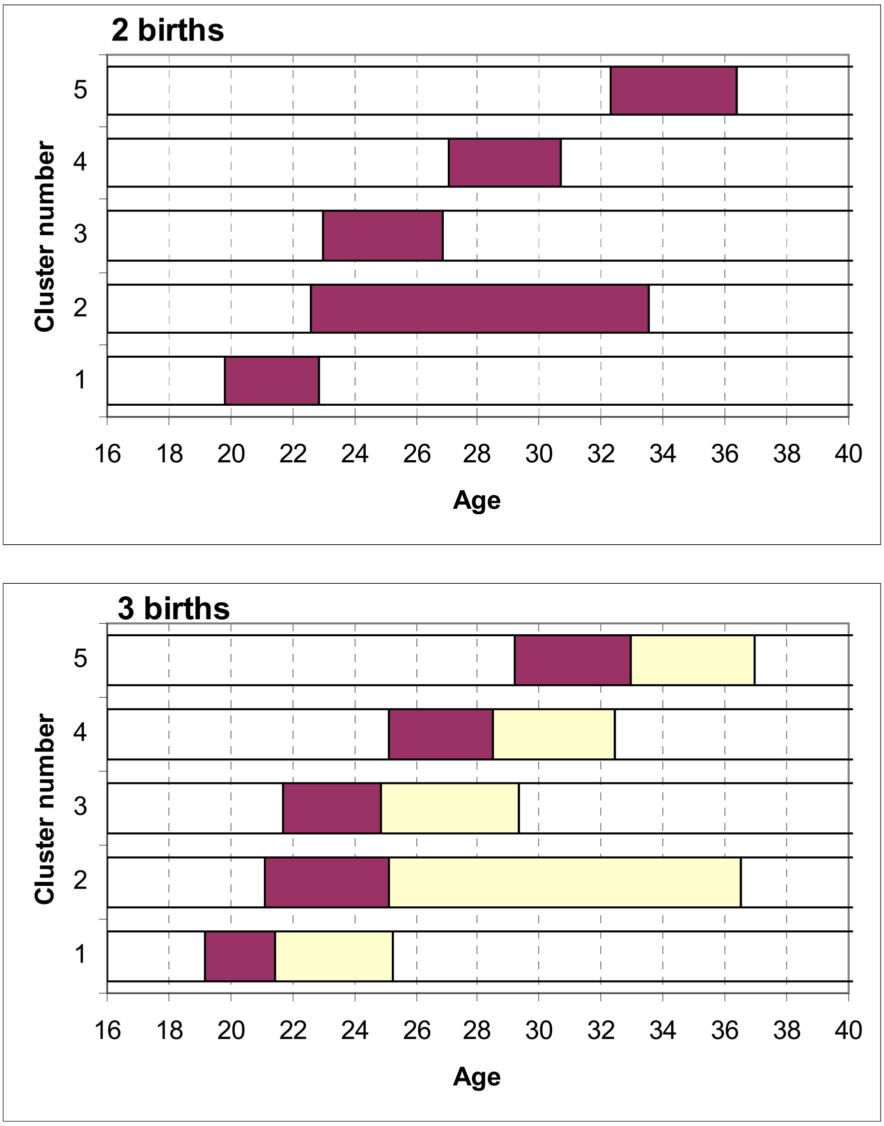
The results of K-means clustering appear in figure 5. Table 3 gives some statistics of each cluster. Clusters are ordered by age at first birth, so that cluster 1 has the lowest age at first birth. For each cluster appearing in figure 5, we show the age at first birth (origin of red bar) and then age at successive birth (or birth intervals as the lengths of colored bars). For example, for women with 2 births from cluster 1 age at first birth is 19.8 years and age at second birth is 22.9; first inter-birth interval is thus 3.1 years.

