Field of education, postponement intentions and childlessness

An exploration based on the European Social Survey

Jan Van Bavel

Interface Demography – Vrije Universiteit Brussel

Jan.VanBavel@vub.ac.be

Paper for the EAPS

European Population Conference 2006,

21-24 June 2006, Liverpool UK.

First draft – work in progress

In the context of below-replacement fertility, the birth rate is determined chiefly by the timing and number of first and second births. In most European countries, at least 75% of all births are first or second. This means that ups and downs in the birth rate are highly influenced by who postpones a first birth and remains childless. Yet, the number of studies and publications about childlessness has remained strikingly low (Sobotka 2004, 126), at least until recently.

This paper aims to contribute to our understanding of postponement and childlessness in Europe by exploring its connection with women's education. Most research about education and fertility has focused on one particular aspect of education, i.e. on the level of educational attainment, considered primarily as an individual attribute (Hoem, Neyer & Andersson 2006). These studies have found that

for women, educational attainment is negatively related to fertility: more highly educated women generally have lower fertility on average and a higher proportion of childlessness. Highly educated women postpone parenthood more than women with lower educational attainment and, as a consequence, a higher percentage is childless at any given age. The literature mentions several explanations. For example, childbearing entails opportunity costs that are bigger for highly educated women. Also, it is argued that more lifestyle options are open to women as their educational attainment rises, offering more alternatives to the roles of mother and caretaker (Hoem, Neyer & Andersson 2006).

In a recent paper, Hoem, Neyer and Andersson (2006) have drawn attention to two dimensions of education that have received much less attention than the level of educational attainment, namely the field of education on the one hand and institutional aspects of the educational system on the other. This paper links up with the first of these two dimensions: we will explore to what extent women's field of education is able to explain a significant portion of childlessness in Europe, beyond what can be explained by the mere level of education.

Using official register data, Hoem and colleagues looked at an entire cohort of Swedish women. They found that permanent childlessness in this cohort was significantly associated not just with the level but also with the field of education. This contribution will try to assess whether the Swedish finding can be generalized to Europe. To this end, data from the second round of the European Social Survey are used (Jowell et al. 2005). From now on, these data are called by their shorthand name ESS2.[1]

The approach taken here differs in important respects from the paper by Hoem and colleagues. First, the Swedish study uses a very big dataset that allows making detailed distinctions between many educational fields. Also, the study carefully documented the institutional setting of the Swedish educational system. In this study, we use a much smaller dataset. Inevitably, therefore, our approach will have to be

[1] More specifically, this papers is based on ESS2 edition 2.0 (production date 7.03.2006). The author is very grateful to the excellent services provided by the Norwegian Social Science Data Services (NSD), who are the data archive and distributor of the ESS data. See http://ess.nsd.uib.no/index.jsp.

much cruder, distinguishing between broad groups of educational fields only. The advantage of the ESS-data is that they cover not just one European country but sample more than twenty countries. Yet, we have not been able to study how educational systems and institutions differ from country to country. So also in that sense, the approach will be rather crude in this paper. In sum, the analyses in this paper are more general but also cruder than the ones presented by Hoem, Neyer & Andersson (2006).

A second important difference is that the Swedish study focuses on permanent childlessness, measured at the end of the fertile life stage. In contrast, the present study includes all women aged 20 to 40 years and models childlessness as a function of age. And thirdly, the Swedish study looks at who remained childless *de facto* whereas this paper follows a two-step approach and looks at two different things. In the first step, the dependent variable is *de facto* childlessness between ages 20 and 40. In the second step, the dependent variable is not actual childlessness but rather childlessness *intentions*. The second step conditions on the outcome of the first step in the sense that childlessness intentions are modelled only for childless people. More specifically, in this second step we analyse who intends to postpone parenthood for at least three more years. Again, the age range is restricted to women between 20 and 40 years, where the bulk of first births occur.

Education and childlessness

Research about the relationship between education and childbearing has tended to focus on a single dimension, namely on the vertical differentiation of levels of educational attainment. Hoem and colleagues (2006) have drawn attention to the importance of the horizontal dimension of fields or types of education.

There are at least three reasons why study field may have an impact on intended and actual childbearing. First, the choice of educational field reflects a person's preferences and some of these may also relate to childbearing. Second, the area of education determines to some extent the social environment during student's formative years. This includes the extent of sex segregations in the chosen study area and values and norms which may have an impact on subsequent fertility or infertility. Thirdly, the choice of a study domain has a strong impact on a person's future employment opportunities, so their may also be an indirect effect of field of study on fertility via the position in the labour market (Hoem, Neyer & Andersson 2006).

In this explorative paper, I will not embark upon a detailed theoretical analysis of how particular fields of education may be related to childbearing. This would necessitate studying the educational systems in different European countries. Instead, the question answered in this paper is whether or not field explains a significant part of variability in childlessness in 23 European countries.

Field of education

In ESS2, respondents where asked the field or subject of their highest qualification and they were offered fourteen answering alternatives. As the number of cases in some fields was too small, these were regrouped into nine categories:

1	Teacher training or education	
2	Arts & Humanities	
3	Science & Technology	
4	Health care	
5	Private and public administration	
6	Law and legal services	
7	Personal care services	
8	General or no specific field	
9	Other	

Some fields need some comment. First, the category of women trained as teachers is not as clear-cut as we would like. For those who did not choose education as their major field of study, we cannot distinguish between women who obtained additional qualifications to be a teacher and those who did not, in contrast to the Swedish study. As a result, there will be many teachers among those who declared that their major study area was science or the humanities, for example. Second, preliminary analysis showed that the level of childlessness is particularly high among women who indicated that they followed legal studies. Therefore, it was decided to provide for a separate category for this group even if the number of cases in this group is relatively limited. Fourth, the category “personal care services” includes vocational training

leading to jobs as diverse as cooks, hairdressers, salespersons, or sewers, for example. As a result, heterogeneity within this category is likely to be very large.

Level of education

With ESS2-data, two operationalizations of the level of education are possible. The first possibility is to look at the number of years completed in fulltime education. Although this approach is often used, it can only be considered a proxy of educational attainment. Therefore, it was preferred to use an ordered categorical variable indicating the highest degree obtained. Exploratory analyses indicated that this measurement yielded the best results, even if the number of levels distinguished was reduced to three for the sake of parsimony: low, medium, and high.

Low (no secondary education finished)

- 0 Not completed primary education
- 1 Primary or first stage of basic
- 2 Lower secondary or second stage of basic

