Early fatherhood: a comparative analysis between EU and the USA

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Acknowledgement: We would like to express our thanks to the UNECE Population Unit for providing us with the data of Fertility and Family Surveys

Abstract

The main objective of this work is to provide information about early male fertility for several European countries, Canada and the USA. The relationship between family characteristics and early-age parenthood is studied, while regression analysis models are used in order to reveal the associations between family characteristics and early male fertility. Trends in early age fertility of males for various populations are examined providing a cross-country comparative analysis. Furthermore differences between the two sexes are studied for each of the above populations. Appropriate parametric models are also used for the estimation of age-specific fertility distributions.

1. Introduction

The study of early childbearing attracts the interest not only of demographers but also of policy makers. The main reason is that fertility occurring early enough in the life course systematically leads to negative outcomes for parents and children. Teen parents are more likely to be married than older parents (Ventura and Bachrach, 2000). Children born to teenage mothers are more likely than those with mothers who where older at the time of birth to grow up in poverty, drop out of high school and become teen parents themselves, marry early and dissolve their marriages (Haveman and al., 2001; Hernandez, 1993; McLanahan and Sanderfur, 1994).

In the literature female fertility is widely studied while little research concerns male fertility (Goldscheider and Kaufman, 1996). However recent socio-demographic changes, such as high divorce and cohabitation rates, increased participation of women in the labour force and the shift from family to individual wage rates, which affect gender division of labour and place more responsibility on men for children rearing, make necessary the study of male fertility.

The lack of studies about male fertility is justified by several biological, methodological and sociological reasons, mainly related to the lack of such data and the quality of existing data sets, the vague and ambiguous age interval of childbearing for men (Shryock and Siegeletal, 1976, Keyfitz, 1977) as well as to reasons related to the different gender's role (Greene and Biddlecom, 2000) and the role of opportunity costs in decision about childbearing (Lundberg and Plotnick, 1995).

Recently, Hynes et al. (2008) provide an extensive analysis of early male fertility trends in the USA using data from multiple surveys. Also, Peristera and Kostaki (2010) examine trends in the evolution of male fertility differentiated by order of birth and race/ethnicity of the respondents, based on the NSFG database.

In this work we study the evolution of early male fertility using mostly data from the Fertility and Family Survey (FFS). A cross-country analysis is provided for several European countries as well as for the USA and Canada. Parametric graduation models are used to estimate the distributions of first births by age of the above populations in order to identify heterogeneity in their fertility behaviour. The same analysis is provided for females in order to study sex differences in early age fertility for each country. In addition we extend our analysis, using regression analysis techniques for investigating the relationship between early male fertility and socio-demographic factors related to the family background as well as the educational level of men. Furthermore , using cluster analysis we classify the various populations in homogeneous groups as regards to fertility at the various age groups.

In Section 2 we provide information about the data used. In Section 3 methodological issues are developed, while in Section 4 an analysis of the main findings is provided. Finally in Section 5 some major conclusions are drawn.

2. The data

In the literature a huge discussion takes place about the quality of male fertility data. It is often stated that male fertility data are less reliable than the female fertility data and this is due to under-reporting of fathering in the national datasets (Rendall et al, 1999; Cherlin and Griffith, 1998). Various studies have found serious problems when analyzing male fertility behaviour stemming from the various methodological difficulties mentioned above (Bledsoe et al., 2000; Coleman, 2000; Rendall et al., 1999; Cherlin and Griffith, 1998). Most of the studies about male fertility stress than men underreport their fertility, even if they are interviewed directly (Goldscheider, and Kaufman, 1996; Rendall et al., 1999; Toulemon, 2001). However, other studies conclude that it is possible to obtain correct fertility data from men (Duberstein Lindberg et al., 1998b; Mott and Gryn, 2002; Alich, 2007).

This work relies mostly on data from the Fertility and Family Survey (FFS) as well as on the National Survey of Family Growth (NSFG). The FFS project was conducted in the 1990s in selected member states of the United Nations Economic Commission for Europe (UNECE). The FFS contains complete fertility, educational and employment histories of adult men and women, belonging to different birth cohorts per country. From 1992 a standard FFS questionnaire has been available allowing comparative research on fertility and family issues. In Table 1, information regarding the survey is provided such as years for which the survey has been conducted births cohorts, samples. In the case of the USA, the FFS contains information only for females. So alternative sources of information regarding are used in the case of the US male fertility.

On of the advantages of the FFS survey is that it contains information for both male and female fertility given that two versions of the FFS model questionnaire have been developed: one for men and one for women. The two questionnaires differ mostly with respect to questions on abortion and contraception. Furthermore its has a comparable and retrospective design, providing internationally comparable information on family and fertility histories, education, employment and partner characteristics. However data sets are not 100% comparable since not all countries closely followed the guidelines for the standard record file.

The primary disadvantage of the FFS is that, it is more than 10 years old, and it does not allow capturing the most recent trends/changes in family and fertility behaviour. However, the FFS remains a good source for comparing male and female fertility across different countries, mostly at European level. Furthermore since it encompasses a period of significant educational advancement for women, it can provide important clues on the influence on women's choices regarding early age fertility compared to men. In addition as already documented in the literature, in the end of the 90s several female populations in Europe and the USA have shown big heterogeneity in their fertility behaviour resulting in a distorted fertility distribution (Chandola et al,, 1999; Peristera and Kostaki, 2007). This heterogeneity may be related to several socio-economic and demographic factors and the FFS enables the comparative analysis between males and females.

As stated in the literature male data from the NSFG database are considered less problematic than other sources due to improved practices for collecting male fertility data. In order to assess the quality of male fertility data, the age-specific fertility rates were compared to estimates on men's fertility from vital statistics. In the case of the NSFG database, it was found that the estimated rates fall within the confidence intervals surrounding the observed age-specific fertility rates of the NSFG database. The only exception was for younger ages of

the previous NSFG database where underreporting births were found (Rendall et al, 2006; Peters et al, 2006).

The main variable of this study is based on the respondent's age at first birth. It is crucial for our analyses to define early age fertility. In the literature there is a relevant discussion regarding the proper way for defining early age fertility. This discussion concerns whether the definition of early age fertility differs between men and women (Hogan and Astone, 1986) as well as the age range of early fertility (Nock, 1998; George, 1993; Hynes et al., 2008). According to the literature, a developmental approach would identify early fertility as occurring early enough in the life course to systematically lead to negative outcome for parents and children. Given that there is not adequate research on male fertility and its impact for men, there is not a guide for the age at which men are likely to be prepared for parenthood. Based on the research work of previous researchers (Hynes et. al., 2008; Rindfuss et al., 1998; George, 1993) we also adopt a life course approach by examining fatherhood from age 15 to 24, which enables us to understand the dynamics of early age fertility.

Table 1: Information on the FFS survey

Country	Period of survey	Age/Cohorts Surveyed	Sample Men	Sample Women
AUSTRIA	1995/ 1996	Men and Women – 20-54 years	1,539	4,581
BELGIUM	1991/1992	Men and Women – born 1951-70	2,198	3,236
BULGARIA	1997	Women – 18-45 years	-	2,367
CANADA J	1990	Men and Women – 15 years and over	4,083	4,482
CZECH REPUBLIC	1997	Women – 15-44 years	721	1,735
ESTONIA Women/Men	1994/ 1998	Women – born 1924-73 Men – born 1924-73	2,511	5,021
FINLAND Women/ Men:	1989 / 1990	Men – born 1943-47, 1953-57, 1963-67 /Women – born 1938-67	2,040	5,105
FRANCE	1994	Men and Women – born 1944-73	1,941	2,944
GERMANY	1992	Men and Women – 20-39 years	3,998	5,976
GREECE	1999	Men and Women – 18-50 years	1,017	3,031
HUNGARY	1992 /1993	Men – born 1947-71 Women – born 1950-73	1,919	3,554
ITALY	1995 / 1996	Men and Women – born 1946-75	1,206	4,824
LATVIA	1995	Men and Women – born 1945 - 1977	1,501	2,699
LITHUANIA	1994 / 1995	Men and Women – 18-49 years	2,000	3,000
NORWAY	1988 / 1989	Men – born 1945, 1960 Women – born 1945, 1950, 1955, 1960, 1965, 1968	1,543	4,019
POLAND	1991	Men and Women – 20-49 years	3,783	3,902
PORTUGAL	1997	Men – 15-54 years Women – 15-49 years	2,957	5,954
SLOVENIA	1994 /1995	Men and Women – 15-44 years	1,761	2,798
SPAIN	1995/1994-1995	Men and Women – 18-49 years	1,991	4,021
USA	1995	Women – 15-44 years	-	10,847

3. Methodological Notes

In order to examine early fatherhood we try to describe trends in fertility for various countries but also between males and females. Furthermore we are interested in examining the relationship between early fatherhood and various associated factors concerning both family background of the respondent but also his socio-demographic characteristics.

Initially a descriptive analysis is provided by age, sex, country and cohort. Results are presented for the age group 15 to 24 years for both males and females. Next, using appropriate parametric models we examine differences in the pattern of first births by age between sexes and among countries. The Peristera-Kostaki (2007) parametric models are used in order to estimate these distributions. In these models the fertility rate expressed as a function of age is estimated through an exponential function that takes into account specific characteristics of fertility such as the total fertility rate, the age at which the highest fertility occurs as well as the spread of the distribution. In this work, the functions represented by the models do not express the age-specific fertility rate but rather the births by age. The mathematical formulae are given below.

Simple Model

$$f(x) = c_1 * \exp\left[-\left(\frac{x-\mu}{\sigma\ (x)} \right)^2 \right]$$

c_1, μ, σ are parameters to be estimated and $\sigma(x) = \sigma_{11} \quad if \quad x < \mu, \quad while \quad \sigma(x) = \sigma_{12} \quad if \quad x > \mu$.

Mixture Model

$$f(x) = c_1 * \exp\left[-\left(\frac{x-\mu_1}{\sigma_1} \right)^2 \right] + c_2 * \exp\left[-\left(\frac{x-\mu_2}{\sigma_2} \right)^2 \right]$$

c_i, μ_i σ_i, are the parameters to be estimated and $\sigma_1(x) = \sigma_{11} \quad if \quad x <= \mu_1, \quad while \quad \sigma_1(x) = \sigma_{12} \quad if \quad x > \mu_1$.

In order to ascertain the factors related to early fertility of males we use logistic regression models. The logistic regression model estimates the log of the odds of an event occurring and is expressed as follows:

$$Log\left(\frac{\pi}{1-\pi} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_\pi X_\pi ,$$

where π ist he probability that the event occurs, β_0 constant and β_i the coefficients of the variates X, X_i are the explanatory variables, i=1,…..,p

The dependent variable is dichotomized indicating whether the respondent experienced a birth or no (0=no, 1=yes) at a given age, falling in the age group 15 to 24 years. The independent variables are related to the family background and the socio-demographic profile of the

respondent. Thus, two versions of logistic models are used. The first model includes only variables related to the family background of the respondent. The second includes also variables related to the socio-demographic characteristics of the respondent. The respondent's family structure during adolescence is measured with a series of dummies variables: respondent comes from a large family (more than three children), respondent's parents were divorced, respondent lived with both biological parents, respondent lived with a single parent, respondent lived with neither biological parent. In the second model the following variables are also included. The respondent's education level, measured with a series dummies variables: respondent has less than a high school education, high school degree, and more than a high school indicator. A dummy variable is also included about whether the respondent is married. Finally a dummy variable indicating whether the respondent is from a European country or not is included in both types of models. We run the above models separately for males and females for the various age groups. Finally country differences are examined regarding the effect of the various factors in early fertility. Countries are classified in specific groups according to their geographical position as well as on thesocio-cultural and historical background.

Finally a classification of the countries is attempted according to the first births of male and female populations. Cluster analysis allows us to identify homogeneous groups as regards to specific measures. In our analysis the main indicator used for grouping the various countries is the number of first births by age for both men and women. The results of cluster analysis are presented for three different age groups in the case of males i.e. ages 15- 19, 20 - 22 and 23 -24, while the age categories for females are 15-17,18-19,20-22 and 23-24.