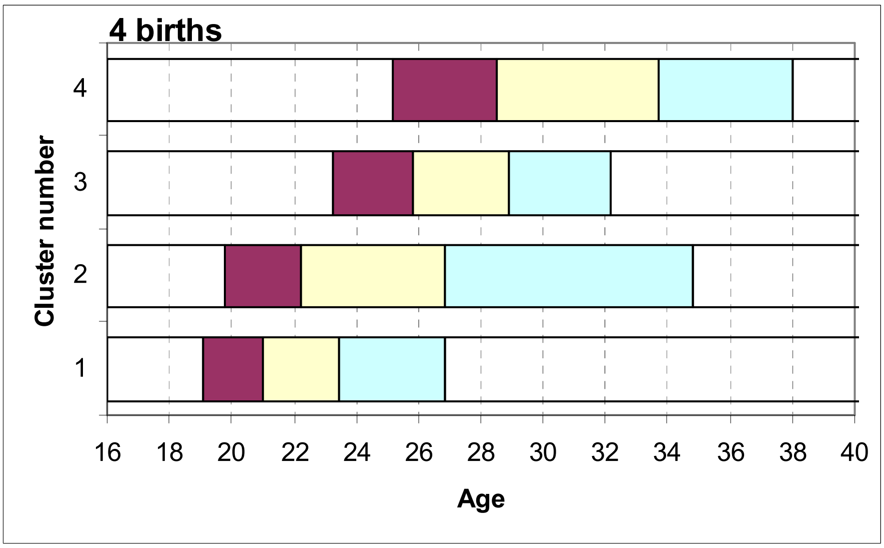
In general, these results reveal a prominent role of age at first birth. At every level of total completed fertility, clusters differ from each other due to the age at first birth with variation in birth intervals playing a smaller part. The range of variation in the age at first birth is impressive especially taking into account that clusters always represent substantial numbers of women (no less than 9%). Indeed, mean age at first birth differs from 19.8 (cluster 1) to 32.3 (cluster 5) among women with two children and from 19.2 years (cluster 1) to 29.2 years (cluster 5) among women with three children. Number 5 Clusters constitute 10-13% of all women with two and three children respectively.

Among women with each number of births, one cluster clearly differs from the others. This "special" cluster has index 2, which means that it always has the second lowest age at first birth in any of the 3 total numbers of births. This cluster is peculiar due to its very long last birth interval when compared with the other clusters within the same total number of births. For women with 2 births, the only birth interval of cluster 2 is almost 11-year long, while it is 4 or less years in the other clusters. For women with 3 births, the second interval of cluster 2 is more than 11 years compared to around 4 years for the rest of clusters. A similar pattern is found for 4 births but with a smaller difference in last interval between cluster 2 and the 3 other clusters.

This special cluster is not small. It represents the less numerous cluster only in the case of 2 births with 9.3% of all women with 2 births in it (Table 3). In the case of 3 births, cluster 2 represents 14% of women, while it includes 20% of women with 4 births.

Figure 5. Patterns of birth schedules by number of births. Results of K-Means cluster analysis





Another point to mention is the low age at first birth of women in cluster 2. In the case of women with 2 and 3 births, age of first birth for cluster 2 is about the same as for the next cluster, cluster 3, that is, 23 and 21 years for women with 2 and 3 births, respectively. For women with 4 births, age at first birth in cluster 2 is similar to the first cluster and is equal to 19 years. Interestingly, women in cluster 2 begin early their childbearing activities but they also finish it quite late. Actually, they finish almost as late as the late beginners from the last clusters, which is especially striking in the case of women who had 3 births (Table 3). The result is that women in the special cluster have a long childbearing span that lasts about 15 years for those with 3 and 4 births, while women in the other clusters concentrates their reproductive life within less than 10 years. This difference is even deeper in the case of women with 2 births: 11 years for women in cluster 2, but less than 4 years in other clusters.