Middle

- 3 Upper secondary
- 4 Post secondary, non-tertiary

High

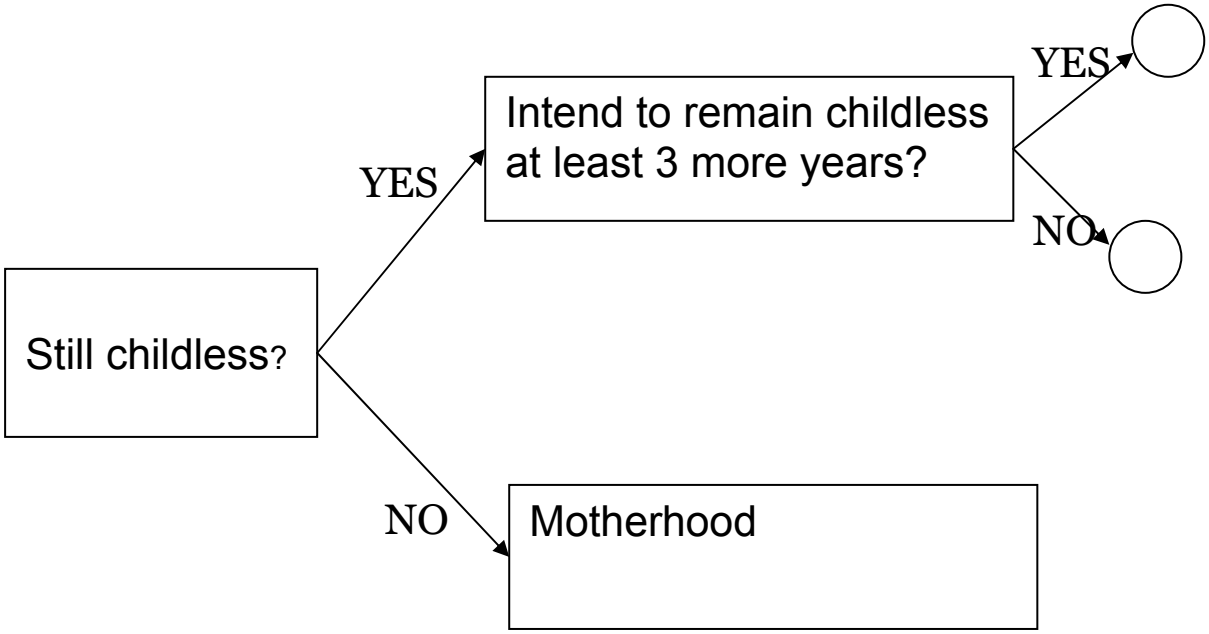
- 5 First stage of tertiary
- 6 Second stage of tertiary

For Great Britain, information about the highest degree obtained was unavailable in the integrated ESS2-datafile. Therefore, the level of education was derived from the number of years completed in fulltime education. All women with less than the first quartile number of years of education were assigned a low level, all those between the first and the third quartile were assigned a medium level, and all women with more years in fulltime education that the third quartile were assigned a high level of education. In this way, the distribution of level of education observed for all other countries combined was approximately reproduced for Britain (i.e. 25%, 50%, and 25% with low, medium, and high level of education respectively). Yet, it should be reminded that this proxy introduces additional noise into the analysis.

Childlessness and childlessness intention

This paper does not analyse permanent childlessness but rather two other things. In a first step, we model the probability of being childless at any age within the 20-40 age range. So women who observed to be childless, say at age 30, may just be postponing motherhood or they may be forgoing it altogether, intentionally or not. In a second step, we select those who *de facto* are childless and see whether they intend to postpone motherhood for at least three more years (see figure 1). We cannot distinguish between women who intend to remain permanently childless and women who intend to postpone only.

Figure 1. De facto and intended childlessness modelled in two steps



Respondents in ESS2 were asked the following question: "Do you plan to have a child within the next three years?" They were offered four answering alternatives: definitely not, probably not, probably yes, definitely yes (pregnant women were coded as "definitely yes"). The second step of our analysis models the probability that a woman is selecting the first alternative: definitely not. Hence, the second step conditions on the outcome of the first step. De first step models *de facto* childlessness, the second postponement or childlessness intentions.

Earlier studies have concluded that fertility intentions have more predictive power for actual fertility if they are held with greater certainty (Schoen et al. 1999). Also, it was found that negative fertility intentions are more reliable than positive intentions: women who state that they expect to have a child in the near future tend to overestimate their actual subsequent fertility. However, women who do not expect to have children in the following years seem to be highly reliable in their forecasting (Noack & Østby 2002, 104).

Note that the process leading to a "definitely not" is very different from the process leading to a "definitely yes", so the alternatives should not be viewed as symmetrical. There are theoretical reasons for this asymmetry but exploratory analysis not reported here also clearly indicate that positive and negative fertility intentions are not mirror images.

Countries and weights

The integrated file of ESS2 edition 2.0 contains survey data for 24 countries. Yet, France had to be dropped from the analysis because the French data do not include information on the field of education. Therefore, the following analyses are based on ESS2-data for 23 countries (from north to south, see Map 1 and table 1): Iceland, Norway, Sweden, Finland, Estonia, United Kingdom, Ireland, Denmark, Germany, Poland, Netherlands, Belgium, Luxemburg, Czech Republic, Slovakia, Ukraine, Switzerland, Austria, Hungary, Slovenia, Portugal, Spain, and Greece.

Map 1. Countries included in the analysis

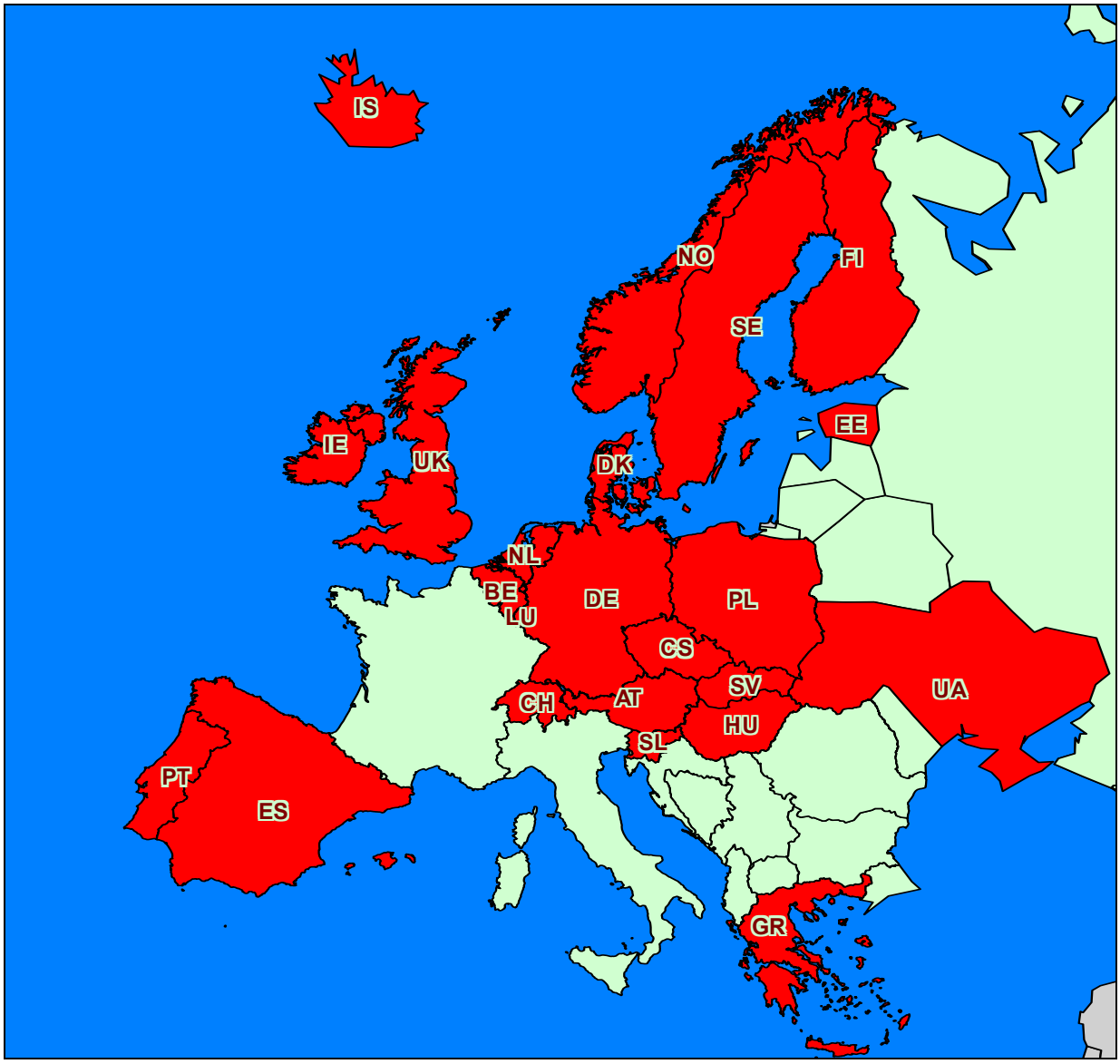


Table 1 gives the unweighted number of cases available for the analysis of de facto childlessness. In all regression models to be presented, cases have been weighted by both the ESS2 population weight and the design weight. The first weight ensures that cases from a particular country affect the outcome of the combined European analyses in proportion to the size of the population of that country, even if sample sizes were similar in most countries. Respondents from countries with few inhabitants, like Luxemburg, weigh less than respondents from big countries, like Germany. The design weight corrects for differences between countries in sampling design. More information about weights in ESS2 can be found in the brochure

Weighting European Social Survey Data on the ESS data homepage (http://ess.nsd.uib.no/).