4. Results

Tables 2 and 3 provide the age-specific cumulative percent of men and women experiencing a first birth for the various countries. As expected more women experience early age births compared to men. Furthermore a varied picture emerges between the different countries. The percentage of women who experience a birth before age 20 varies from 10,7% to 29,7% for the countries under study. This percentage is quite lower for men, ranging from 1,1% to 14,7%. Referring to age 24, a larger variation between countries is observed in the percentage of men experience a first birth, ranging from 20,5% to 66,2%. In contrast, the percentage of women experiencing a first birth up to age 24, varies from 55,9% to 84,1%. Italy is the country with the lowest percentage of early age fertility while Estonia has the highest percentage. Concerning females before age 20, Belgium appears to have the lowest percentage of teenage fertility, while women in the Czech Republic experience the highest teenage fertility among the countries examined. Considering the population aged 24, a different picture emerges regarding first births. The lowest percentage for early male fertility is observed in Greece. On the other hand Estonia shows the highest teenage male fertility. As regards to women, at the lowest percentage of first births characterises Italy, while the highest percentage appears in the Czech Republic.
Our findings confirm that average age of early fertility up to age 18 differs between men and women. However, variations are also observed in the average age difference between women who give birth before age 20 and their partners among the various countries. Thus, for Austria, Belgium, Canada, the Czech Republic, Finland, France the average age difference between women who give birth before age 18 and their partners is 2 years. In the case of Hungary, Italy, Norway, and Portugal the average age differences is approximately 3 years. Estonia and Greece appear to differentiate from the other countries, given that in the case of Estonia there is no age difference, while Greece is characterised by the largest age difference which equals to 5 years.

Table 2: Cumulative percent of men experiencing an early first birth

	Austria	Belgium	Canada	Czech Republic	Estonia	Finland	France	Greece	Germany
<=15	0,58	0,09	0,75	0,47	2,06	0,17	0,18	0,00	1,06
16	1,05	0,18	1,27	0,63	3,20	0,52	0,53	0,23	1,41
17	1,75	0,45	1,88	1,56	5,60	0,96	1,34	0,46	2,29
18	2,91	1,16	3,23	3,75	9,71	2,09	2,58	0,46	4,64
19	6,41	3,04	6,24	8,13	14,74	4,53	5,53	1,60	7,87
20	12,00	5,36	10,31	13,59	20,11	8,11	9,27	2,97	14,69
21	18,76	12,24	15,94	20,63	28,34	13,95	14,62	4,57	22,21
22	29,25	20,38	21,75	31,41	40,34	22,06	22,73	7,76	32,55
23	38,81	30,38	29,25	44,38	54,63	31,65	31,28	12,56	43,89
24	48,72	41,20	37,88	56,41	66,17	41,59	42,25	20,55	54,11
N	858	1119	2133	640	875	1147	1122	438	1702

	Hungary	Italy	Latvia	Lithuania	Norway	Poland	Portugal	Slovenia	US
<=15	0,58	0,00			0,00		0,35	0,62	1,28
16	0,83	0,00			0,19		0,58	0,98	2,94
17	1,33	0,00	0,58	0,47	0,37		1,04	1,25	5,49
18	3,09	0,56	2,14	2,11	1,12		2,08	2,05	10,99
19	6,67	1,12	5,34	5,16	2,97		4,57	3,74	17,50
20	11,93	2,62	9,62	8,44	6,41		8,91	6,32	24,53
21	18,77	6,73	18,17	15,31	11,71		13,94	12,81	31,18
22	28,11	12,52	33,24	26,33	20,07		20,13	25,09	39,05
23	40,70	17,20	48,98	41,33	30,48		27,41	38,79	46,68
24	50,79	25,42	62,00	55,63	42,01		38,06	51,33	53,66
N	1199	535	1029	1280	1076		1729	1124	2348

Table 3: Cumulative percent of women experiencing an early first birth

	Austria	Belgium	Bulgaria	Canada	Czech Republic	Estonia	Finland	France	Greece	Germany
<=15	1,23	0,10	1,63	1,51	0,36	0,00	0,07	0,77	1,69	0,69
16	2,86	0,86	3,71	2,78	1,55	0,63	0,73	1,89	3,60	1,37
17	7,06	2,92	8,15	6,07	5,83	2,88	3,36	4,55	7,29	3,51
18	13,69	5,55	15,46	11,27	15,57	8,65	8,02	9,82	12,58	8,94
19	22,77	10,69	27,26	18,89	33,61	19,62	15,97	18,01	20,34	17,58
20	32,74	17,70	41,26	27,61	51,28	32,73	25,19	28,01	29,53	30,20
21	42,71	26,83	55,20	37,03	69,22	46,21	34,94	38,23	37,19	43,76
22	52,77	38,43	66,67	45,89	79,42	58,12	43,39	48,45	46,84	54,90
23	62,03	50,03	75,89	54,95	88,80	69,72	52,58	57,86	55,32	64,57
24	69,77	60,92	81,96	62,23	95,08	78,31	61,86	65,96	62,97	72,94
N	3500	1983	1779	2981	1098	1595	3005	2221	1947	3503

	Hungary	Italy	Latvia	Lithuania	New Zealand	Norway	Poland	Portugal	Slovenia	US
<=15	0,71	0,93	0,09	0,09	0,62	0,12	0,12	1,26	0,51	4,25
16	2,83	1,75	0,65	0,83	2,75	0,19	0,83	3,02	1,76	9,03
17	7,15	3,78	3,27	2,40	7,29	0,37	2,56	7,61	5,43	16,35
18	15,67	7,69	8,54	6,50	13,53	1,12	6,98	14,13	12,91	25,34
19	28,89	13,39	18,20	14,15	21,02	2,97	16,25	23,15	25,77	34,73
20	43,15	20,80	30,98	24,75	28,68	6,41	28,71	33,01	40,53	43,60
21	55,66	29,45	44,98	37,65	37,76	11,71	42,74	42,49	53,85	51,60
22	66,87	38,55	59,03	51,75	47,13	20,07	55,87	52,66	65,60	58,66
23	74,65	46,65	68,74	63,32	55,20	30,48	67,06	62,11	74,51	64,99
24	82,02	55,58	76,48	74,29	63,49	42,01	75,59	70,41	81,52	70,34
N	2346	2913	2143	2170	2402	1076	3236	3481	2154	7020

In the sequence the cohort analysis results are presented. The percent of men and women experiencing a first birth at various ages is given in Tables 4 and 5. The results are classified in four age groups, corresponding to ages below 18 years, 18 to 19 years, 20 to 22 years and finally 23 to 24 years. Variations are observed in the number of cohorts between countries due to differences in the data. An obvious result is that the percent of men experiencing a first birth is growing by age for all the observed cohorts. For the majority of countries and cohorts, the highest percent of men experience a first birth in the age group 23 to 24 years. Few exceptions are observed for some countries in the most recent cohorts, such as Austria, Greece, Portugal, the Czech Republic, Slovenia, Latvia and Lithuania. In these cases the highest percent of men appears to experience births in the ages 20 to 22 years. A different picture emerges in the case of women. The highest percent of women experiencing a first birth appears in the age group 20 to 22 years, which means 2 to 4 years earlier than males.

Table 4: Percent of men experiencing a first birth by age and cohort

Austria	**1941-1950**	**1951-1960**	**1961-1976**		**France**	**1944-1950**	**1951-1960**	**1951-1974**	**Norway**	**1946-1962**			
<18	0,68	2,06	0,58			0,62	1,30	0,50		0,26			
18-19	3,75	3,34	1,87			2,78	2,76	2,10		1,81			
20-22	19,80	16,71	8,52			14,81	12,97	6,50		11,92			
23-24	12,29	17,74	7,23			20,68	13,45	6,90		15,29			
N						273	498	351		1076			
Belgium	**1951-1960**	**1961-1971**			**Greece**	**1949-1960**	**1961-1970**	**1971-1984**	**Poland**	**1941-1950**	**1951-1960**	**1961-1973**	
<18	0,29	0,17				0,00	0,29	0,25					
18-19	2,22	0,52				0,36	1,16					0,10	
20-22	13,58	4,57				4,36	2,61	1,48		0,09		0,10	
23-24	14,16	7,41				12,00	5,80	0,74		0,38	0,07		
N	802	317				244	177	17		6	2	2	
Canada	**1936-1940**	**1941-1950**	**1951-1960**	**1961-1975**	**Hungary**	**1948-1960**	**1961-1970**	**1971-1984**	**Portugal**	**1943-1950**	**1951-1960**	**1961-1970**	**1971-1982**
<18	0,36	1,38	1,06	0,79		0,42	1,54	0,37		0,40	0,52	1,12	0,34
18-19	0,72	2,53	3,41	1,46		3,79	2,52	3,70		1,80	2,36	3,48	0,67
20-22	14,49	13,02	8,34	4,14		16,53	12,48	4,07		8,40	12,98	12,42	3,15
23-24	18,12	10,60	9,40	4,75		16,63	15,99			10,40	18,22	13,17	1,46
N	227	708	890	308		809	367	23		460	680	535	54
Czech Republic	**1930-1940**	**1941-1950**	**1951-1960**	**1961-1979**	**Italy**	**1946-1960**	**1961-1976**		**Slovenia**		**1950-1960**	**1961-1970**	**1971-1980**
<18	0,00	0,00	1,50	1,51							0,70	1,22	0,21
18-19	33,00	33,00	4,89	7,04		1,20					2,11	1,92	0,42
20-22	33,00	36,00	16,17	24,87		8,82	2,40				19,80	15,18	2,52
23-24	0,00	0,00	27,44	19,35		10,22	2,55				23,31	21,64	1,05
N	3	53	261	323		401	134				674	429	21
Estonia	**1944-1950**	**1951-1960**	**1961-1979**		**Latvia**	**1946-1960**	**1961-1970**	**1971-1977**	**Germany**	**1953-1960**	**1961-1972**		
<18	2,80	4,89	4,95			0,14	0,61	0,60		1,25	0,69		
18-19	4,21	6,90	8,95			2,51	3,85	3,91		2,95	2,02		
20-22	12,15	22,70	22,67			20,71	4,46	9,04		14,82	7,84		
23-24	26,64	22,70	17,14			24,11	25,35	2,41		13,38	6,59		
N	190	320	365			609	367	53		1084	618		
Finland	**1994-1950**	**1951-1960**	**1961-1967**		**Lithuania**	**1945-1960**	**1961-1970**	**1971-1977**	US				
<18	0,55	1,00	0,45			0,11	0,47	0,41					

18-19	2,88	2,00	2,26		2,39	3,62	3,29				
20-22	17,15	10,02	5,88		15,49	16,22	6,57				
23-24	17,28	12,83	7,69		24,60	23,94	1,44				
N	625	383	139		774	449	57				