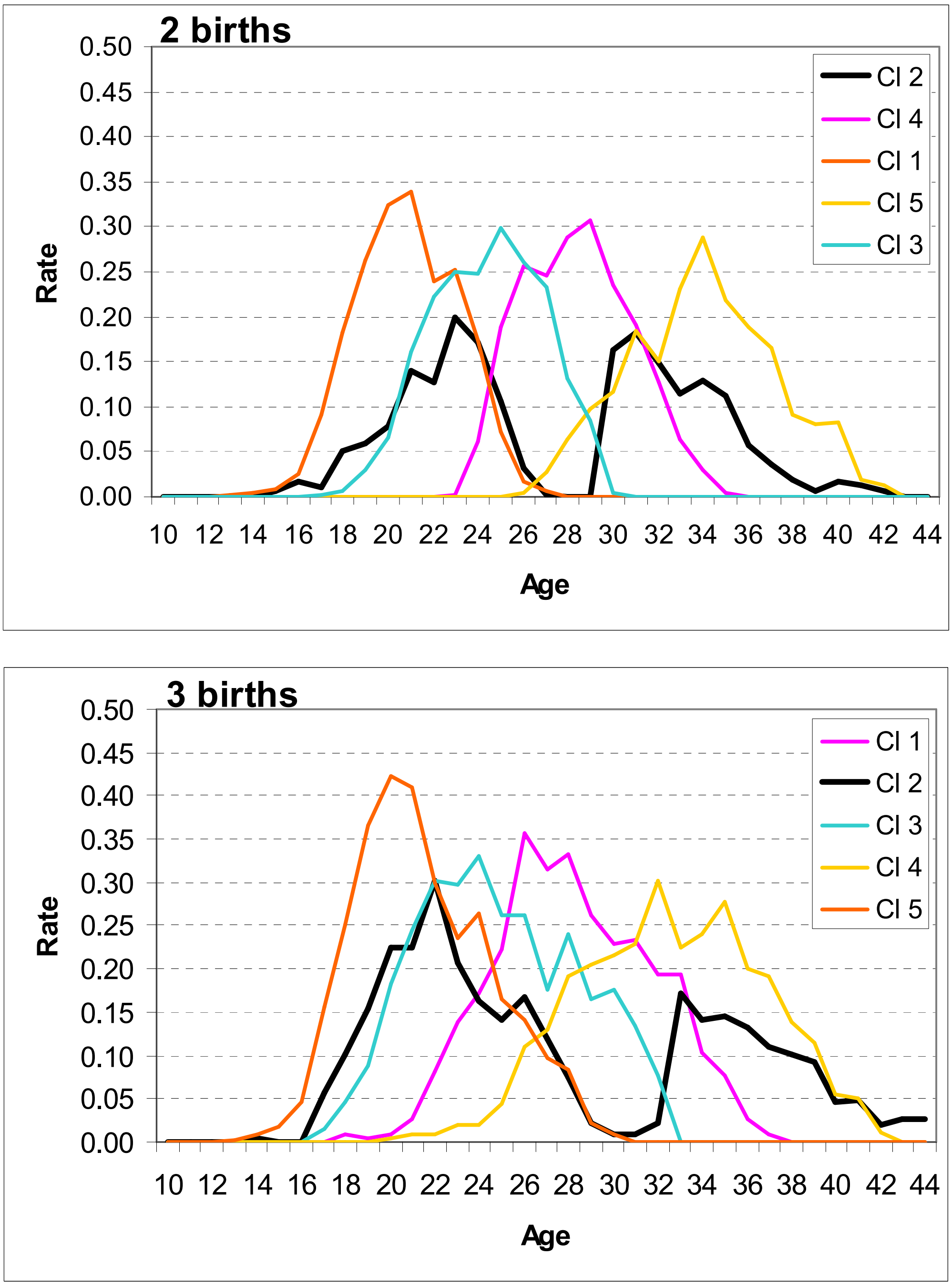
One can also characterize the clusters by looking at age-specific fertility rates for each group of women, according to their final number of births and the cluster number. This is done in Figure 6. We use the same numbering of clusters as in Figure 5 and Table 3. Cluster 2 is specially identified by the fertility curve in black. For every total number of births, cluster 2 translates in Figure 6 into very peculiar bimodal fertility curve. It looks as a split of the curve into two parts, as if childbearing had started over and the women had gone through a second fertility career. For women with 2 births, the cluster 2 fertility curve is divided exactly into two sub-curves with a breaking point at age 28 representing exactly one child each (age 14-28, 28-44); for women with 3 births, the cluster 2 curve is split at age 30 and gives two children in the first sub-curve (age 14-30) and one in the second sub-curve (age 30-44). For women with 3 births, the split is less pronounced and does not correspond to an exact numbers of children.