Table 1. Countries included in the analysis and unweighted number of cases available for the analysis of de facto childlessness

Country	unweighted N	Percent
Austria	388	5.6
Belgium	288	4.1
Switzerland	398	5.7
Czech Republic	470	6.8
Germany	408	5.9
Denmark	242	3.5
Estonia	225	3.2
Spain	281	4.0
Finland	325	4.7
United Kingdom	315	4.5
Greece	419	6.0
Hungary	273	3.9
Ireland	411	5.9
Iceland	90	1.3
Luxembourg	260	3.7
Netherlands	322	4.6
Norway	297	4.3
Poland	324	4.7
Portugal	357	5.1
Sweden	301	4.3
Slovenia	219	3.1
Slovakia	11	.2
Ukraine	334	4.8
Total	6958	100.0

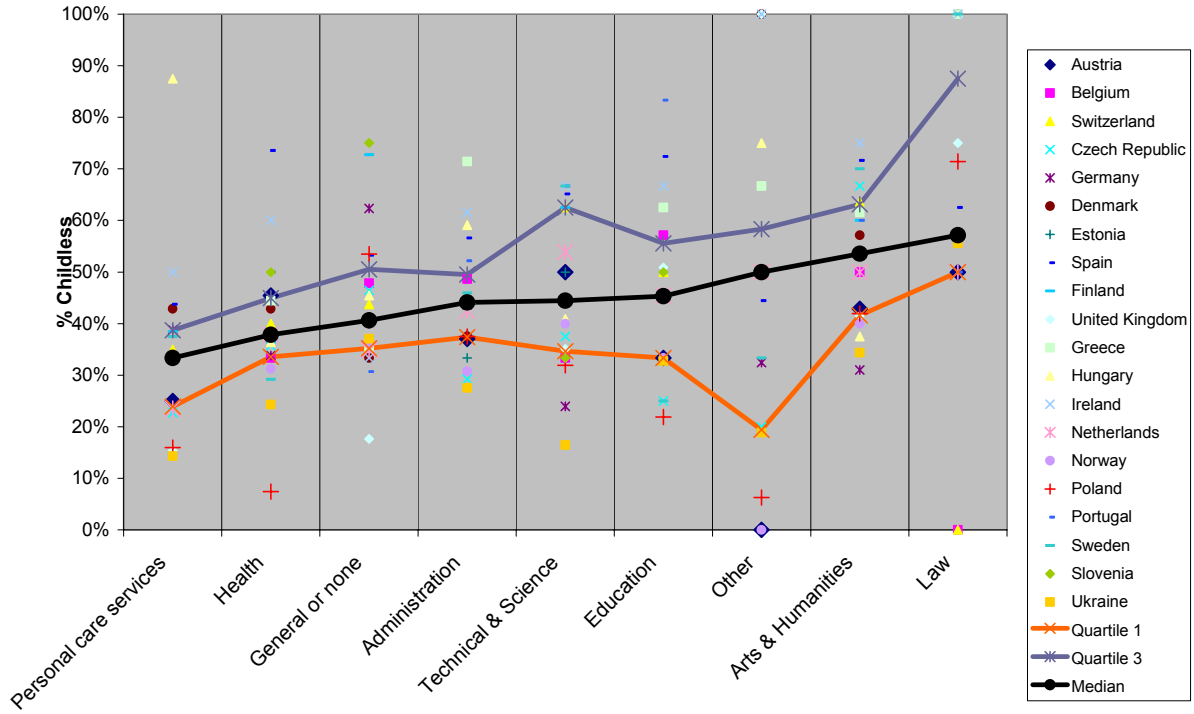
Results

De facto childlessness

In order to see, in a descriptive way, whether educational domains make a difference, Figure 2 plots the proportion of childless women aged 20 to 40 by field of education. The dots, little squares, crosses and other markers refer to 23 different countries. As the number of women in some countries and educational fields are small, there are many unreliable outliers that distort the picture. Therefore, the first, second (median)

and third quartiles were calculated, treating the 23 countries as units – and, hence, giving each country the same weight for the time being; later on proper population and sampling design weights will be applied. Figure 2 orders the educational fields by the median percentage of childless women.

Figure 2. Percentage of childless women, aged 20-40 years, by field of education and country, 2004/2005



Source: ESS2 (2004/2005)

The first observation from this figure is that there are clearly important differences between educational domains. Median levels of childlessness range from 33% among women educated in personal care services like catering and hairdressing, to 57% among those who followed law studies. Apart from personal care services, relatively low percentages of childlessness are also observed among women educated in health services (for example as nurses or as medical doctors), among women trained to work in business or public administration (as secretary or as chief executive), and among women educated in a general, non-specific field. Particularly high percentages of childlessness are found among women with an educational background in the arts and the humanities, apart from the students in law and legal services.

The second observation from this plot is that there is substantial heterogeneity between countries with respect to childlessness in each of the educational domains. For example, while women trained as teachers tend to have higher childlessness than average, they are the group with the lowest childlessness in Sweden. (The latter observation is in accordance with the findings by Hoem and colleagues (2006)). The differences between countries call for a multilevel modelling framework that tries to take into account sources of variance on the country level. Yet, even though there is considerable heterogeneity, first, second, and third quartiles are in most cases not so far apart as might be expected. In most cases, the first and the third quartile lie fairly symmetrically around the median. Therefore, it seems to make sense to try to identify some overall "average" level of childlessness associated with specific fields of education across countries. The most important exception is, not unexpectedly, the "other" category. Indeed, this category is a repository for a number of very heterogeneous domains that are too small to be brought under a separate, more meaningful heading. For the group of women educated in technology and the natural sciences, the margins between quartiles are rather big as well.

In the light of the finding by Hoem et al. (2006) that women educated for jobs in teaching had much lower childlessness than any other major grouping, it may seem surprising to find women trained for education in the upper half of the childlessness distribution in figure 2. Several points can be made in this respect. First, as said, the ESS2-data confirm that women trained as teachers have the lowest level of childlessness in Sweden. However, in most other countries this does not hold. Second, figure 2 assembles all women between ages 20 and 40, so most women will not remain permanently childless. In contrast, the Swedish paper is about permanent childlessness. Finally, the Swedish study is able to distinguish between women trained in the humanities or in the natural sciences, for example, who did acquire the additional qualifications to be a teacher on the one hand, and those who did not acquire these additional qualifications on the other hand. This distinction is not possible with the ESS data. Respondents were just asked to indicate their major field of education. As a result, many teachers probably have indicated their specialty, for example in the humanities or natural sciences, instead of indicating that they were trained as a teacher.