Table 5: Percent of women experiencing a first birth by age and cohort

Austria	**1941-1950**	**1951-1960**	**1961-1976**		**France**	**1944-1950**	**1951-1960**	**1951-1974**	**New Zealand**	**1936-1950**	**1951-1960**	**1961-1970**	**1971-1976**
<18	7,76	4,99	4,64			2,21	4,78	2,78		3,85	6,29	6,08	8,68
18-19	14,91	13,72	9,99			11,70	12,41	7,91		11,66	11,51	9,42	11,20
20-22	28,26	25,69	19,40			27,59	27,11	18,25		27,18	19,83	18,24	13,45
23-24	15,94	14,30	11,15			16,78	14,71	10,91		17,55	13,11	12,99	1,68
N	898	1108	1494			415	1003	803		811	837	629	125
Belgium	**1951-1960**	**1961-1971**			**Greece**	**1949-1960**	**1961-1970**	**1971-1984**	**Norway**	**1946-1962**			
<18	1,97	1,64				6,77	6,14	1,46		0,26			
18-19	7,15	2,63				11,95	10,11	3,56		1,81			
20-22	23,03	11,63				23,36	19,23	9,23		11,92			
23-24	16,99	10,93				13,85	12,88	4,84		15,29			
N	1291	692				877	828	242		1076			
Canada	**1936-1940**	**1941-1950**	**1951-1960**	**1961-1975**	**Hungary**	**1952-1960**	**1961-1975**		**Poland**	**1934-1940**	**1941-1950**	**1951-1960**	**1961-1974**
<18	2,99	3,75	3,34	4,10		5,72	5,16				1,76	2,03	2,07
18-19	11,14	10,32	7,84	5,87		17,61	15,53			13,33	10,40	10,37	10,72
20-22	26,90	23,88	16,72	10,49		34,89	23,97			13,33	34,73	33,27	25,02
23-24	16,30	12,83	11,49	5,97		14,42	9,18			33,33	19,31	18,90	8,59
N	314	800	1236	631		1439	1247			12	1005	1373	846
Czech Republic	**1953-1960**	**1961-1970**	**1971-1982**		**Italy**	**1946-1960**	**1961-1976**		**Portugal**	**1961-1970**	**1971-1982**		
<18	4,52	3,66	3,12			3,08	1,61			6,30	3,01		
18-19	21,94	18,92	13,10			8,24	3,75			12,06	4,48		
20-22	35,70	39,90	13,42			22,41	9,10			22,20	6,20		
23-24	13,33	13,51	3,90			14,31	6,88			13,02	2,28		
N	447	575	220			1920	993			1485	392		
Estonia	**1944-1950**	**1951-1960**	**1961-1979**		**Latvia**	**1946-1960**	**1961-1970**	**1971-1977**	**Slovenia**	**1949-1960**	**1961-1970**	**1971-1980**	
<18	1,03	1,89	3,34			1,56	2,46	5,38		4,99	4,24	2,70	
18-19	10,85	12,46	16,28			9,05	14,53	14,84		19,78	16,67	6,83	
20-22	28,42	32,97	32,89			35,83	38,05	15,40		38,08	34,62	11,11	
23-24	23,00	19,40	12,26			17,95	15,27	8,00		14,70	15,65	2,22	
N	347	589	659			1257	686	200		1050	960	144	
Finland	**1994-1950**	**1951-1960**	**1961-1967**		**Lithuania**	**1945-1960**	**1961-1970**	**1971-1977**	**Germany**	**1952-1960**	**1961-1972**		
<18	2,23	2,66	2,41			1,57	1,74	1,99		2,57	1,63		
18-19	11,52	8,72	5,73			6,69	9,43	10,34		10,14	7,07		
20-22	25,39	18,31	12,86			29,21	33,20	16,05		26,69	18,86		
23-24	14,60	15,38	8,24			21,73	20,49	4,24		13,32	8,86		
N	1457	1191	357			1143	800	227		1849	1654		
US	**1950-1960**	**1961-1970**	**1971-1981**										
<18	11,06	10,13	10,16										

18-19	13,57	12,68	8,55		
20-22	18,43	19,32	6,37		
23-24	10,01	10,03	0,20		
N	3438	2813	769		

Then the distribution of first births for the total age range is examined, in order to achieve a clear view of the situation in the various countries. The observed and estimated values of the number of births at each age are graphically depicted in Figure 4 in the Appendix. The main findings conform to what is already described in the literature. Differences are observed in the age distributions of births between men and women. These differences consist in the timing of births, and the intensity of births. We observe that women's distributions are steeper with higher peak values while men have wider distributions with lower peak values. As prior research has shown, women experience earlier first births. This is also validated from our data. As depicted in Figure 4, the age of peak births, is earlier for women than for men. This is consistent through all countries, although variations are observed in the age at which peak fertility occurs. Thus, women experience their peak in first births between 12 to 25 years old while males' peak fertility ranges between 24 and 26 years.

Concerning variations between females, women in Bulgaria seem to experience first births enough earlier than in the other countries, with peak fertility around the age of 12 years old. Women from Hungary, Greece and the Czech Republic follow with peak fertility, with highest fertility around age 20. On the other hand, women in Belgium seem to experience first births at later ages around age 25. In the case of males smaller variations between countries are observed as regards to the peak fertility years. Latvia and the Czech Republic are the countries with earliest peak fertility around age 24. Greece, Italy, Portugal and Belgium are the countries with latest peak fertility around age 26. The intensity is also higher for women than for men for all countries under study. Differences are also observed between countries as regards to the intensity of births. Another finding using these data, is that the simple P-K model has been adequately used for estimating the age distribution of the first births. Therefore the populations under study are not characterised by distorted distributions of first births. This is an indication of non heterogeneity in the behaviour of populations regarding first births, although the estimations are not based on population data but only in the number of births. However, these findings are in agreement with the general literature, according to which distorted fertility distributions have appeared in more recent years for some European populations and the US.

In the sequence we run several logistic regression models so as to investigate different hypotheses regarding the associations of early fertility and various family and personal characteristics. So, the first set of models test (simple model) for the differences in the effects of family background. The second logistic regression model (complex model) examines the associations between personal characteristics across the early fertility age range, including all countries. The third set of models examines whether there are country differences in the early fertility.

The first model focuses only on variables reflecting the family background characteristics. The second is more complex, including also variables that compose the socio-demographic profile of the respondent, related to its personal, marital status and its educational level. In these models a variable indicating whether respondents are from European or non-European countries is also included, so at to test for differences between European countries, the USA

and Canada. All analyses are presented for men and women and different age groups. In the case that country differences are tested the models are evaluated for specific groups of countries

Table 6a and 6b present the results of the regression analysis concerning the first and second models. Each column represents a separate logistic regression model, including all the countries, with the coefficients for selected independent variables are shown in each row. The associations between disadvantaged family background and early fertility (simple model) are displayed in Table 6a. Thus, in the first line of Table 6a, the associations between family background characteristics and the likelihood of experiencing a birth before age 20 are represented. Next, in row 2 it is examined whether family background characteristics are associated with the likelihood of experiencing a birth between ages 20-22. The third row of the table examines the likelihood of experiencing a first birth in the age group 23 to 24 years. Table 6b represents the associations between family background and personal characteristics (complex model) with the likelihood of experiencing a first birth at the various age groups. In Tables 7a and 7b, the results are replicated for women for both the simple and complex models. In all tables, coefficients in red indicate that the odds of experiencing a first birth for this group/category differs significantly in relation to the comparison group ($p<0.05$).

Let us now continue with the presentation of the results. As indicated in Table 6a, teenagers from European countries are less likely to experience a first early birth than teenagers from non-European countries, particularly before age 20. A reverse trend is observed for men of higher ages, although these results are not statistically significant. Men who were raised in a large family (with more than 3 children) have a greater likelihood of having a first early birth than men raised in a household with both biological parents. As it comes out from the analysis the coefficients for large families declined with age, while the result at ages 23-24 is not statistically significant. Being raised in a single parent family is consistently associated with early births at all ages between 15 and 22 years while at ages 23-24 there is evidence of no association with early fertility. Regarding men who were raised with none of the parents, they are more likely to have a first birth at all ages. These differences are significant for teenagers but they are no longer significant at older ages.

Table 6a: Logistic Regression models: Odds of first birth for men by age/simple model

MALES					
	European country	Large Family	Divorced	Single Parent	Neither Parent
15-19	0,03	1,35	-	1,88	1,53
20-22	4,24	1,08	-	1,23	1,17
23-24	4,81	0,96	-	0,87	1,05

Table 6b shows the results of the complex model, including independent variables related to the family background structure as well as about the socio-demographic profile of the respondent. Regarding the associations between the family background characteristics and early fertility no major differences are observed, compared to the results obtained with the simple model. In fact, in the complex model, no associations appear for men raised with non parent, while for men raised in large families, strong associations appear only at ages 15-19. Regarding the family status and the professional level of the respondent, significant associations between the educational level and marital and professional status are observed. Thus, men with a low education are more likely to experience a first birth at ages 15-19 than men with a medium education. No association appears at later ages. On the contrary high education level is associated with lower early fertility for men at all ages. Marriage is

associated with a lower likelihood of experiencing a first birth at ages 15-19 and 20-22. A reverse trend is observed at ages 23-24. A houseman has a greater likelihood of fertility at ages 15-19 and 20-22. A man, who is unemployed at ages 15-19 is more likely to experience a first birth at ages 15-19 than those who work. Differences are no longer significant at ages 20-22 and 23-24. Finally, associations between students and early fertility are not significant at any ages.

Table 6b: Logistic Regression models: Odds of first birth for men by age/complex model

MALES											
	European country	Large Family	Divorced	Single Parent	Neither Parent	Educational level:low	Educational level:high	Married	Houseman	Une-mployed	Student
15-19	0,05	1,22	-	1,85	1,31	1,45	0,42	0,45	3,26	1,6	0,99
20-22	6,12	1,02	-	1,24	1,13	0,9	0,59	0,75	2,38	1,45	1,08
23-24	4,69	0,97	-	0,88	1,03	0,81	0,77	1,2	0,72	0,96	0,96

Next, the results for the females are presented. As indicated in Table 7a, consistent associations exist between disadvantaged family background and early fertility. Women from European countries aged 15-17 or 18-19 have less likelihood of fertility than women from non-European countries. This trend is reversed at ages 20-22 and 23-24. Women from large families are more likely to have an early first birth until age 22 than women from families with less than 3 children. A decline of the coefficient is observed at ages 23-24, with a lower likelihood of fertility for women from large families. The divorce of parents is associated with early fertility at the first three age groups, but a negative association is apparent after age 23. Regarding women who were raised with no parents, there is evidence of significant associations at ages 15-17 and 18-19. At these ages, women who were raised with no parents are more likely of experiencing a first birth rather than women raised in households with both parents.

Table 7b: Logistic Regression models: Odds of first birth for women by age/simple model

FEMALES					
	European country	Large Family	Divorced	Single Parent	Neither Parent
15-17	0,31	1,62	1,39	1,59	1,74
18-19	0,86	1,2	1,33	1,33	1,39
20-22	1,65	1,01	1,09	0,97	1,05
23-24	1,56	0,89	0,89	0,86	0,91

In the extended model, significant associations appear between early fertility and many of the independent variables. Regarding the effects of disadvantaged family background, similar results as the ones with the simple model are obtained. Women raised in a large family are more likely to early fertility at ages 15 to 22. Women from single parent family or without parents have higher likelihood to a first birth at ages 15-17 and 18-19 compared to women raised in households with both parents. Furthermore, if the parents were divorced women at ages 15-15 and 18-19 are more likely to a first birth than women in two parents' households. Regarding the nationality, it comes out that women from European countries are less likely to have births at ages 15-15 and 18-19. However, the likelihood of births above age 20 is greater for women in European countries than for women in non-European countries. Women with a low or high educational level are less likely to early fertility than women with medium educational level. Only women of high educational level at have greater likelihood for experiencing a first birth ages 23-24. Married women are less likelihood for having a first

birth at ages 15-17 and 18-19, while at later ages they are more likely for a birth than women who are not married. The results for housewives are not significant except for women at ages 20-22 who are more likely to experiencing a first birth. Unemployed women at ages 15-17 and 18-19 experience a first birth at a greater likelihood than women who are employed. This coefficient declines with age. Finally, there is no evidence of significant associations between students and early fertility except for ages 15-17.

Table 7b: Logistic Regression models: Odds of first birth for women by age/complex model

	FEMALES										
	European country	Large Family	Divorced	Single Parent	Neither Parent	Educational level:low	Educational level:high	Married	House-wife	Une-mployed	Student
15-17	0,31	1,33	1,24	1,3	3,2	0,37	0,89	0,51	1,07	1,65	2,2
18-19	0,86	1,08	1,25	1,28	1,69	0,27	0,87	0,78	0,98	1,34	1,15
20-22	1,68	1,01	1,05	0,95	0,85	0,52	0,95	1,09	0,83	0,96	0,9
23-24	1,55	0,94	0,9	0,87	0,97	0,78	1,21	1,26	0,95	0,87	1,06

Considering sex differences it is obvious that the models for women present more significant associations across the various age-groups. A weakening relationship between disadvantage and early fertility with age occurs for both men and women. Although differences by sex are not pronounced, the models for women contain more significant associations and are more consistent across data sources at 23-24 than the models for men.