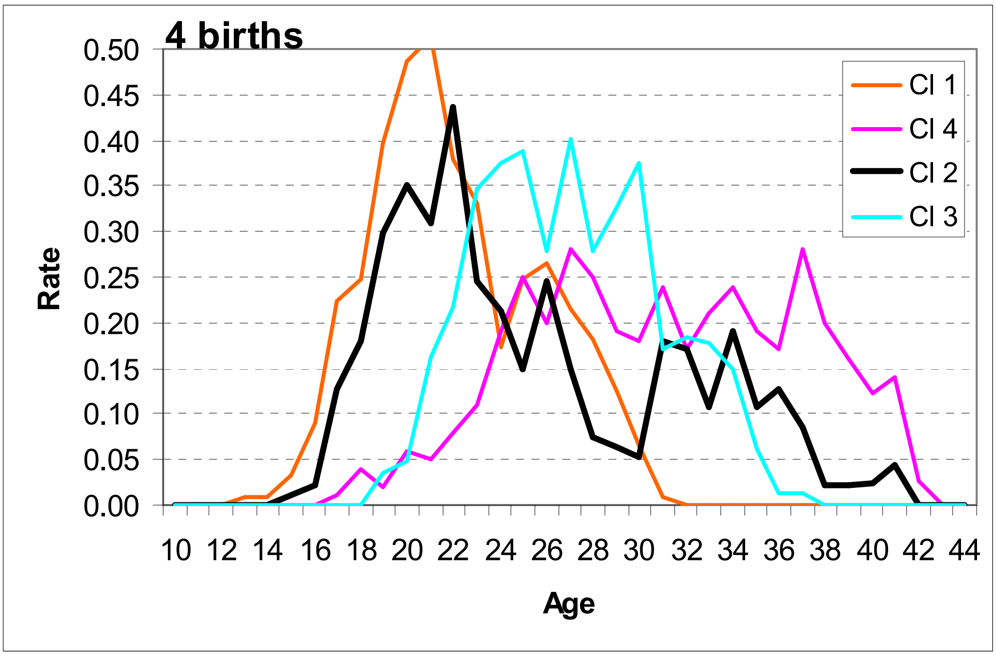
As Figure 5 suggests beginning of a renewed fertility career, which could not be expected from the previous birth schedule, one can try to estimate a number of children contributed to the overall outcome of offspring by the phenomenon. The number can be estimated as a difference between the actual number of children produced by female cohort minus number of children which would have been observed in absence of the second fertility career in the special cluster (approach 1) or if women from cluster 2 would have been redistributed among other clusters (approach 2). Both calculations return about the same proportion of additional births equal to 5.7%.

Table 3. Some statistics of clusters

Number of births, cluster number	Number of women (n)	n (%)	Age at first birth	Age at last birth	Mean inter-birth interval	Its standard deviation
Women with 2 births						
1	871	22.7	19.8	22.9	3.1	
2	356	9.3	22.6	33.5	10.9	
3	1343	35.0	23.0	26.9	3.9	
4	846	22.1	27.0	30.7	3.6	
5	420	10.9	32.3	36.4	4.1	
Total	3836	100.0	24.1	28.5	4.3	
Women with 3 births						
1	347	21.5	19.2	25.2	3.0	1.1
2	226	14.0	21.1	36.5	7.7	5.2
3	470	29.1	21.7	29.4	3.8	0.9
4	365	22.6	25.1	32.5	3.7	0.4
5	209	12.9	29.2	37.0	3.9	0.2
Total	1617	100.0	22.8	31.1	4.2	1.3
Women with 4 births						
1	121	26.2	19.1	26.8	2.6	0.8
2	94	20.3	19.8	34.8	5.0	2.8
3	147	31.8	23.2	32.2	3.0	0.3
4	100	21.6	25.2	38.0	4.3	0.9
Total	462	100.0	23.2	32.2	3.0	0.3

Figure 6. Age-specific fertility rates by number of births and cluster





What stands behind clusters

Previous section showed two forces of grouping women's birth schedules into clusters. There is a mainstream dependence of clustering on the age at first birth and also a special cluster with a very long interval preceding the last birth.