The high percentage of childlessness among women who studied law and legal services, as opposed to the low childlessness among women trained to work in personal care services, raises the question whether differences between educational fields will stand after taking the *level* of education into account. Indeed, it can be expected that most women in the former group have a university degree, or pursuing such a degree. The opposite holds for the latter group: women educated in personal care services probably have a lower level of education, on average, than law students, for example. We therefore need to control at least for the level of educational attainment in order to assess the role of field of education.

Multilevel regression model

Of course it is advisable to introduce some other controls as well. *Age* is evidently an important covariate of childlessness. Including it in the regression model will allow us to produce model-based predictions of the level of childlessness at any given age. Furthermore, it should be reminded that the analysis is based on cross-sectional data, so age reflects not just age but also birth cohort. This is a reason why age may be related to field of education, because maybe women of more recent generations are more inclined to take education in a particular field than older generations.

In all models to be presented, age is included on the right-hand side of the equation in the form of a second order polynomial, as a convenient way to allow for a nonlinear relationship between age and childlessness. Recall that the age range is restricted to 20 to 40 years. Therefore, the age variable has been rescaled by subtracting 20 years so that the intercepts of all regression models refer to the level of childlessness at age 20.

Partnership situation is another crucial determinant of childbearing behaviour. Two aspects of the partnership situation are included here. First, the regressions include the number of years that women have been living with their partner. This variable is set to zero for those who are not living with a partner. Again, we include a second order polynomial for this variable to allow effects to be nonlinear. Second, we add a dummy variable indicating who is married and who is not.

Fields of education are expected to be associated with a range of fields of occupational activity. Therefore, we would like to control for the professional domain women are working in. Unfortunately, this information is not available in ESS2. What we do have

is a general indicator of women's self-declared *main activity*: paid work, in education, unemployed but looking for a job, unemployed and not looking for a job, doing housework, and other (permanently sick, community service etc.). Using a set of dummy variables, this is included in the model as well.

Table 3 gives the estimated regression parameters for three multilevel models. Point estimates are exponentiated in order to allow interpretation as odds ratios. In all three cases, the dependent variable is the log of odds that a woman currently still has no children rather than at least one child. Only children alive are covered, because ESS2 does not include information about deceased children. In determining the value of the dependent variable, both children living in the mother's household and children living in another household were counted. It should be noted that, with ESS2, it is impossible to distinguish between biological children, stepchildren or adopted children for those living within the mother's household. In consequence, the prevalence of childlessness will be underestimated if one means to refer to biological childlessness.

Because it can be expected that the effect of educational field, if any, differs from country to country, I have been trying to estimate a model with random slopes. These attempts were not successful due to convergence problems, maybe due to lack of sufficient data. As a consequence, the multilevel models to be presented only allow the intercept to vary from country to country. The intercepts are assumed to be normally distributed in the population of countries. The mean value of this distribution of intercepts can be found on the line labelled "Intercept" in the upper part of Table 3, reporting the fixed effects. The square root of the estimated variance of the distribution of intercepts is to be found in the part reporting the random effects (below "Std.Dev."). These estimates are based on Laplace approximation, which is described in the literature as being more precise than marginal or penalized quasi-likelihood methods. In addition, if Laplace approximations are used, the deviance can be used to produce chi-squared tests (Snijders & Bosker 1999, 218-220). Estimates were computed by the *lme4* package of *R* (R development Core Team 2006; Bates & Sarkar 2006).

Model a1 includes the control variables as well as a set of dummy variables indicating the field of education. Model a2 adds the level of educational attainment to the first model, while model a3 includes the level of education but not the field. We will now compare the results of these three models.

Table 3. Multilevel logistic regression of being childless in 23 European countries, ESS2 (2004/2005)

Covariates	Model (a1) with educational field			Model (a2) with field *and* level			Model (a3) level without field		
	Exp(b)	s.e.(b)	P(>|z|)	Exp(b)	s.e.(b)	P(>|z|)	exp(b)	s.e.(b)	P(>|z|)
FIXED EFFECTS									
Intercept	17.95	0.1802	<.001	12.72	0.2177	<.001	13.93	0.1669	<.001
Age minus 20	0.86	0.0237	<.001	0.86	0.0288	<.001	0.86	0.0235	<.001
Age minus 20²	1.00	0.0011	0.118	1.00	0.0013	0.252	1.00	0.0011	0.196
#years living with partner	0.72	0.0211	<.001	0.72	0.0226	<.001	0.72	0.0207	<.001
#years living with partner²	1.01	0.0011	<.001	1.01	0.0012	<.001	1.01	0.0011	<.001
Married	0.51	0.0917	<.001	0.50	0.0991	<.001	0.54	0.0902	<.001
Main activity									
- paid work	1.00			1.00			1.00		
- in education	3.74	0.1846	<.001	3.58	0.1946	<.001	3.26	0.1817	<.001
- looking for a job	0.64	0.1171	<.001	0.71	0.1315	0.010	0.71	0.1190	0.004
- not looking job	1.19	0.1809	0.348	1.34	0.2201	0.184	1.23	0.1808	0.260
- housework	0.09	0.1021	<.001	0.09	0.1166	<.001	0.09	0.1016	<.001
- other	0.90	0.1763	0.552	0.97	0.2033	0.875	0.97	0.1746	0.842
Educational field									
- personal care services	1.00			1.00					
- health	1.62	0.1289	<.001	1.37	0.1555	0.041			
- general, no specific field	1.12	0.1169	0.314	1.22	0.1423	0.155			
- administration	1.36	0.1087	0.005	1.17	0.1318	0.228			
- technology & science	0.67	0.1353	0.003	0.57	0.1568	<.001			
- teaching	2.42	0.1429	<.001	1.91	0.1767	<.001			
- other	1.20	0.2059	0.383	1.15	0.2577	0.588			
- arts and humanities	1.03	0.1443	0.856	0.84	0.1654	0.285			
- law & legal services	4.73	0.2484	<.001	3.34	0.2670	<.001			
Level of education									
- low				1.00			1.00		
- medium				1.55	0.0968	<.001	1.44	0.0889	<.001
- high				2.26	0.1149	<.001	2.35	0.0988	<.001
RANDOM EFFECTS	Std.Dev.			Std.Dev.			Std.Dev.		
Country (23 countries)	0.3319			0.3436			0.3325		
N unweighted	6811			6811			6811		
Deviance	7086.04			7028.70			7139.45		
Loglikelihood	-3543.02	df=	20	-3514.35	df=	22	-3569.72	df=	14
BIC	7262.56			7222.88			7263.02		

The control variables have the expected effect in all three models. Figure 3 illustrates the model effects of age and partnership situation. They can be interpreted as follows. The predicted proportion childless declines nonlinearly with age, first slowly and more rapidly after age 25. Cohabitation with a partner speeds up entry into parenthood. This holds for unmarried cohabitation but even more after marriage. The rate of entry into parenthood depends in a non-linear way on how long people are living together with a partner. At first, the proportion childless declines ever more rapidly as a woman is cohabiting for a longer time. But after about five years, the process of entry into parenthood slows down markedly for couples who have not yet had their first child. This may reflect both a generic effect of duration and a selection effect of people with low childbearing propensities, voluntarily of involuntarily, for physiological or other reasons.