In the sequence we examine country differences in the relationship between family background characteristics and the likelihood of experiencing a first birth at early ages. In order to provide more coherent results, we distinguished countries in six groups based on their geographic position, as well as common characteristics regarding economy and cultural background. Thus, the results are presented for the following six groups. Group 1 comprises of Austria, France, Belgium, Germany. In the second group Bulgaria, Hungary and the Czech Republic are included. The third group concerns the Scandinavian countries, i.e Norway and Finland. In group 4 belong Latvia, Lithuania, Poland, Slovenia and Estonia. The fifth group is about Mediterranean countries, i.e. Portugal, Italy and Greece. Finally Canada and the USA are also included in the analyses.

Concerning males, the results of both models, i.e. simple and complex model are shown in Tables 10a and 10b respectively. As indicated in Table 10a, the association between family structure in adolescence and male fertility in teenage is quite complex. The effects are significant in some cases, such as at ages 15-19 and 20-22 but weaker associations appear at later ages. Furthermore, there is evidence of country differences in the relationship between family background characteristics and the likelihood of experiencing a first birth at various ages. Disadvantaged family background is more consistently associated with early male fertility for countries of north and central Europe than for countries of south Europe. These differences are more pronounced for males below age 20 than for the other age groups. Men raised in single parent households or with neither parent are more likely to have an early birth below age 20 in countries belonging to group 1, group 2 and group 4. At ages 20-22 men from large families or with divorced parents have greater likelihood of a first birth. Regarding non-European countries data for large families were only available. As indicated in Table 8a, men from large countries have a lower likelihood for experiencing a first birth.

Table 8a: Logistic regression models: odds of first births for men, by age and group of country/simple model

	MALES			
	Large Family	Divorced	Single Parent	Neither Parent
15-19				

Group 1	0,98	1,32	1,78	2,62
Group 2	2,42	-	2,14	0,61
Group 3	1,23	-	1,52	4,72
Group 4	0,88	-	2,03	1,75
Group 5	1,47	-	1,00	1,61
Canada	1,33	-	-	-
USA	1,23	-	1,1	5,85
20-22				
Group 1	1,21	1,24	1,26	1,03
Group 2	1,14	1,22	1,17	1,33
Group 3	1,46	2,55	0,65	0,00
Group 4	0,89	1,38	1,09	0,84
Group 5	1,33	1,17	1,45	1,38
Canada	0,18	-	-	-
USA	1,03	-	1,29	0,68
23-24				
Group 1	1,04	1,22	0,92	1,01
Group 2	0,84	1,02	0,69	1,27
Group 3	1,05	1,02	1,00	0,99
Group 4	1,03	0,99	0,83	1,22
Group 5	1,30	1,07	0,75	1,13
Canada	0,19	-	-	-
USA	0,97	-	0,92	0,47

In the sequence, the associations between the profile of the respondent and early fertility are presented. Significant associations exist between the educational level and early fertility, although some variations are observed among the different group of countries. Men with low educational level are associated with high early fertility almost at all ages. The most significant associations are observed for Group 2, 4 and 5 at ages 15-19, for Group 1, 3 and 5 at ages 20-22 and finally at group 2, 4, and 5 at ages 23-24. High educational level is associated with lower early fertility at all ages. Significant associations are observed for Group 1 and Group 4, i.e. north and central Europe at ages 15 to 19. In the case of non-European countries men with higher educational level experience early fertility with a smaller likelihood, although the results are not statistically significant. Concerning marriage a significant association is observed for all group of countries at ages 15-19. Married men at these ages have lower likelihood of experiencing a first birth. The association is weaker for Mediterranean countries, while the strongest association appears for the US. At ages 20-22 a significant association is only observed for Group 1, 3, and 4 while at ages 23-24 only men from countries in Group 1 are associated with early fertility.

Table 8b: Logistic regression models: odds of first births for men, by age and group of country/complex model

				MALES			
	Large Family	Divorced	Single Parent	Neither Parent	Educational level:low	Educational level:high	Married
15-19							
Group 1	0,94	1,13	1,68	2,37	1,20	0,58	0,44
Group 2	1,60	1,02	1,94	0,40	2,46	0,00	0,43
Group 3	1,13	-	1,41	4,04	1,28	0,35	0,52
Group 4	0,80	-	1,92	1,70	2,69	0,34	0,65
Group 5	1,09	-	0,86	1,50	2,42	0,32	0,31
Canada	0,97	-	-	-	1,38	0,36	0,44
USA	1,45	-	3,16	2,37*10-9	5,6*10-9	0,36	1,8

Group 1	1,15	1,12	1,14	0,95	1,38	0,52	0,68
Group 2	1,02	1,18	1,13	1,26	1,22	0,48	0,95
Group 3	1,34		0,93	0,92	1,38	0,40	0,80
Group 4	0,85	1,36	1,07	0,83	1,08	0,70	0,84
Group 5	1,00	1,22	1,21	1,26	1,98	0,27	0,62
Canada	1,06	-			1,75	0,36	0,61
USA	0,86	-	1,42	1,66*10-9	4,81	0,48	1,81
23-24							
Group 1	1,01	1,22	0,94	0,97	1,29	0,68	1,23
Group 2	0,78	0,99	0,68	1,28	1,26	0,37	1,31
Group 3	1,02	1,04	0,96	0,93	0,86	0,39	1,22
Group 4	1,02	0,98	0,83	1,20	0,29	0,85	1,16
Group 5	1,09	1,10	0,69	1,05	1,46	0,51	1,46
Canada	1,32				1,27	0,41	0,94
USA	0,79	-	0,65	4,62*10-9	4,46*10^{-9}	0,87	1,07

The results for women are presented in the following tables. A mixed picture characterises the associations of female early fertility and disadvantaged family background for the various groups of countries. Significant associations exist for women for the majority of the groups of countries and through the various age groups. The associations are weaker at ages 23-24.

At ages 15-17, the highest associations appear for women from East European countries (group 2), Mediterranean countries (group 5), and countries from group 3. The only exception is about women from the US raised in single parent families.

Comparing European and non-European countries it is obvious that women at ages 15-17 have a greater likelihood of experiencing a first birth. A greater likelihood characterises also women at ages 18-19 except for Canada. Regarding women at ages 20-22, the strongest associations appear usually for European countries. Significant associations for women from the USA are consistent through all ages.

Table 8a: Logistic regression models: odds of first births for women, by age and group of country/simple model

	FEMALES			
	Large Family	Divorced	Single Parent	Neither Parent
15-17				
Group 1	1.49	1.35	1.06	1.19
Group 2	3.53	1.30	1.03	1.25
Group 3	1.48	3.02	0.85	1.83
Group 4	1.18	1.00	1.94	2.93
Group 5	1.69	1.72	1.94	1.39
Canada	1.58	-	-	-
USA	1.43	1.56	2.24	1.95
18-19				
Group 1	1.07	0.80	1.69	1.68
Group 2	1.56	1.32	1.05	0.76
Group 3	1.48	0.75	1.69	3.07
Group 4	1.24	1.85	1.27	0.96
Group 5	1.35	1.27	1.03	1.48
Canada	0.15	-	-	-
USA	1.29	1.30	1.43	1.63
20-22				
Group 1	1.19	1.21	1.02	1.01
Group 2	0.84	0.78	0.91	0.94

Group 3	1.25	1.38	1.03	1.07
Group 4	0.94	1.11	0.92	0.97
Group 5	1.23	1.12	1.05	1.12
Canada	1.24	-	-	-
USA	0.96	1.01	0.94	1.24
23-24				
Group 1	0.82	0.89	0.57	0.76
Group 2	0.62	0.93	1.39	1.47
Group 3	0.95	1.28	0.88	0.85
Group 4	0.86	0.75	0.93	1.35
Group 5	0.96	0.83	0.80	1.01
Canada	0.99	-	-	-
USA	0.86	0.77	0.61	0.64

Examining the effect of variables related to family status and educational level of the respondent, consistent results are obtained for the majority of countries. Thus, low educational level of women is associated with a higher likelihood of early fertility. The opposite is observed for women with high educational level. At ages 23-24 this is not valid for all the groups of countries. Furthermore, is associated with lower likelihood of early fertility at ages 15-17 and 18-91, and with a higher likelihood of experiencing a birth at ages 20-22 and 23-24.

Table 9b: Logistic regression models: odds of first births for women, by age and group of country/complex model

				FEMALES			
	Large Family	Divorced	Single Parent	Neither Parent	Educational level:low	Educational level:high	Married
15-17							
Group 1	1.54	1.25	1.04	1.15		0.98	0.49
Group 2	2.09	1.17	0.97	1.12	3.07	0.63	0.64
Group 3	1.29	2.92	0.74	1.51	2.61	0.18	0.53
Group 4	1.29	2.92	0.74	1.51	2.61	0.18	0.53
Group 5	1.22	1.61	1.80	1.20	2.21	0.21	0.53
Canada	1.39				1.68	0.19	0.40
USA	1.15	1.46	1.70	1.31	3.89	0.25	0.46
18-19							
Group 1	1.07	0.79	1.60	1.03	0.93	0.71	1.15
Group 2	1.08	1.24	1.00	0.68	1.95	0.32	0.90
Group 3	1.30	0.71	1.55	2.61	2.29	0.04	0.86
Group 4	1.09	1.71	1.17	0.93	1.09	0.17	0.97
Group 5	0.98	1.20	0.94	1.29	1.96	0.15	0.73
Canada	1.11				1.73	0.10	0.63
USA	1.17	1.17	1.15	1.22	1.09	0.09	0.62
20-22							
Group 1	1.18	1.23	1.03	1.02		1.16	1.09
Group 2	0.95	0.81	0.92	0.97	0.70	0.88	1.23
Group 3	1.19	1.34	0.96	0.97	1.25	0.24	0.83
Group 4	0.87	1.07	0.87	0.95	0.46	0.49	1.14
Group 5	1.02	1.07	1.02	1.02	1.31	0.28	1.03
Canada	1.14				1.35	0.28	0.75
USA	0.93	0.95	0.89	1.14	0.61	0.30	1.02
23-24							

Group 1	0.82	0.90	0.55	0.76		0.99	1.12
Group 2	0.83	0.99	1.44	1.63	0.50	1.49	1.16
Group 3	0.98	1.32	0.89	0.93	0.70	0.78	1.32
Group 4	0.92	0.79	0.97	1.39	1.51	1.61	1.19
Group 5	0.95	0.84	0.81	1.02	0.93	0.68	1.26
Canada	0.97				0.56	0.65	1.22
USA	0.91	0.79	0.68	0.73	0.58	0.95	1.41

Our next goal is to classify countries into homogeneous groups as regards to the fertility behaviour of males/females in the various age groups. Hierarchical cluster analysis is the major statistical method for finding relatively homogeneous clusters of cases based on measured characteristics. Our analysis is based on the main fertility indicator in our data sets, which is first births per father or mother. The main issue in cluster analysis is the selection of an optimum selection concerning the number of clusters used. The methodology adopted in this work, consists of the following stages: i) initially we carry out a hierarchical cluster analysis applying squared Euclidean Distance as the distance or similarity measure and different linkage rules, such as single linkage, complete linkage, average linkage, Ward's method. The outcome of this procedure is the selection of the number of clusters based on the stability of the results for the different methods ii) The next stage is to rerun the hierarchical cluster analysis with our selected number of clusters, which enables us to allocate every case in our sample to a particular cluster.

The results for both sexes and at the different age groups are presented in the graph that follows. Regarding males, a varied picture characterizes the classification of the different countries as regards to fathering at early ages.