We can think of at least three hypothesis that could help explaining this last long birth interval. The first one is the remarriage hypothesis as proposed by Thornton (1978). The basic argument is that in certain contexts (low and planned fertility, rapid remarriage after dissolution) there exists a norm or a desire that each marriage should bring its own child. Having a child is a sign of a commitment to the new union (Vikat et al. 1999). A second hypothesis relates long birth intervals to the fact that women who work try to minimize interruptions of their career. However, this view is contested by the exact opposite contention, that working women rather compress their fertility in order to minimize the time they have to spend outside the labor market (Ram & Rahim 1993). A third hypothesis is simply to consider that long birth intervals are consequences of contraception failures. But one can wonder how such a high proportion of failures (11% of our women with parities 2-4 are in clusters 2) could take place in high fertility control settings where, for the most part, contraception is widespread whether in the forms of modern contraception as in the West or in the form of induced abortion as in the former socialist states. However, such a contraception failure is not incompatible with the remarriage effect since remarriage increases sexual intercourse. In this hypothesis, both effects would be mixed and very difficult to disentangle without the appropriate data. In the following paragraphs we present the results of multinomial logistic regression that relates being in any one of the five clusters (for women with two and three births separately) to education, number of marriages ever contracted and region of residence.

The dependent variable is the probability of being in one of the five clusters. Cluster 1 characterized by the youngest age at first birth is taken as the reference cluster. The first covariate is educational attainment at the moment of the survey. We have defined only two values of educational level due to the problems we faced when trying to set up a common categorization for all countries. (We actually had to drop two countries with very outstanding educational structures of women, Sweden and Lithuania). These two values of educational level are low and high education. Low education is defined by any kind of education below post-secondary. High education is defined as any post-secondary education, including university.

The number of marriages is given by the question 202 in the international version of the FFS questionnaire. Question 207 asks for the number of partnerships, but unfortunately not all countries included it in their surveys. The complete partnership histories would have been the ideal source on marriage and partnership, but they were not used for the non-comparability (or their absence) in some countries. This is the case of Portugal, Bulgaria and Poland (Festy & Prioux 2001). The 5 regions used are groupings of countries based on geographical or cultural proximity (Table 4).

Table 4. Regions used in multinomial logistic regression

Region	Country	Region	Country
West	Austria France Switzerland	East	Bulgaria Czech Rep. Poland Slovenia
South	Italy Spain Portugal	Baltic	Estonia Latvia *Lithuania*
Nordic	Finland Norway *Sweden*	Overseas	Canada USA New Zealand

Multivariate results are presented in Table 5 and 6. Its upper panel refers to women with 2 births and the lower panel to women with 3 births. Table 6 displays results for women with 4 births.
One of the points to note is the effect of having a high level of education. Our results clearly show a strong correlation between increased age at first birth and higher education, which has been considered in great detail elsewhere (Blossfeld and Huinink 1991).The older the age at first

birth (that is, the higher the cluster number), the higher the relative risk of those having high education of being in higher clusters (in particular in the last two clusters).

Education does not affect the propensity of being in cluster 2 in a specific manner. For women with 2 births, the effect of high education is greater than for cluster 3, but this is not the case for women with 3 and 4 births for whom the effect of having high education increase uninterruptedly with cluster number.

The fact of having been in two or more marriages increases the risk of being in cluster 2 in the case of women with 2 births. A similar pattern is found for 3 and 4 births, though the coefficients are not statistically significant. These results would partially support the remarriage hypothesis. Region of residence offers the less easy results to interpret. Here parity plays a stronger role. For women with 2 births, we first can see three types of regions in terms of cluster distribution. In the Southern region formed by Italy, Spain and Portugal that stands alone, the risk of being in cluster 2 are increased in comparison with the rest of clusters, all of which have equal relative risk ratio values of about 1. The rest of counties (except Western countries that represent the reference category) exhibit a very pronounced effect of age at first birth on the propensity of being in one of the five clusters. In the case of Nordic, East and Baltic regions, we clearly see that the higher the cluster number, the lower the propensity of being in the cluster (all relative risk ratios have values below 1). The pattern for the overseas region is different and the relation takes the form of a U-shape: the risks of being in cluster are higher at both extremes, with very low risks for cluster 2.

For women with 3 births, two specific situations can be distinguished. On the one hand, the risks of being in cluster 2 are very high for the Baltic region and low in the overseas region. On the other hand, there is a general tendency of a decreasing propensity of being in cluster 4 and 5 in all regions but the South. Even though most coefficients for women with 4 births in Table 6 are not statistically significant, one can note that the situation is about the opposite of women with 2 and 3 births: the risks of being in clusters increase with age at first birth, or at least do not diminish, which is consistent with the fact found in Table 1 and Figure 3 (and Figure A in annex 1) that age at first birth loses its relation with final fertility outcome for women with high parities.