Figure 3. Model effects of age and partnership situation (model a2)

Predicted probability of childlessness for a woman in paid work, trained in personal care services, and medium level of education, by age and partnership situation

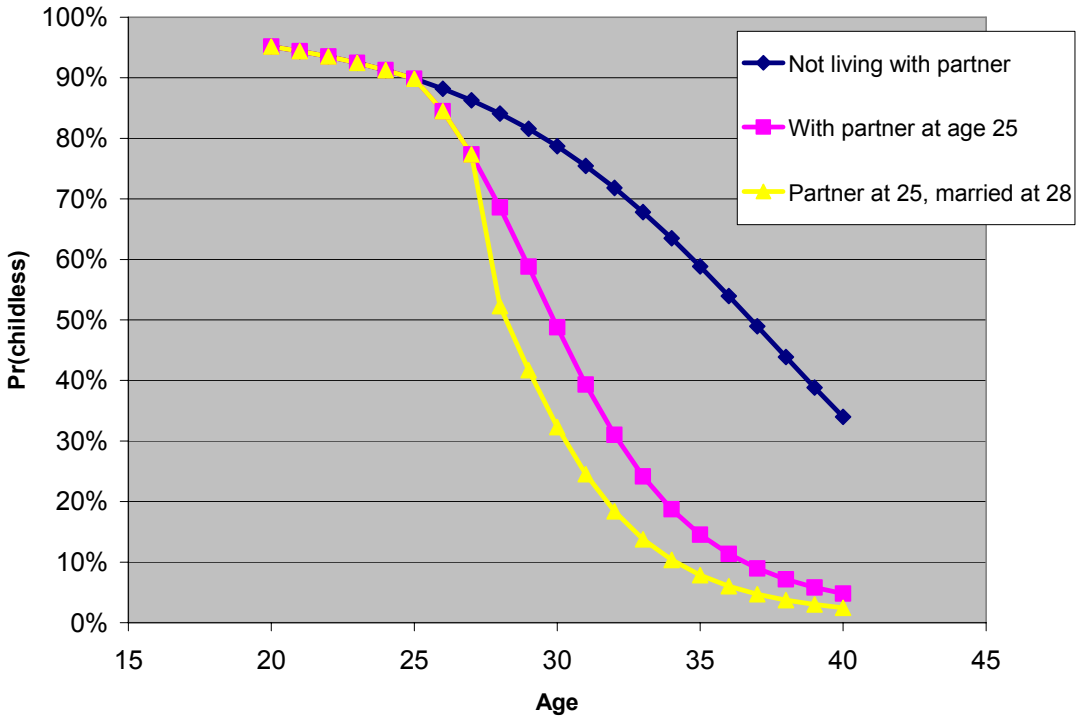
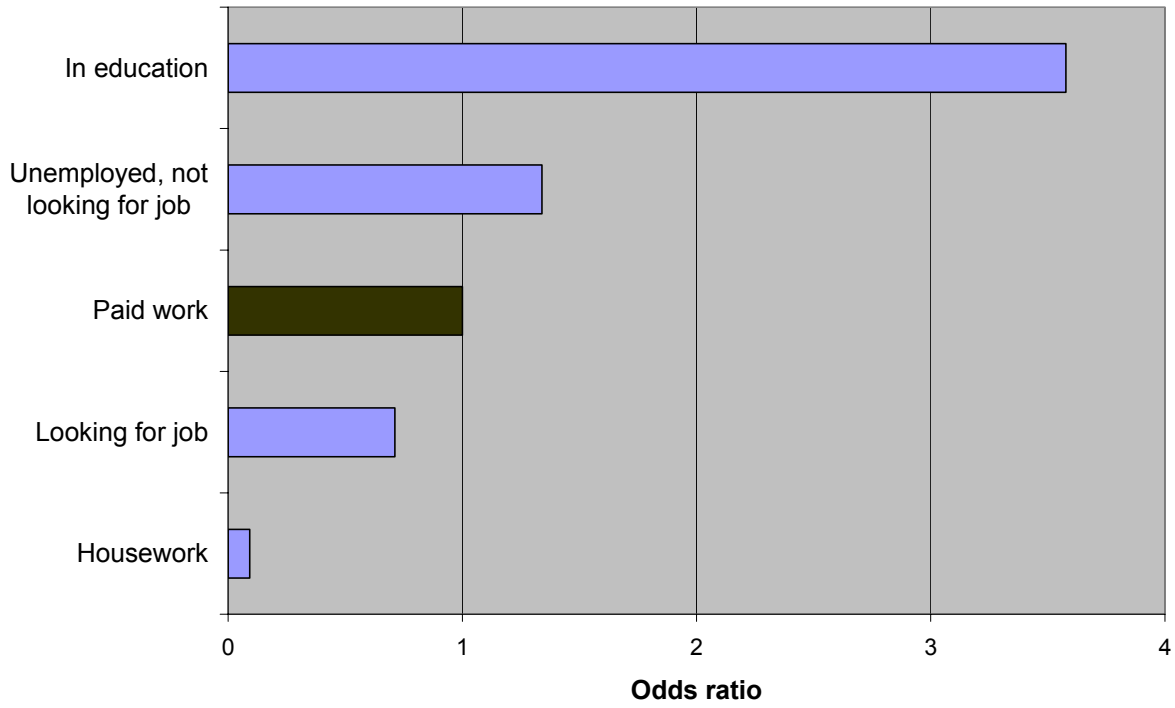


Figure 4 displays the odds ratios for main activity, with women in paid work as the reference category. Compared to this group, the odds of still being childless is more than three times as high for women who are mainly in education. Women who say that they are unemployed but looking for a job are estimated to be less likely to be childless than women who do have a job, while unemployed women who are not looking for a job a more likely to still be childless (although the latter difference is not statistically significant). The group of women who is least likely to be childless is, as expected, composed of people who indicate that their main activity is doing housework, which includes looking after children. Most probably, the causal effect mainly runs from childbearing towards main activity in this case rather than the other way around.

Figure 4. Effect of main activity (model a2)

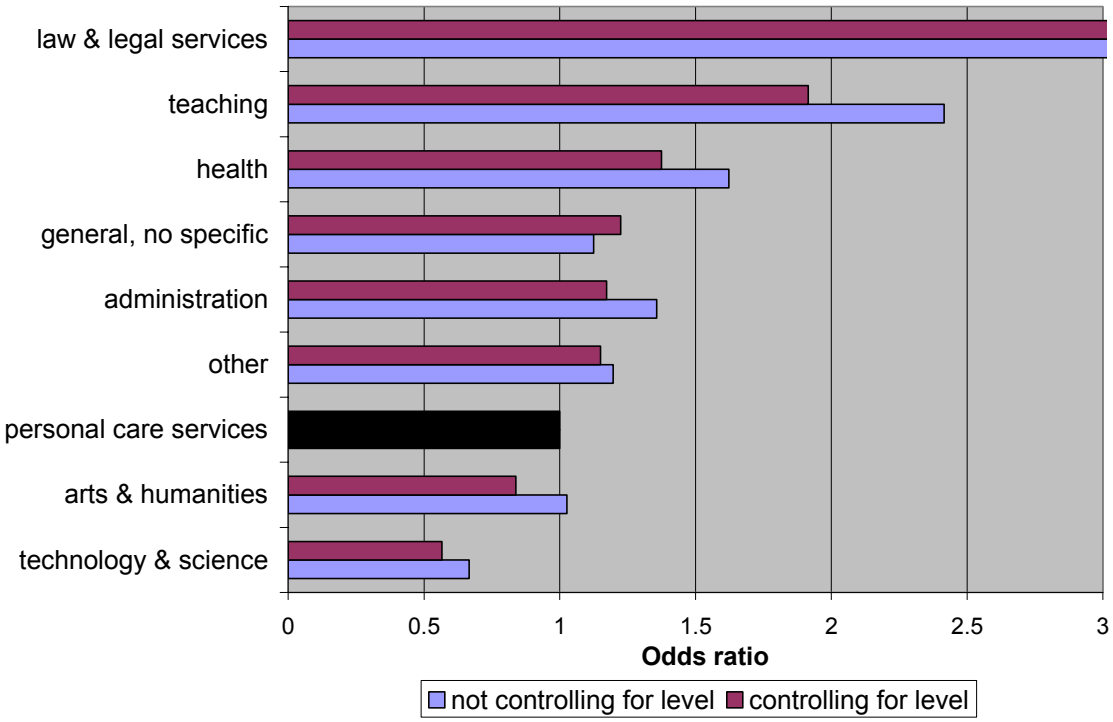


We now turn to the factor that is really at issue in this paper. Model 1a includes field of education without controlling for the level. A likelihood ratio chi-squared test indicates that field of education does have a significant effect on the proportion childless: the deviance of model 1a is 7086 with 20 degrees of freedom (see the lower panel of Table 3), while a variant of the same model but without the dummy variables that indicate field of education has a deviance of 7221 with 12 degrees of freedom. The

difference is supposed to have a chi-squared probability distribution with 8 degrees of freedom. In this case the difference is equal to 135, which is significantly different from zero ($p<0.0001$). Hence, the first conclusion is that field of education significantly affects childlessness, on average in the studied European countries.