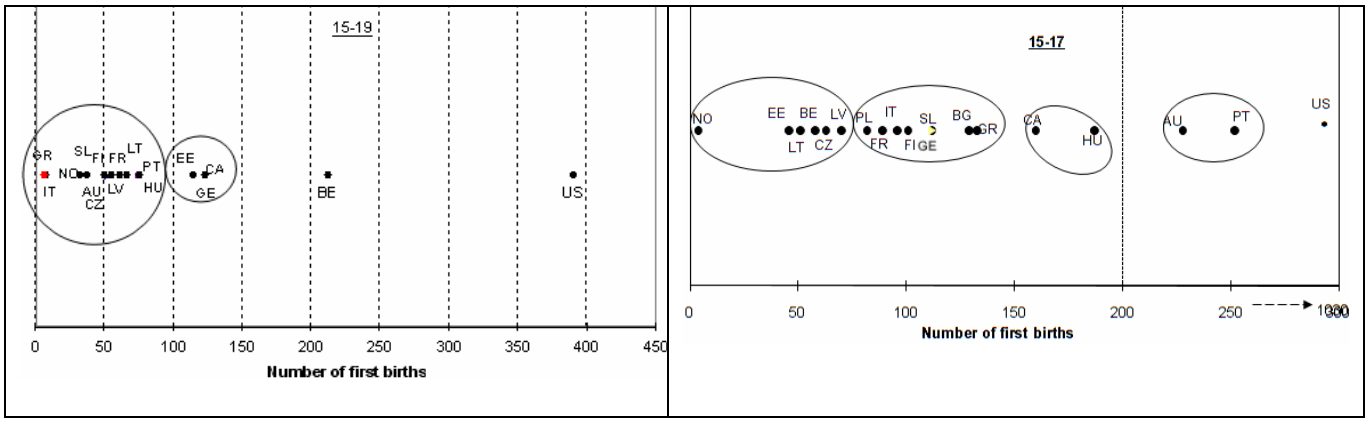
At ages 15-19 countries are mostly clustered in two groups, while Belgium and the US are at a distinct position compared to the other countries. In fact, there exits a major cluster with countries with low number of first children, a second one with more than 100 first births. Thus, in the first group of countries Greece, Italy, Norway, Slovenia, Austria, the Czech Republic, France, Lithuania, Latvia, Hungary, Portugal and Finland are included. The second group consists of Estonia, Canada and Germany. Belgian males are characterized by a medium number of first births while the US is the country with the highest number of first births.
Concerning ages 20-22, a different classification characterizes the countries under study. As depicted in Figure 1(d), countries are classified in five distinct groups. The first includes Greece and Italy, which are characterized by very low number of first births. In the second group, countries with low number of births are included, i.e. Norway, the Czech Republic, France, Finland, and Austria. The biggest groups consists of countries with medium number of births, valid for Estonia, Hungary, Latvia, Lithuania, Slovenia and Portugal. The countries with high number of births are Canada and Germany, forming a different cluster. The countries with the highest fertility are the USA and Belgium.

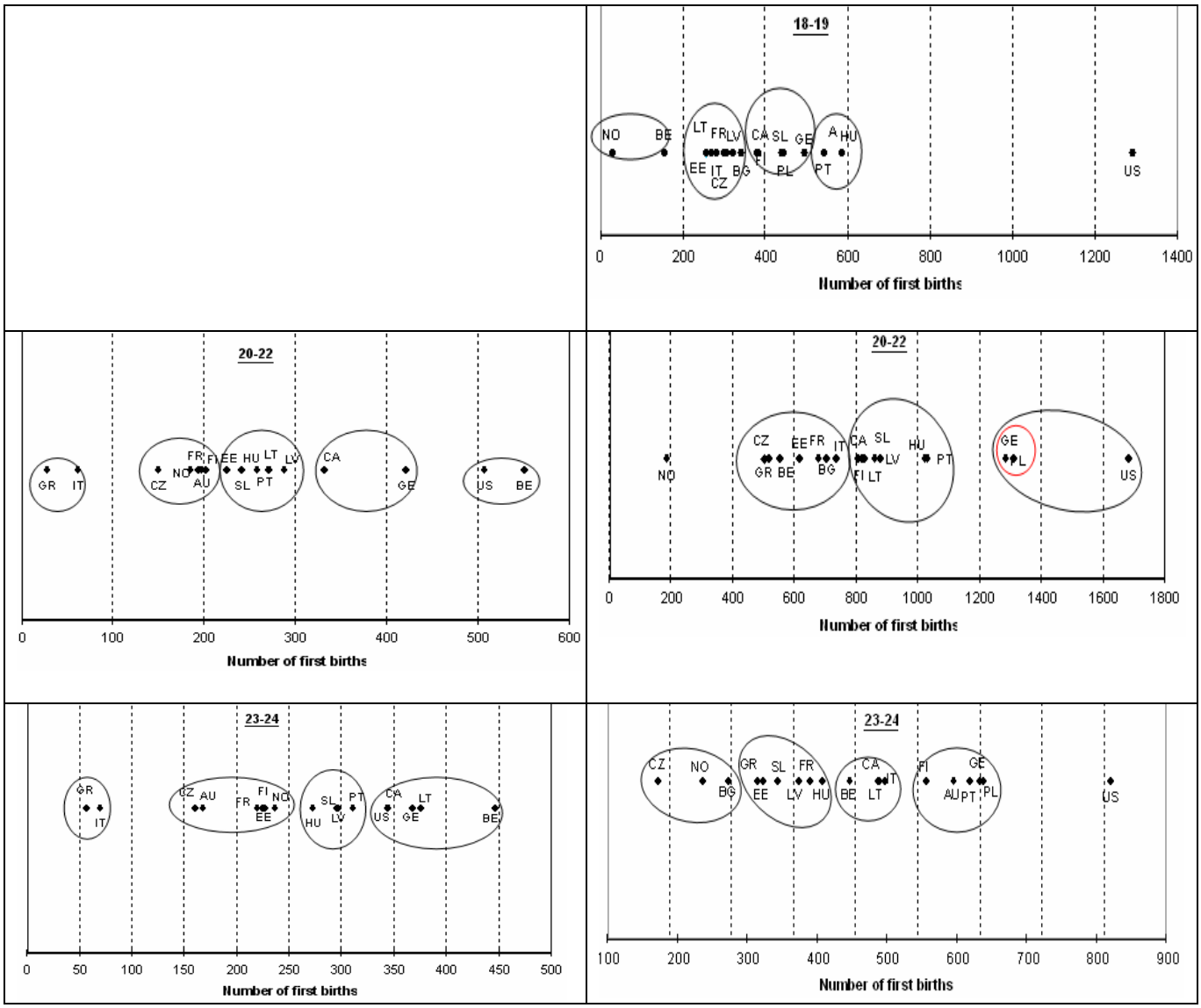
At later ages, varying from 23 to 24 years, four distinct groups are created. Greece and Italy belong in the first group, characterized by very low number of births. The group with low and medium number of births consists of Austria, France, Finland, Norway, Estonia and the Czech Republic. Countries with high fathering are Slovenia, Portugal, Latvia and Hungary in the third cluster. Finally Canada, the US, Germany, Lithuania, Belgium are included in the fourth cluster with higher number of first births.

So, fertility at the very early ages, below age 20 is low for the majority of European countries. At the following age group, low fathering characterizes only some Mediterranean countries. Males from North, East and Central Europe have medium first births. The only exceptions are Germany and Belgium with high fathering at ages 20-22. Furthermore, non European countries, i.e. Canada and the US are also characterized by high fathering. Concerning males at ages 23-24, a natural outcome is observed, i.e. more countries are characterized by high number of births. As previously low number of births characterizes some Mediterranean countries. Men in most European countries are characterized by medium fertility. The only exceptions are Belgium, Germany and Latvia, with higher fertility, which also characterizes the US and Canada.

A different picture emerges in the case of female populations. Let us first present the results at ages 15 to 17 years old. Females mostly from East-European countries and Belgium are characterized by low fertility. Norway is the country with very low number of births. Females with medium births are from Mediterranean countries, namely Italy and Greece, as well as from Bulgaria, Slovenia and Poland. Furthermore, France and Finland belong in the above group of countries. Females from Canada and Hungary form also a cluster with high number of births. Females with the highest number of children come from Austria, Portugal and the US. Considering ages 18 to 19, it is obvious that the number of births is increasing for the majority of the countries examined. The countries are classified as follows: the first group consists of countries with the lowest number of births i.e. Norway and Belgium; females from Lithuania, Latvia, Estonia, the Czech Republic, Bulgaria, France and Italy form the next cluster with medium number of births; the countries with higher numbers of first births belong to the two next groups, i.e. Canada, Finland, Slovenia, Germany, Portugal, Austria and Hungary. Regarding the US it is a distinct case with very high number of births. A different picture emerges at ages 20 to 22. We observe an increasing trend in the number of births for all the countries. As previously the countries with lowest and highest number of births are Norway and the US. The other countries are divided in two major groups. In the first belong mainly countries from South and East Europe. The second group consist of countries from North and Central Europe as well as Canada. Furthermore there is a small group in which belong Poland and Germany. Concerning ages 23 -24, all countries are classified in four major groups. In the first group the Czech Republic, Bulgaria and Norway are included. The second consists of Greece, Slovenia, France, Estonia, Latvia and Hungary. Women from Canada, Belgium, Lithuania and Italy face also high number of births. Higher births are observed for Finland, Germany, Austria, Portugal and Poland.

Figure 1: Clusters of countries as regards to number of children





In the sequence in order to sketch the profile of respondents are regards to their demographic characteristics we continue our analyses with a two step cluster analysis. The two step cluster analysis is applied at the time being only to males/females in the first age group and for the major clusters. The purpose is to have a more clear view about the characteristics of populations belonging in these clusters. Thus, in the case of males we focus on males aged 15 to 19 years from the countries that form cluster 1. The outcome of the analysis is present in Table 10. It is obvious that the Czech Republic, Greece, Hungary, Latvia and Slovenia are associated with cluster 1, Austria, Italy, France, Portugal and Lithuania with cluster 2 and the nordic countries are associated with cluster 3. Examining the educational status by cluster, we observe that cluster 1 is mostly made up by low educated person, cluster has a high percentage of high educated persons as well as an importan percentages of persons with average education, while cluster 3 varies as regards to the educational level of respondents. Concerning the marital status, we observe that cluster 2 has the highest percentage of married persons. As regards to the religion of persons, it comes out that cluster 1 mainly consists of Protestatn and Jewish, cluster 2 has a high percentage of Catholic, freethinking and Islamic. Finally as regards to the employment status, cluster 1 mainly consists of housemen, while cluster 2 of students and persons with parental leaves.

Table 9: Characteristics of males aged 15-19 years , belonging to cluster 1

Country

	Cluster			
%	1	2	3	Combined
AUSTRIA	0	100	0	100
CZECH	100	0	0	100
FINLAND	0	0	100	100
GREECE	100	0	0	100
HUNGARY	100	0	0	100
ITALY	0	100	0	100
LATVIA	100	0	0	100
LITHUANI	0	100	0	100
NORWAY	0	0	100	100
SLOVENIA	100	0	0	100
FRANCE	0	100	0	100
PORTUGAL	0	100	0	100

Educational level

	Cluster			
%	1	2	3	Combined
Low	74,07	0,00	25,93	100
Average	34,36	44,79	20,86	100
High	9,09	72,73	18,18	100