Table 5. Results of multinomial logistic regression for 2 and 3 births

Women with 2 births											
			Cluster number								
Covariate	Value	1	2		3		4		5		
Education	High education (ref: low education)	1	4.63	***	3.92	***	9.20	***	12.61	***	
Number of marriages	2+ marriages (ref: no or 1 marr.)	1	2.23	***	0.50	***	0.68	*	0.83		
Region	South	1	1.65	**	0.89		1.01		0.94		
	Nordic	1	0.62	*	0.70	*	0.60	**	0.42	***	
	East	1	0.44	***	0.52	***	0.23	***	0.13	***	
	Baltic	1	0.99		0.71	*	0.47	***	0.25	***	
	Overseas (ref: West)	1	0.39	***	0.51	***	0.61	***	0.68	*	
Women with 3 births											
			Cluster number								
Covariate	Value	1	2		3		4		5		
Education	High education (ref: low education)	1	2.06	*	2.24	**	8.40	***	7.13	***	
Number of marriages	2+ marriages (ref: no or 1 marr.)	1	1.45		0.70		0.61	*	0.78		
Region	South	1	1.69		1.43		1.76	**	1.15		
	Nordic	1	0.93		0.74		0.83		0.44	**	
	East	1	1.58		0.81		0.70		0.29	***	
	Baltic	1	3.68	**	1.39		1.90	*	0.66		
	Overseas (ref: West)	1	0.58	*	0.67	*	0.70		0.72		

Significance: *** 1%, ** 5%, * 10%

Table 6. Results of multinomial logistic regression for women with 4 births

		Cluster number					
Covariate	Value	1	2	3		4	
Education	High education (ref: low education)	1	1.81	2.97	**	6.77	***
Number of marriages	2+ marriages (ref: no or 1 marr.)	1	1.46	0.63		0.93	
Region	South	1	1.19	1.80		3.40	**
	Nordic	1	1.11	0.64		1.98	
	East	1	1.85	0.72		1.34	
	Baltic	1	1.76	1.03		2.07	
	Overseas (ref: West)	1	0.48	0.60		1.54	

Significance: *** 1%, ** 5%, * 10%

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Summary of findings and discussion

Analysis of variability is interested in questioning how different are women and families from each other according to fertility or family processes and also in decomposing and explaining of this diversity. We already know that during that female cohort are becoming more diverse iin respect to numbers of children women have (Shkolnikov et al., 2004). In the beginning of the paper we show also that regions and countries are characterized by different degrees of variability in respect to number of children. In addition to the quantum dimension, one can be interested in analyzing the tempo dimension. This study was focused on inter-individual variability in timing of births.

We analyzed diversiyty of individual birth schedules in 19 countries that participated in the 1990s in the FFS project. Methodologically this paper has some relation with some other studies analyzing individual life trajectories such as study of job careers by Solis and Billari (2002). The fact that birth histories are chains of repeatable and uniform events allows applying simple cluster analysis for their classification. In general, our work shows the relevance of examining complete birth schedules as sequences of events showing their chains from the very beginning to the end. For example, it is well known that a young age at first birth increases the transition to second birth. It appears, however, that the more women progress in their childbearing experience (at least up to the fourth birth) the less this relation holds. The relation is not invalidated, but rather it must be put in the adequate context.

We also showed that birth schedules function as an engine of reproduction, in the sense used by Rodríguez et al (1984): once the childbearing process has begun, it follows a relative stable path characterized by quite stable birth intervals in respect to both age at first birth and total number of children born. Individual-level distributions of women by length of birth intervals are almost the same for different total numbers of children. For each final parity, women mostly differ in their age at first birth, and less in the length of their birth intervals. A formal cluster analysis procedure also groups women depending on their ages at first birth. As one could expect, probability of being in clusters with higher numbers are strongly related to having higher level of education. Risks of being in these clusters are also somewhat lower in Eastern European countries.