The bars in Figure 5 display the odds ratio's of childlessness for different fields of education, compared with the reference category of women educated in personal care services. The latter were selected as the reference group because they were the ones with the lowest proportion childless in the descriptive, bivariate analysis (see figure 2). After controlling for age, partnership situation and main activity, it turns out that the lowest likelihood of childlessness is associated with the group of women educated in the natural sciences, engineering and technology. The difference with the reference group is significant.

Figure 5. The effect of field of education on childlessness, with and without controlling for level of education (model a1 versus a2)



Contrary to the findings in the Swedish paper, women educated in health care or as teachers are significantly more likely to be childless after controlling for the other covariates. Recall, however, that the group of teachers is not as clearly defined in the

ESS2 data as in the Swedish analysis. Also, it should be reminded that heterogeneity between countries in the effect of field of education may be substantial, as suggested by figure 2. All models in Table 3 report a fixed effect of education, which is in fact a weighted average across countries.
As in figure 2, women educated in law and legal services stand out as a category of their own, with exceptionally high odds of being childless at any age. Women with a background in arts and the humanities do not differ significantly from the reference group.

Now the question is whether field of education still has a significant effect after controlling for the level of education. This can be judged by comparing model a2 and model a3. The latter model includes the level of educational attainment but not the study field. Model a2 includes both level and field. If field has a significant impact, the deviance of the second model should be significantly lower than the deviance of the third model. This is clearly the case: the difference between both deviances equals 110.75. Assuming a chi-squared distribution with 8 degrees of freedom, this is significantly different from zero ($p<0.0001$). So the second conclusion is: even after controlling for level of education, the field of study is significantly related to childlessness.

According to the Bayesian Information Criterion (BIC), the second model, the one that includes both field and level of education, turns out to be the best model: for a fixed set of data, the best model is the one with the lowest BIC value. The criterion takes both the model fit and parsimony into account.

As can be seen in figure 5, differences between fields of education change after controlling for level. With few exceptions, the differences with the reference group become smaller. There are only minor changes in the rank order. Women educated in health care, as teachers, or in law are still the most likely to be childless after controlling for the other covariates. Women educated in technology and science, in personal care services, or in arts and the humanities are least likely to be childless between ages 20 and 40. Again, this average rank order for the 23 European countries combined is very different from the order found in Sweden.

Figure 6 illustrates the effect of the level of education, as estimated in model a2, by graphing differences between levels as a function of age. As may be expected *a priori*, differences between educational levels are smallest for the youngest and oldest women in the 20-40 age range. Relatively large differences are found among women in their late twenties and early thirties, with the highest proportions childless among the highly educated, the lowest among women with a low level of education, and the medium level in between.

Figure 6. Model probability of childlessness by age and level of education for a women in paid work, trained in health care, living with a partner from age 20, not married (model a2)

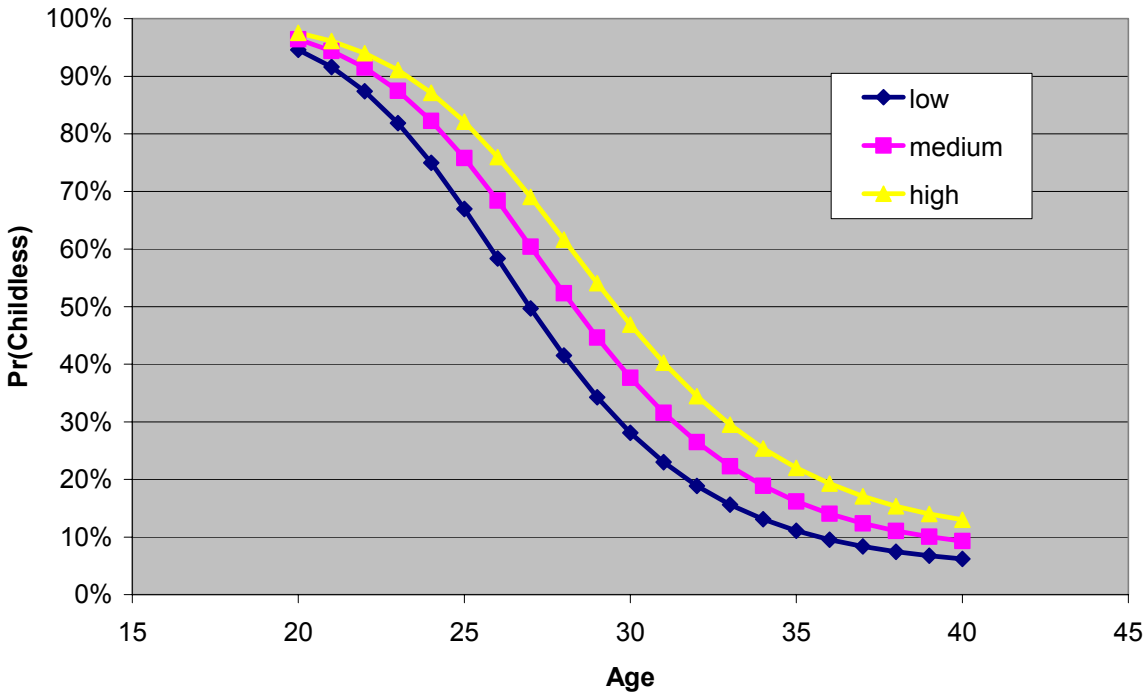
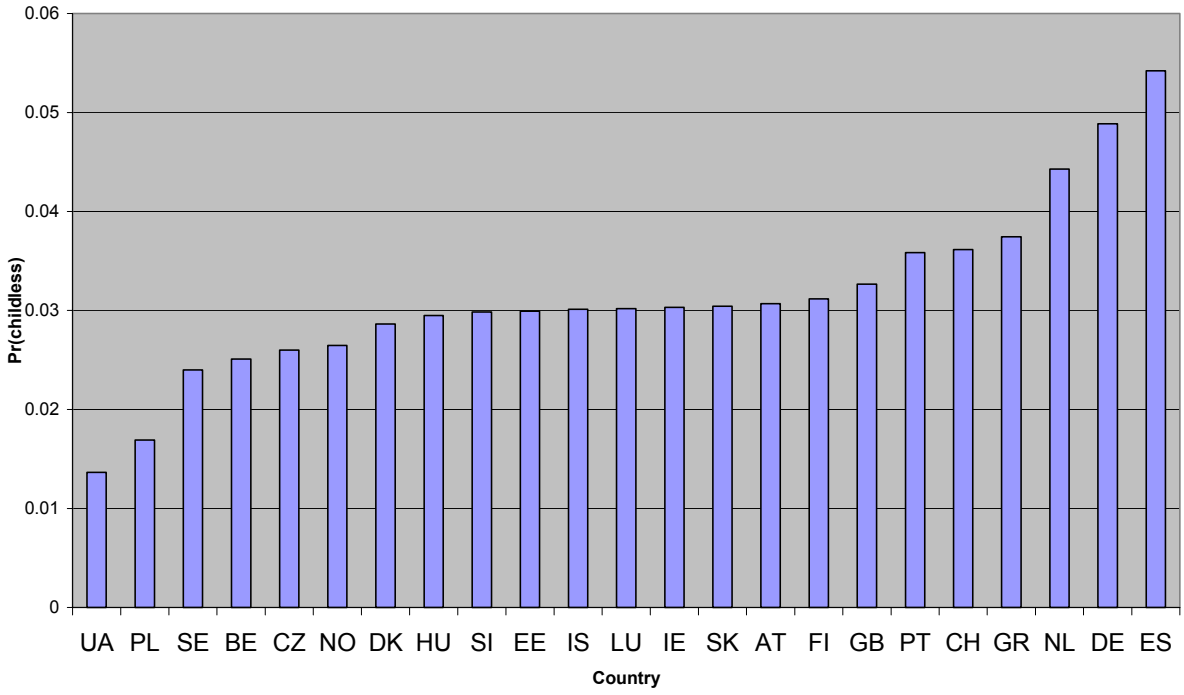