Marital status

	Cluster			
%	1	2	3	Combined
Married	38,31	40,30	21,39	100

Religion

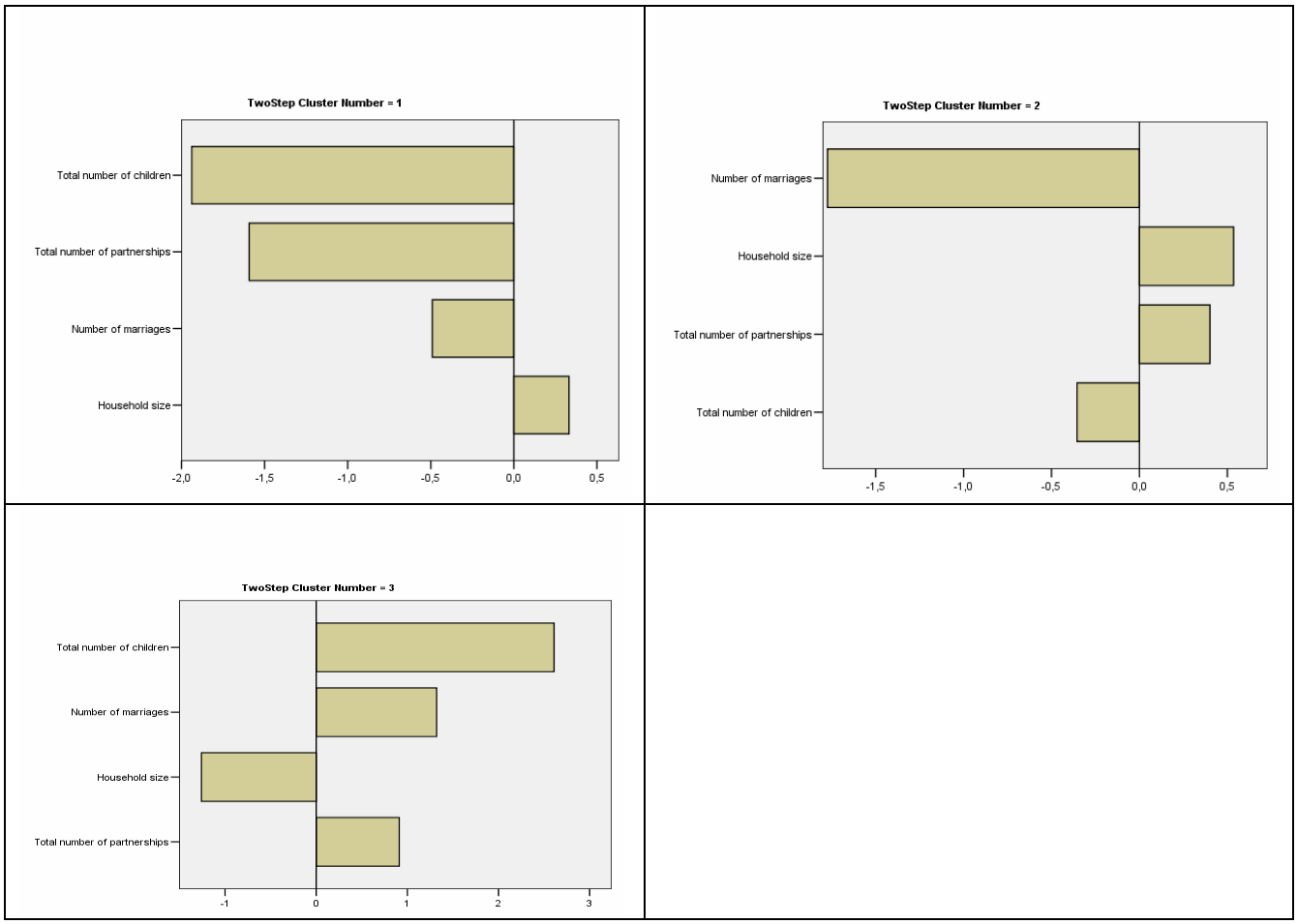
	Cluster			
%	1	2	3	Combined
Catholic	40,00	60,00	0	100
Protestant	100,00	0,00	0	100
Christian orthodox	64,29	35,71	0	100
Freethinking	50,00	50,00	0	100
Jewish	100,00	0,00	0	100
Islamic	33,33	66,67	0	100
Other, including 3-6	62,50	37,50	0	100

Employment Status

	Cluster			
%	1,00	2,00	3,00	Combined
Employed	40,13	42,76	17,11	100
Unemployed	58,33	41,67	0,00	100
Housewife/man	100,00	0,00	0,00	100
Study	0,00	100,00	0,00	100
Other (parentaleave)	16,67	83,33	0,00	100

As indicated in Figure 2, Cluster 1 had below average all variables except for the household size. In Cluster 2, household size and total number of parternships is above average while in cluster 3 , the household size is below the average.

Figure 2: Two step cluster analysis of continuous variables for men 15-19/cluster 1



We present now the results for women aged 15-17 years included in cluster 1. The countries icnluded in that cluster are Belgium, Estonia, Latvia, Lithuania, the Czech Republic. The new classification of countries results in the following. Estonia, Lithuania and the Czech Republic are associated with cluster 1. Belgim and Latvia are associated with cluster 2. Cluster 1 mostly comprises of women with high educational level, and a high percentage of women with average educational level. On the contrary, cluster 2 has a high percentage of low educated women. Cluster 1 is mostly associated with non married women, while cluster 2 has a high percentage of married women. Catholic and Protestatn are highly associated with cluster 1. As regards to the employment status, cluster 1 has a high percentage of students while cluster has a high percentage of housewifes.

Table 10: Characteristics of females aged 15-17 years , belonging to cluster 1

Country

	Cluster		
	1	2	Combined
BELGIUM	0	100	100
ESTONIA	100	0	100
LATVIA	0	100	100
LITHUANI	100	0	100
CZECH REPUBLIC	100	0	100

Educational Level

	Cluster		
	1,00	2,00	Combined
Low	0,00	100,00	100
Average	47,97	52,03	100
High	100,00	0,00	100

Marital Status

	Cluster		
	1	2	Combined

Religion

	Cluster		
	1	2	Combined

Yes	39,73	60,27	100
No	100,00	0,00	100

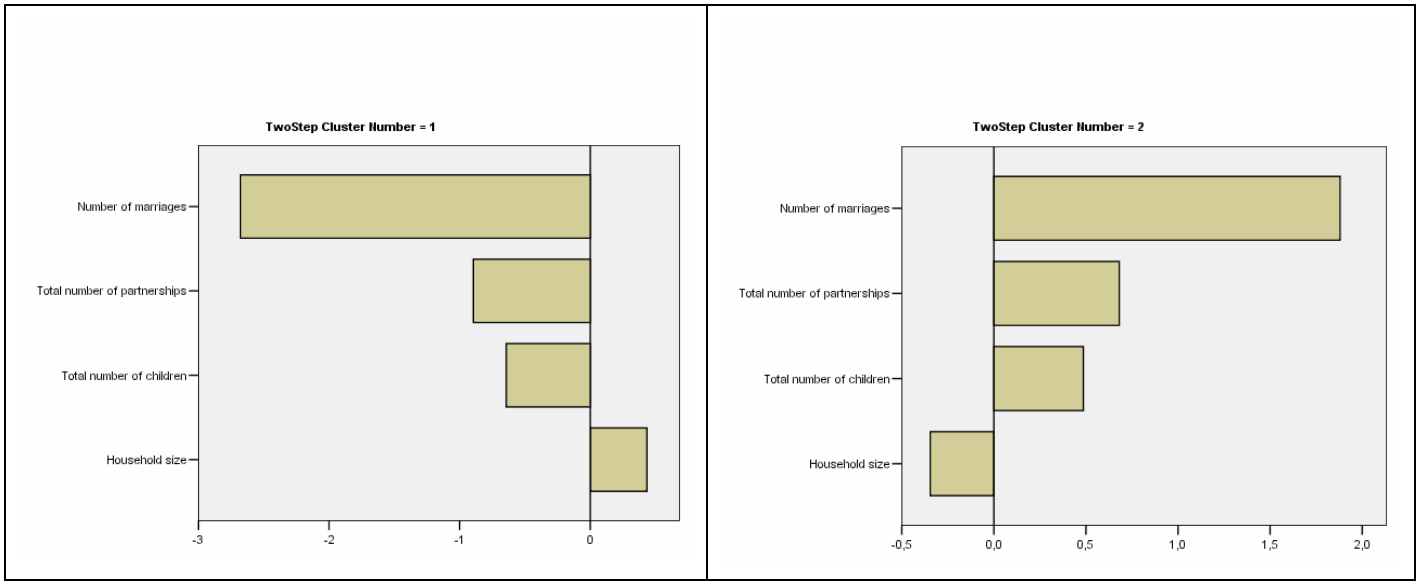
Catholic	43,00	57,00	100
Protestant	59,26	40,74	100
Christian orthodox	25,00	75,00	100
Freethinking	0,00	100,00	100
Other, including 3-6	11,11	88,89	100

Employment status

	Cluster		
	1	2	Combined
Employed	46,59	53,41	100
Unemployed	47,37	52,63	100
Housewife/man	33,33	66,67	100
Study	50,00	50,00	100
Other (parentaleave)	0,00	100,00	100

As shown in Figure 3 all variables except for the household size in Cluster 1 are below average while the opposite occures for cluster 2.

Figure 3: Two step cluster analysis of continuous variables for women 15-17/cluster 1



In the sequence the same analysis is performed for the countries that constitute the second important cluster of women aged 15 to 17 years. This groups consists of the following countries: Bulgaria, Finland, Germany, France, Greece, Italy, Poland, Slovenia. The results of the two step cluster analysis are presentd in Table 15 and Figure 4. As it comes out Greece is associated with cluster 1, Germany and France with Cluster 2. Cluster 3 is mostly associated with Bulgaria, while cluster 4 with Poland and Slovenia. Finally, cluster 5 is associated with Finland. As regards to the educational level by status, we observe that there is a big variation between the different clusters. In fact, cluster 1 has a relatively high percentage of low educated women, cluster 2 has mostly women with average and high education, cluster 3 has a high percentage of highly educated women while in cluster 4 dominate low educated women. As regards to marriage, in all cluster dominate married women. Concerning the religion of participants, cluster 1 consists mainly of Christian orthodox and freethinking women, cluster 2 has a high percentage of islamic, while cluster 3 consists mainly of protestatns. Regarding cluster 4, there is a high percentage of Catholic as well as of other religions' persons. Taking into account the employment status in the various clusters, we

observe that cluster 1 is associated mostly with housewives while cluster 3 with unemployed women.

Table 11: Characteristics of females aged 15-17 years , belonging to cluster 2

Country

	Cluster					
%	1	2	3	4	5	Combined
BULGARIA	0.00	0.00	82.72	17.28	0.00	100
FINLAND	0.00	0.00	0.00	0.00	100.00	100
GERMANY	0.00	100.00	0.00	0.00	0.00	100
GREECE	100.00	0.00	0.00	0.00	0.00	100
ITALY	0.00	1.12	11.24	87.64	0.00	100
POLAND	0.00	0.00	2.94	97.06	0.00	100
SLOVENIA	0.00	100.00	0.00	0.00	0.00	100
FRANCE	0.00	100.00	0.00	0.00	0.00	100

Educational Level

	Cluster					
	1	2	3	4	5	Combined
Low	36.13	4.71	6.28	41.36	11.52	100
Average	17.76	28.66	19.31	24.61	9.66	100
High	9.09	36.36	45.45	0.00	9.09	100

Marital Status

	Cluster					
	1	2	3	4	5	Combined
Yes	24.47	20.23	14.45	30.44	10.40	100
No	0.00	0.00	100.00	0.00	0.00	100

Religion

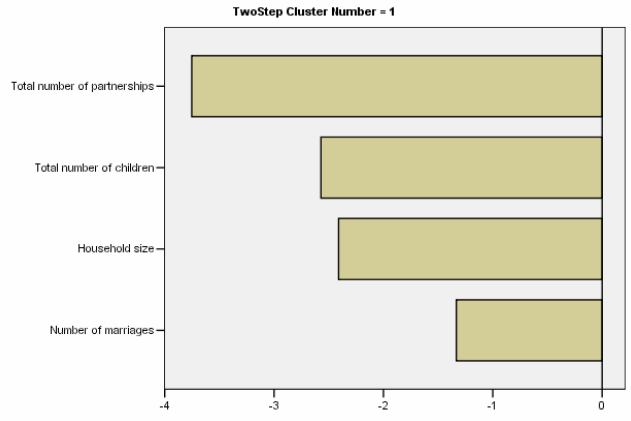
	Cluster					
	1	2	3	4	5	Combined
Catholic	0.00	28.62	16.96	54.42	0.00	100
Protestant	0.00	36.96	60.87	2.17	0.00	100
Christian orthodox	97.66	0.78	1.56	0.00	0.00	100
Freethinking	50.00	0.00	0.00	50.00	0.00	100
Islamic	14.29	85.71	0.00	0.00	0.00	100
Other, including 3-6	0.00	0.00	33.33	66.67	0.00	100