We found one exception to this general regularity: birth intervals are not always that stable. Some women have a late child after 8 or more years following the previous one. This pattern is not really new, and Thornton (1978) proposed the hypothesis that this was an effect of remarriage. He suggests that in some specific social contexts characterized by a low and planned fertility and a rapid remarriage for those who dissolved their union, each new marriage has to have its own child. Our results also point into this direction. First, age-specific fertility curves illustrate well how women with these specific long birth intervals actually have two distinct fertility curves, especially for women with parities 2 and 3. In both cases, the last child entirely forms the second fertility curve, while the first child for women with parity 2 and the first tow children for women with parity 3 form the first fertility curve. The shapes of curves suggest an entrance into a new fertility career, which is characteristic solely to cluster 2. We estimated that the phenomenon increases the total number of children by about 6%.

Second, results of multinomial logistic regression on the probability on being in one or another cluster, for each parity, show that being in cluster 2, which corresponds to the groups of women that exhibit a very long last birth interval, is associated with remarriage. This result is clear for women with 2 births, although for parities 3 and 4 coefficients are not statistically significant.

Probability of being in cluster 2 tends to be somewhat higher in Baltic and Southern European countries, which could be an indication of some influence of contraceptive failures (Philipov et al., 2004). These effects, however are not statistically significant for all birth orders and could be also attributed to a bias due to variation in unobservable here of non-registered cohabitation across regions.

Further research should deepen the study of remarriage and its effects on childbearing. This is not a trivial point since union dissolution by separation and divorce is high and still increasing in many countries. Not only remarriage should be examined, but also non-marital unions that are widespread in some countries and that are also increasing in many countries. More detailed data and more research are also needed for understanding of connections between job careers and changing life conditions and birth schedules.