Figure 7 shows how the level of childlessness differs between countries, according to the model predictions. Recall that the model only allows the intercepts to vary by country, so the model rank order between countries holds irrespective of the characteristics of individual women.

High childlessness, after controlling for the covariates in the model, is found is Spain, Germany, and the Netherlands. Ukraine, Poland, and Sweden have relatively low childlessness after taking into account the distribution of the covariates.

Figure 7. Model predicted proportion childless at age 40 by country in 2004/2005 for married women, living with partner since age 30, medium level of education in personal care services and in paid work



Intentions

Most women observed and predicted to be childless in the previous section will eventually have children. In this section, we look at the intentions of childless women for the next three years. Are they planning to forego or postpone any children for at least three more years, or do they leave the door open to giving birth in the near future?

Respondents in ESS2 were asked the following question: "Do you plan to have a child within the next three years?" They were offered four answering alternatives: definitely not, probably not, probably yes, definitely yes (pregnant women were coded as "definitely yes"). In this section we model the probability that a childless woman chooses the "definitely not" option. Table 4 gives the estimates for the multilevel models. The linear predictors are the same three versions of the model of de facto childlessness.

Table 4. Multilevel logistic regression of childlessness *intentions* in 23 European countries, ESS2 (2004/2005)

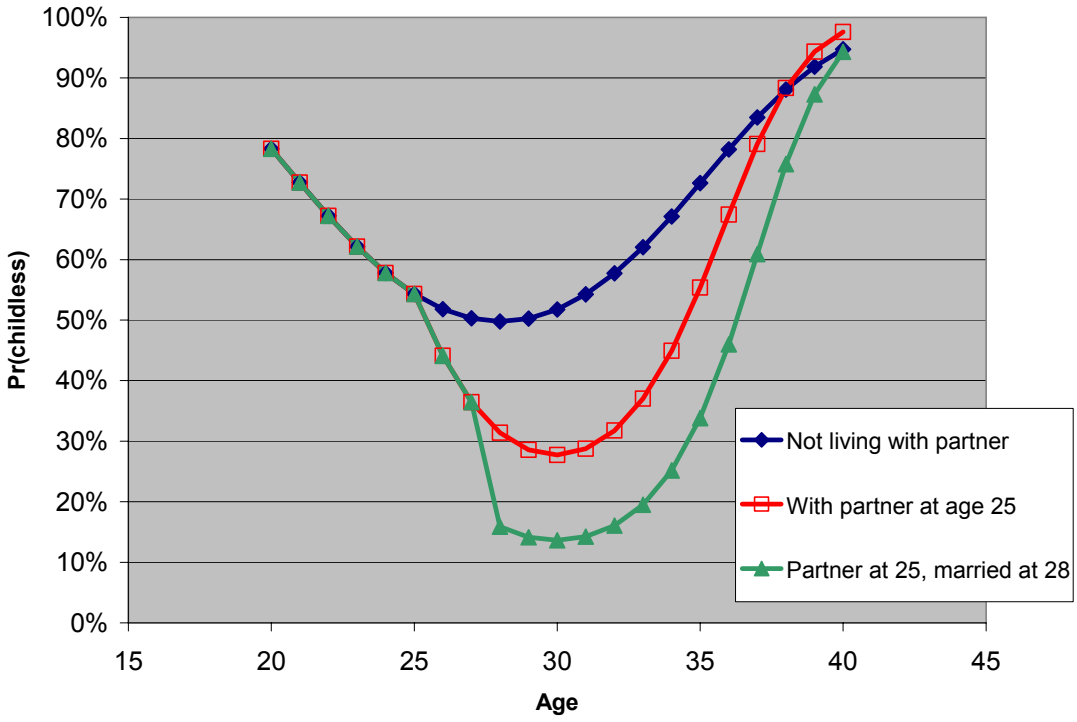
Covariates	Model (b1) with educational field			Model (b2) with field *and* level			Model (b3) level without field		
	Exp(b)	s.e.(b)	P(>|z|)	Exp(b)	s.e.(b)	P(>|z|)	exp(b)	s.e.(b)	P(>|z|)
FIXED EFFECTS									
Intercept	3.35	0.2227	<.001	2.46	0.2496	<.001	0.68	0.1848	0.034
Age minus 20	0.69	0.0278	<.001	0.72	0.0282	<.001	0.76	0.0266	<.001
Age minus 20²	1.02	0.0014	<.001	1.02	0.0015	<.001	1.02	0.0014	<.001
#years living with partner	0.73	0.0416	<.001	0.72	0.0425	<.001	0.71	0.0425	<.001
#years living with partner²	1.03	0.0026	<.001	1.03	0.0027	<.001	1.03	0.0028	<.001
Married	0.41	0.1831	<.001	0.41	0.1869	<.001	0.53	0.1770	<.001
Main activity									
- paid work	1.00			1.00			1.00		
- in education	2.92	0.1151	<.001	3.00	0.1172	<.001	3.09	0.1095	<.001
- looking for a job	1.03	0.1972	0.864	1.01	0.2008	0.946	1.00	0.1914	0.991
- not looking job	1.44	0.3031	0.230	1.35	0.3027	0.321	1.74	0.2786	0.046
- housework	3.10	0.2312	<.001	3.22	0.2323	<.001	2.93	0.2265	<.001
- other	1.21	0.2637	0.466	1.16	0.2632	0.575	1.07	0.2458	0.774
Educational field									
- personal care services	1.00			1.00					
- health	0.42	0.1961	<.001	0.44	0.1985	<.001			
- general, no specific field	0.31	0.1704	<.001	0.30	0.1723	<.001			
- administration	0.12	0.1792	<.001	0.13	0.1809	<.001			
- technology & science	0.42	0.1962	<.001	0.58	0.2031	0.008			
- teaching	0.21	0.2258	<.001	0.28	0.2295	<.001			
- other	0.38	0.3106	0.002	0.45	0.3169	0.012			
- arts and humanities	0.16	0.2068	<.001	0.20	0.2128	<.001			
- law & legal services	0.65	0.3073	0.159	1.03	0.3269	0.936			
Level of education									
- low				1.00			1.00		
- medium				1.47	0.1303	0.003	1.38	0.1206	0.008
- high				0.57	0.1602	0.001	0.57	0.1352	<.001
RANDOM EFFECTS	Std.Dev.			Std.Dev.			Std.Dev.		
Country (23 countries)	0.4469			0.4770			0.4018		
N unweighted	2562			2562			2562		
Deviance	3564			3504			3711		
Loglikelihood	-1782	df=	20	-1752	df=	22	-1856	Df=	14
BIC	3721			3676			3821		

Likelihood ratio chi-squared tests show that field of education explains a significant part of the childlessness intentions, both with and without controlling for level. As was the case with respect to de facto childlessness, the model that includes both level and field of education turns out to be the best one according to the BIC.