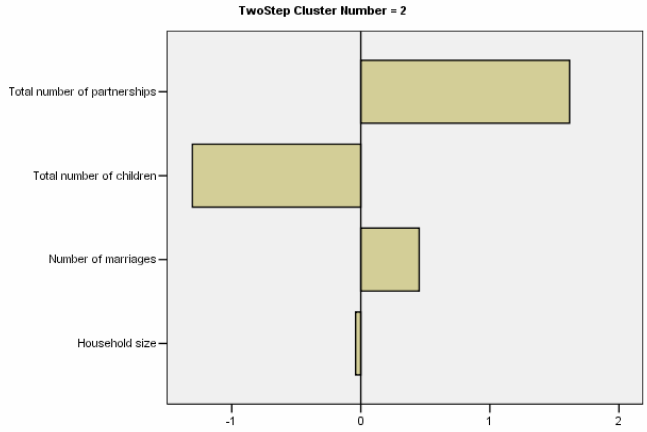
Employment status

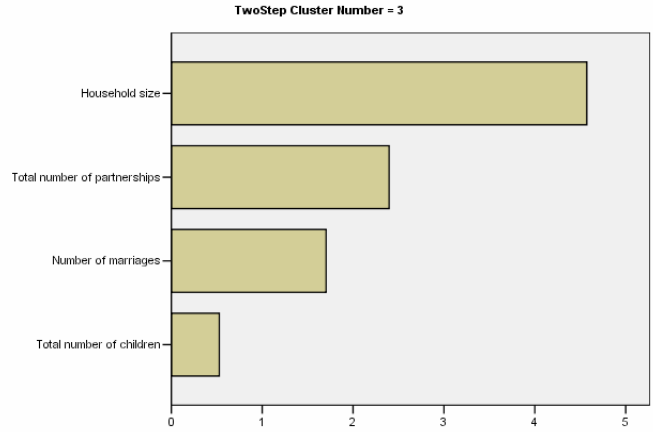
	Cluster					
	1	2	3	4	5	Combined
Employed	23.11	30.19	13.21	33.49	0	100
Unemployed	5.80	23.19	69.57	1.45	0	100
Housewife/man	42.94	13.53	1.18	42.35	0	100
Study	0.00	0.00	0.00	100.00	0	100
Other (parentaleave)	0.00	0.00	0.00	100.00	0	100

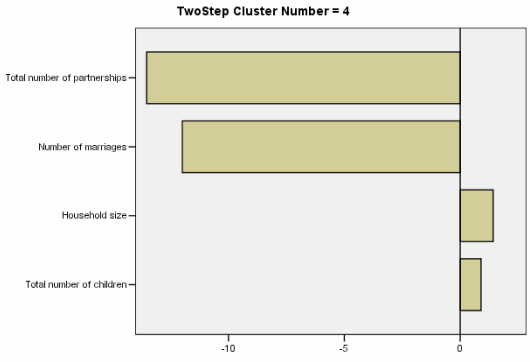
As demonstrated in Figure 4, all variables Cluster 1 had below average except for the household size while the opposite occures for cluster 3. In cluster 5 the household size is below the average, while all the other variables are above it.

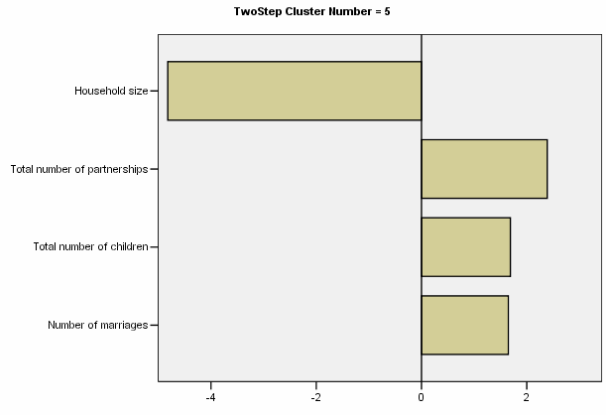
Figure 4: Two step cluster analysis of continuous variables for women 15-17/cluster 2


TwoStep Cluster Number = 1
Total number of partnerships
Total number of children
Household size
Number of marriages
-4
-3
-2
-1
0


TwoStep Cluster Number = 2
Total number of partnerships
Total number of children
Number of marriages
Household size
-1
0
1
2


TwoStep Cluster Number = 3
Household size
Total number of partnerships
Number of marriages
Total number of children
0
1
2
3
4
5


TwoStep Cluster Number = 4
Total number of partnerships
Number of marriages
Household size
Total number of children
-10
-5
0


TwoStep Cluster Number = 5
Household size
Total number of partnerships
Total number of children
Number of marriages
-4
-2
0
2

5. Conclusions

The aim of this work is to study early male and female fertility in various European countries, Canada and the USA and to investigate the associations between disadvantaged background family structure and early fertility as well as to investigate how the profile of respondents affects early fertility.

The data used for the various countries make part of the FFS survey, which enables to trace fertility for men and women. Furthermore data from the NSFG survey were used for the USA males. Based on the descriptive statistics it is obvious that experiencing a first birth as an adolescence is more common among women than for men. The gap between early male fertility and early female fertility ranges from three to five years. Variations are observed between the countries as regards to the age gap in fertility between men and women. The smallest gap is observed for Belgium, Estonia, Lithuania and Slovenia. The peak of fertility also differs between sexes but also between countries. In the case of Austria, the Czech Republic, Estonia, Finland, Lithuania and Slovenia the peak age of fertility for men is prior to age 25.

In order to estimate the age distributions of first births the P-K models has been used. The models have been useful in estimating the distribution for all male and female populations. In all the cases the simple model has been adequate for estimating the age distribution of first births indicating non heterogeneity , though no population data are included in the estimates.

Considering the associations between early fertility and disadvantaged family background, we obtained significant results especially at ages between 15-20 for males. Associations are weaker at later ages, especially at ages 23-24. In the case of women more consistent results are obtained through the various age groups.

Strong associations exist between the socio-demographic profile of the respondent and early male fertility. The educational level as well as the marital status of the respondent are associated with early fertility. The associations are significant at all age-groups. From the analysis comes out that early female fertility is strongly associated with the family background structure as well as with their educational level, family and marital status.

As regards to the country differences, mixed results are observed. Significant associations are found between the education level and the marital status of the respondent for all the group of countries. The results are consistent through all the age groups. The associations between the disadvantaged family background and early fertility are weaker at higher ages. In the case of women the results are significant at almost all ages. However a mixed picture is shown at ages 23-24.

Cluster analysis resulted in the grouping of male and female populations as regards to early fertility. Different outcome characterise men at the various age groups, as well as women at similar age groups. Thus, in the case of males aged 15-19 years most countries are characterised by low early fertility and are grouped together. A second cluster with countries with relatively higher early fertility is apparent, while Belgium and the US are characterised by high early age fertility. More variations are observed in the grouping of the countries at later ages. Greece and Italy are the countries with lowest early fatherhood at ages 20 to 24 while the US and Belgium are always in the cluster with high early fertility. The opposite

appears in the case of women, where Belgium usually belongs to the clusters characterised by lower early fertility.

Finally, examining the profile of the dominant clusters of male and females aged 15-19 and 15-17 years we found that males from the Czech Republic, Greece, Hungary, Latvia and Slovenia are low educated persons, most of them non-married, Protestants and Jewish and with no employment. Men from Austria, Italy, Portugal, Lithuania are high educated, at a high percentage non married and students. A high percentage of them are Catholic, Islamic and freethinking. More variations are observed in the case of females.

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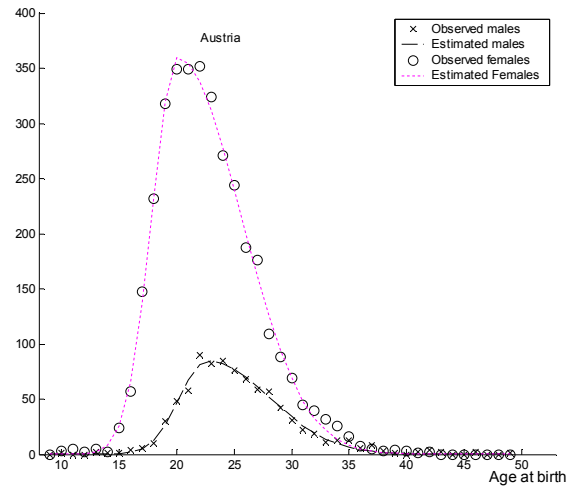
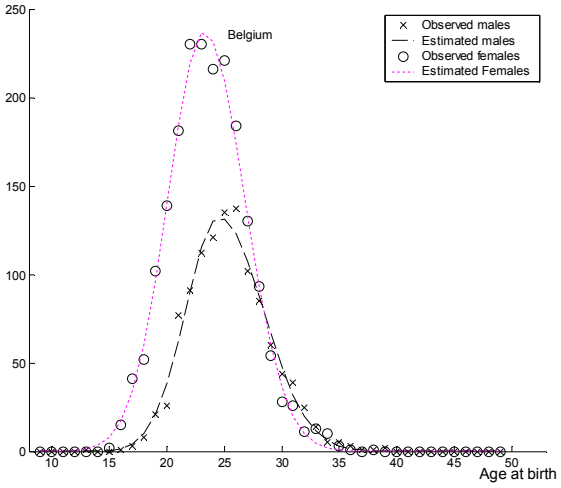
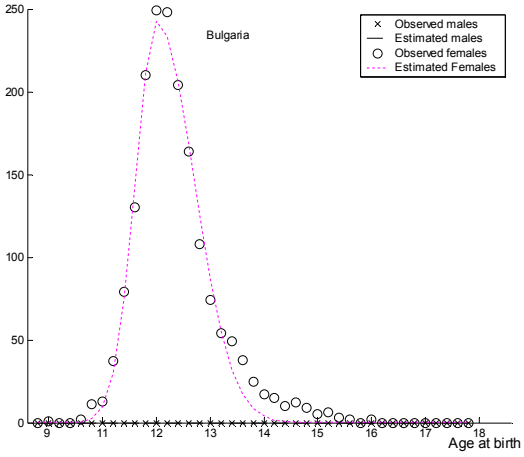
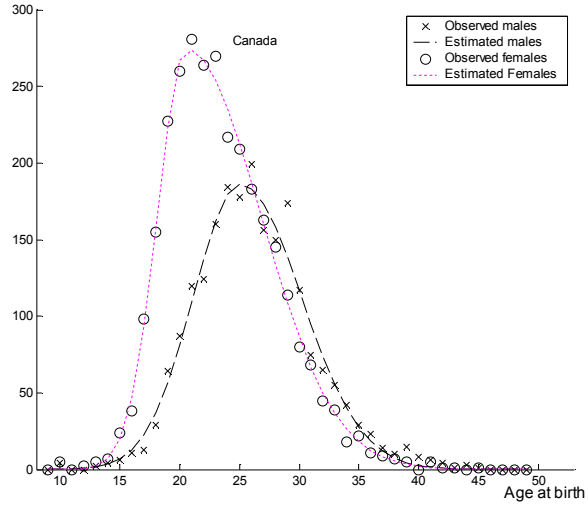
APPENDIX

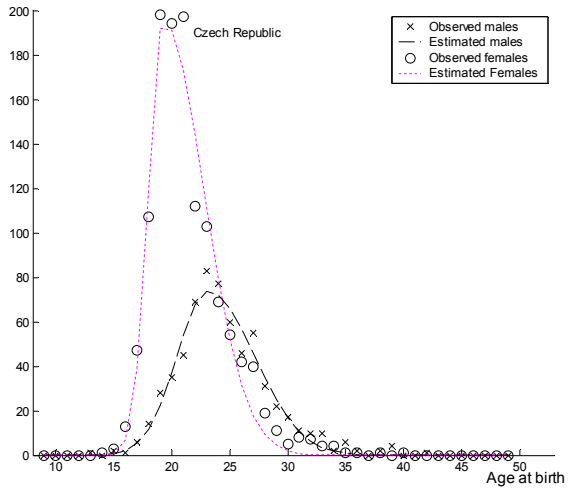
Figure 5: Distribution of age at first birth form en and women