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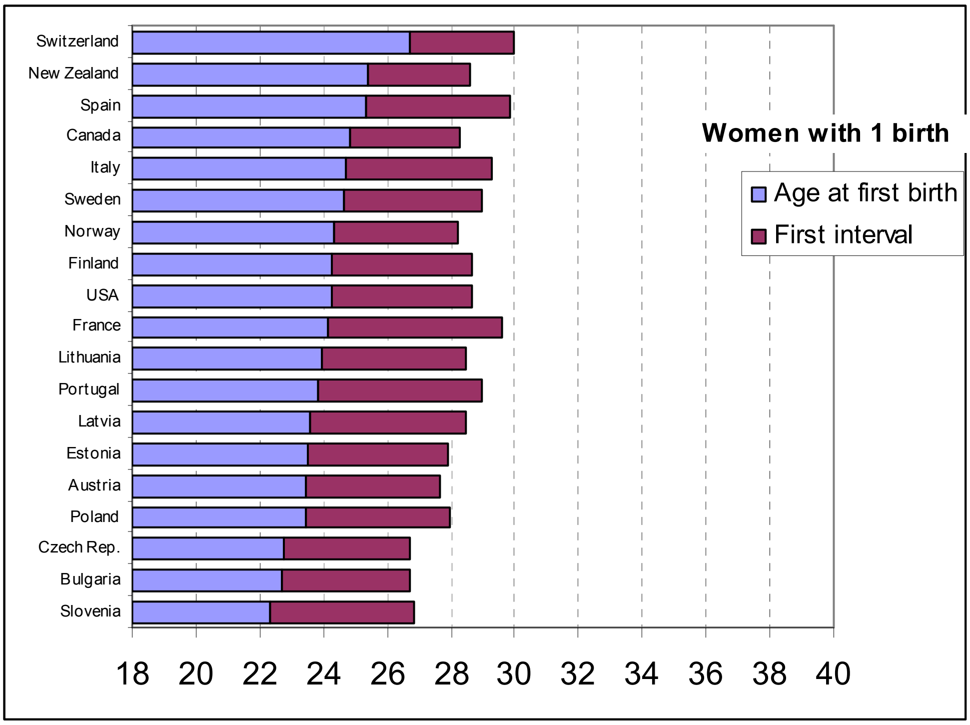
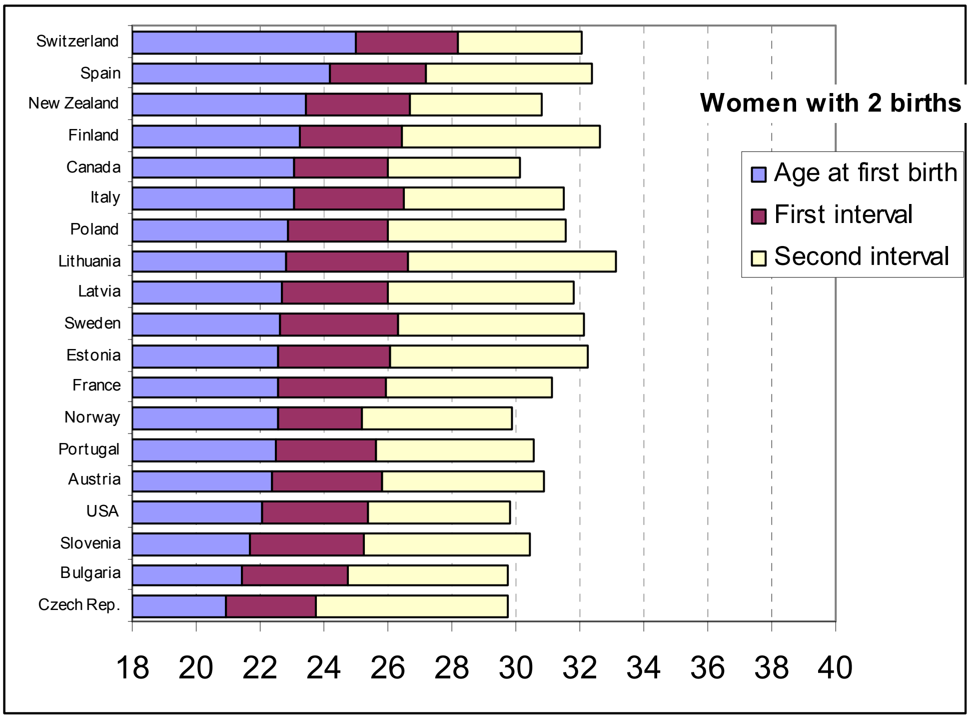
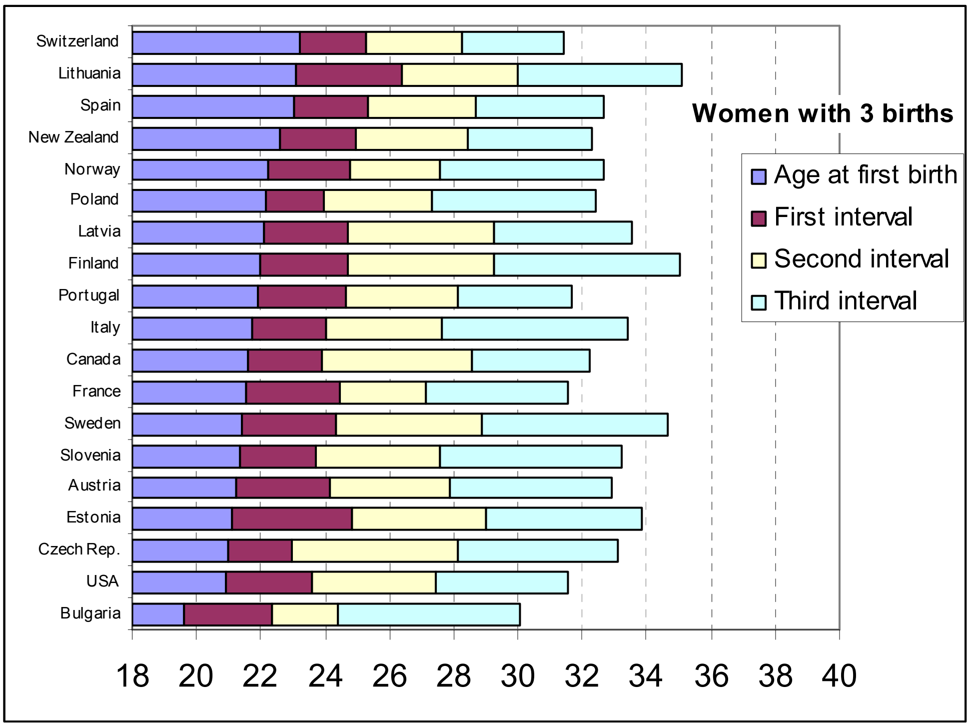
Annex 1. More on age at first birth and inter-birth intervals.

Figure A. Age at first birth and length of inter-birth intervals (in years) in FFS countries for women with completed fertility (40-44), for each parities 2, 3 and 4







Annex 2. Application of K-means cluster analysis.