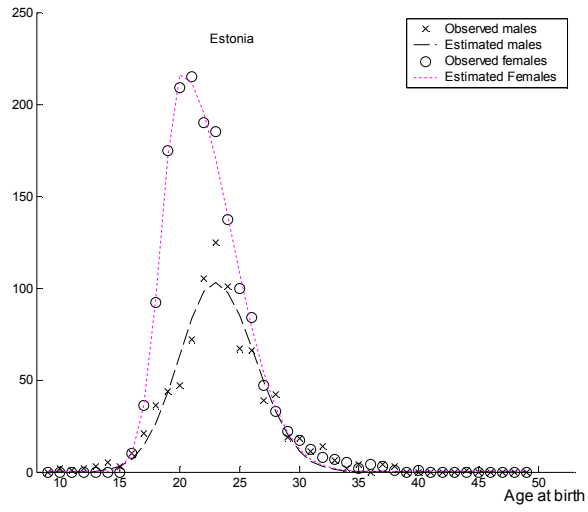


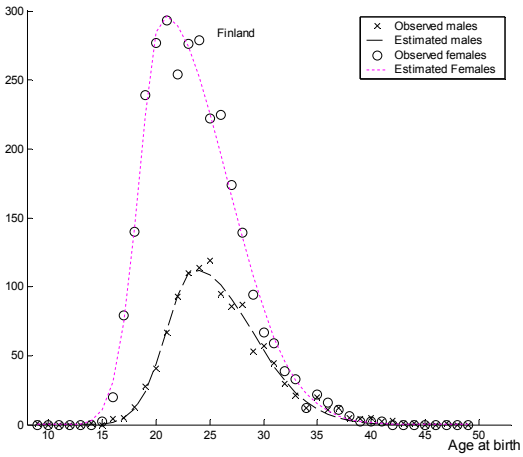


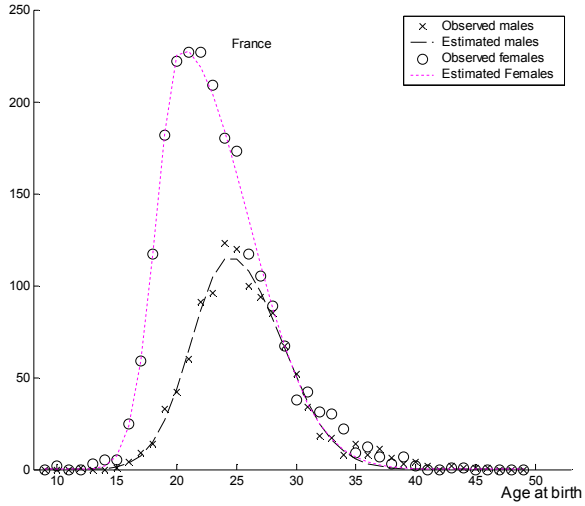


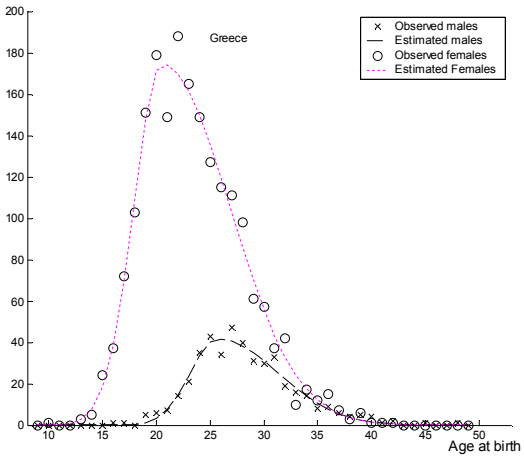


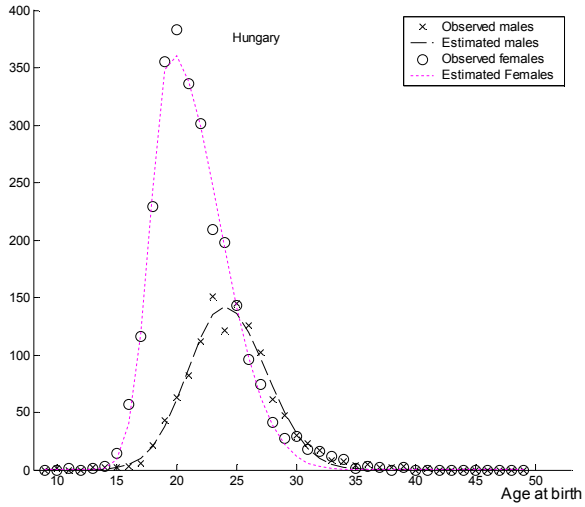


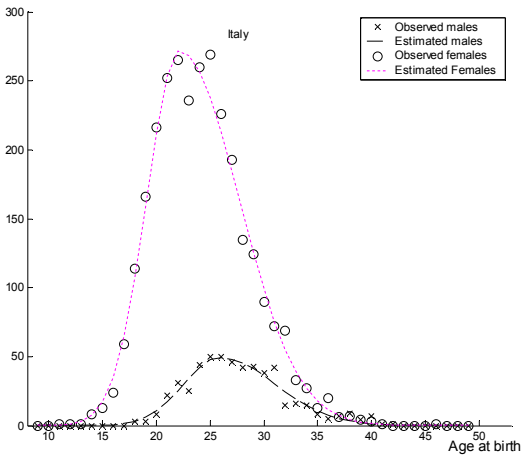


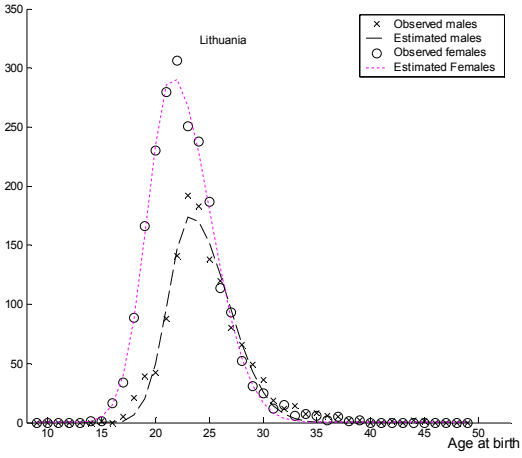

Finland
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

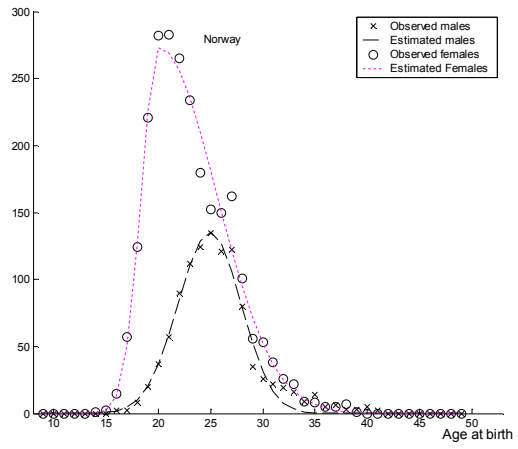

France
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

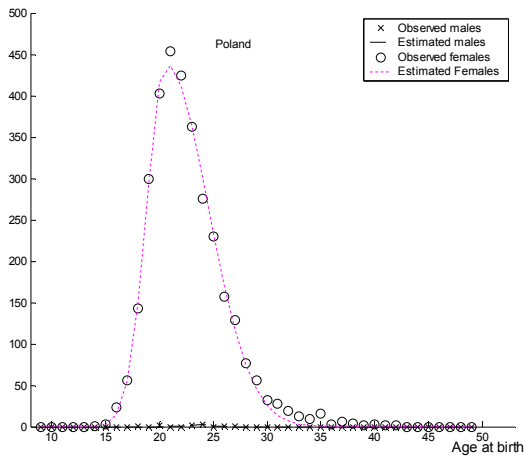

Greece
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

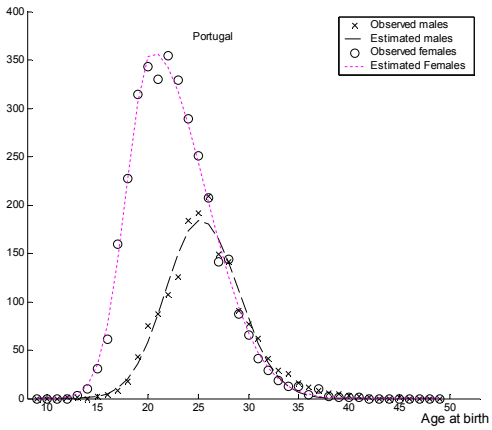

Hungary
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

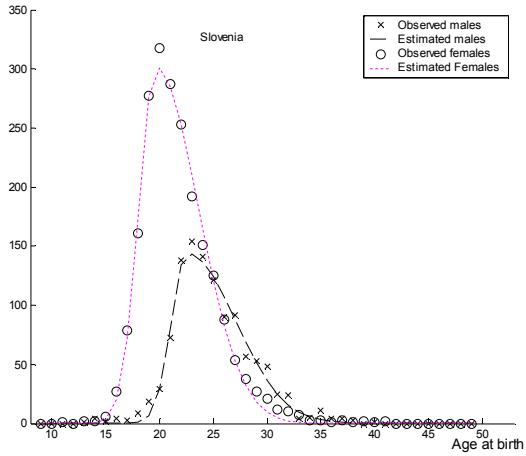

Italy
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

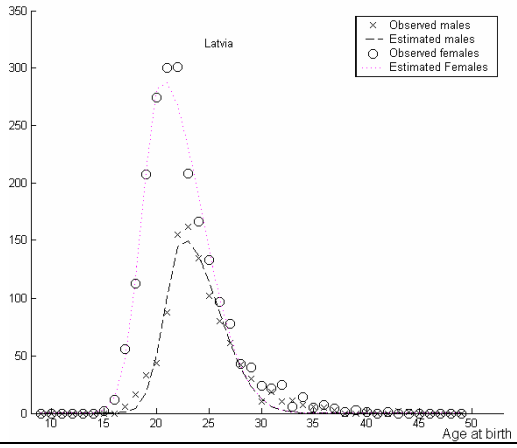

Lithuania
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

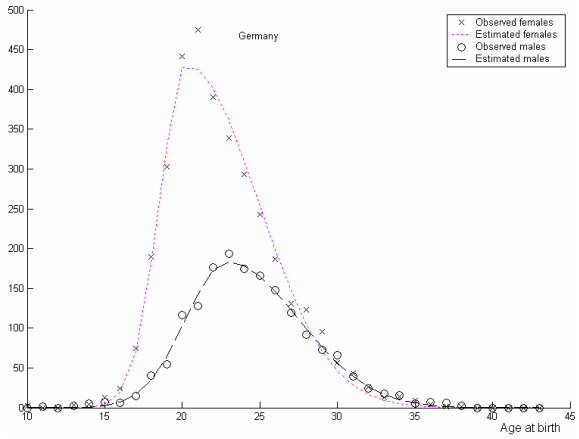

Norway
Observed males
Estimated males
Observed females
Estimated Females
Age at birth

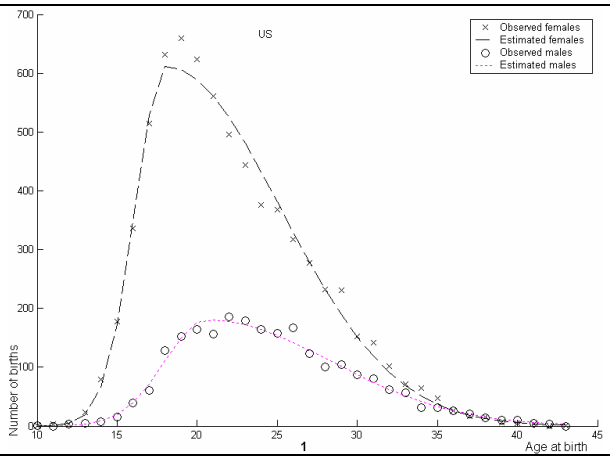

Poland
Observed males
Estimated males
Observed females
Estimated Females
Age at birth


Portugal
Observed males
Estimated males
Observed females
Estimated Females
Age at birth


Slovenia
Observed males
Estimated males
Observed females
Estimated Females
Age at birth


Latvia
Observed males
Estimated males
Observed females
Estimated Females
Age at birth


Germany
Observed females
Estimated females
Observed males
Estimated males
Age at birth


US
Observed females
Estimated females
Observed males
Estimated males
Number of births
Age at birth
0
100
200
300
400
500
600
700
10
15
20
25
30
35
40
45
1