In substantive terms, however, the effects of the predictor variables on intentions are very different from the effects on *de facto* childlessness. First, with respect to age, if we select women who are still childless and model how their intentions depend on age, we see a U-shaped curve (see Figure 8): women in their early twenties are highly likely to say that they definitely do not plan to have a child for a least three more years. This likelihood declines and reaches a minimum around age 30, then rises again.

Figure 8. Model effects of age and partnership situation (model b2) on childlessness intentions

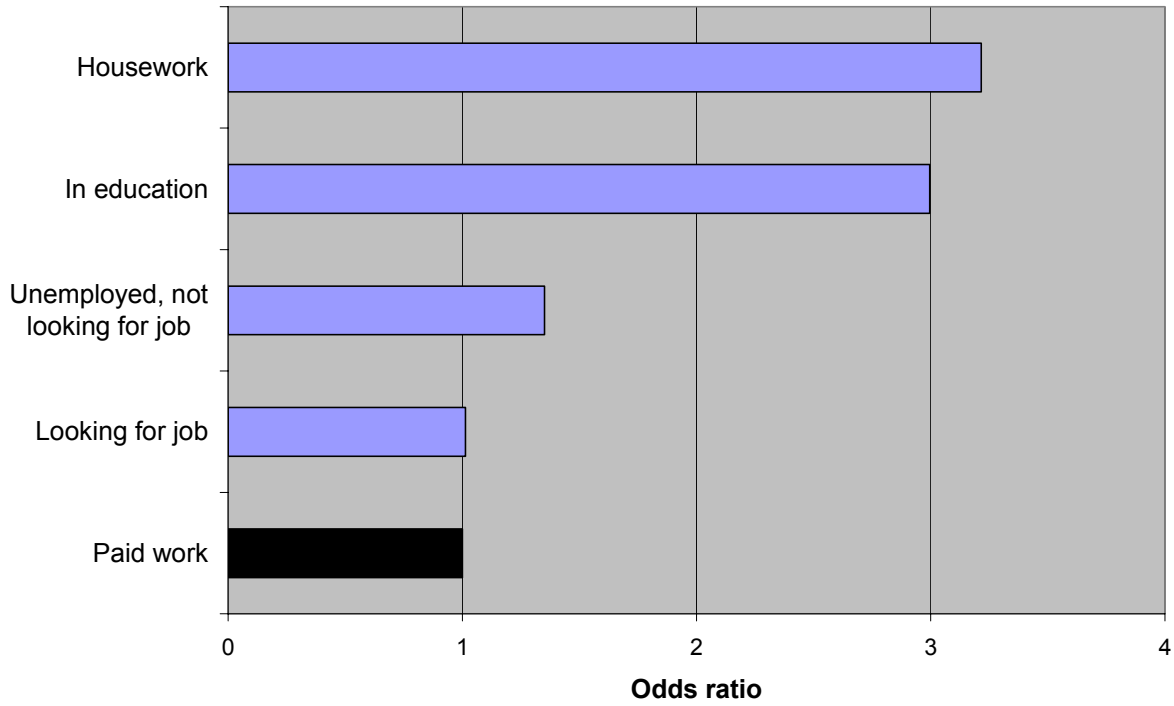
for women in paid work, trained in personal care services, and medium level of education, by age and partnership situation



Partnership situation highly influences childlessness intentions (Figure 8). For women who are not living with a partner, childlessness intentions never drop below 50%: at all ages, at least 50% intend to remain childless for at least three more years. Women who are living with a partner intend to remain childless significantly less often, especially when married, at least during the first years of their married or

unmarried cohabitation. After a number of years, the positive effect of partnership on childbearing intentions fades, so that the difference between partnered and unpartnered women vanishes as they reach age 40.

Figure 9. Effect of main activity (model b2)

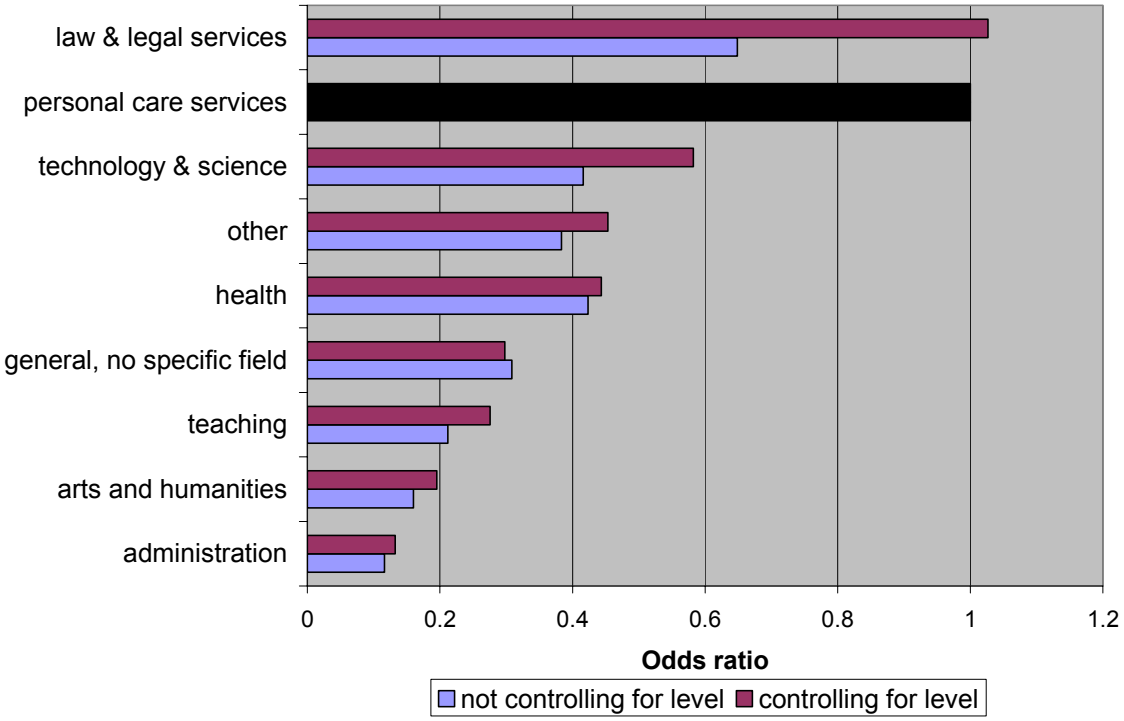


Childless women whose main activity is doing paid work or who are looking for a job, are least likely to say that they will postpone motherhood for at least three more years, holding other covariates constant. On the other hand, women who are mainly doing housework or going to school are most likely to postpone motherhood. The effect of housework, as compared to the reference category, is completely opposite what was found in the model of actual childlessness. This probably results from a selection mechanism: house workers are very unlikely to remain childless, but those who do, are a special subgroup of women who are, for example, looking after a chronically ill parent. This subgroup of "leftovers" has little childbearing intentions.

Figure 10 graphs the odds ratios of field of education, with women educated in personal care services still the reference category. It turn out that the rank order of

fields has changed completely in comparison with the order found in the previous model. This can be judged more directly from Figure 11.

Figure 10. The effect of field of education on intended childlessness, with and without controlling for level of education (model b1 versus b2)

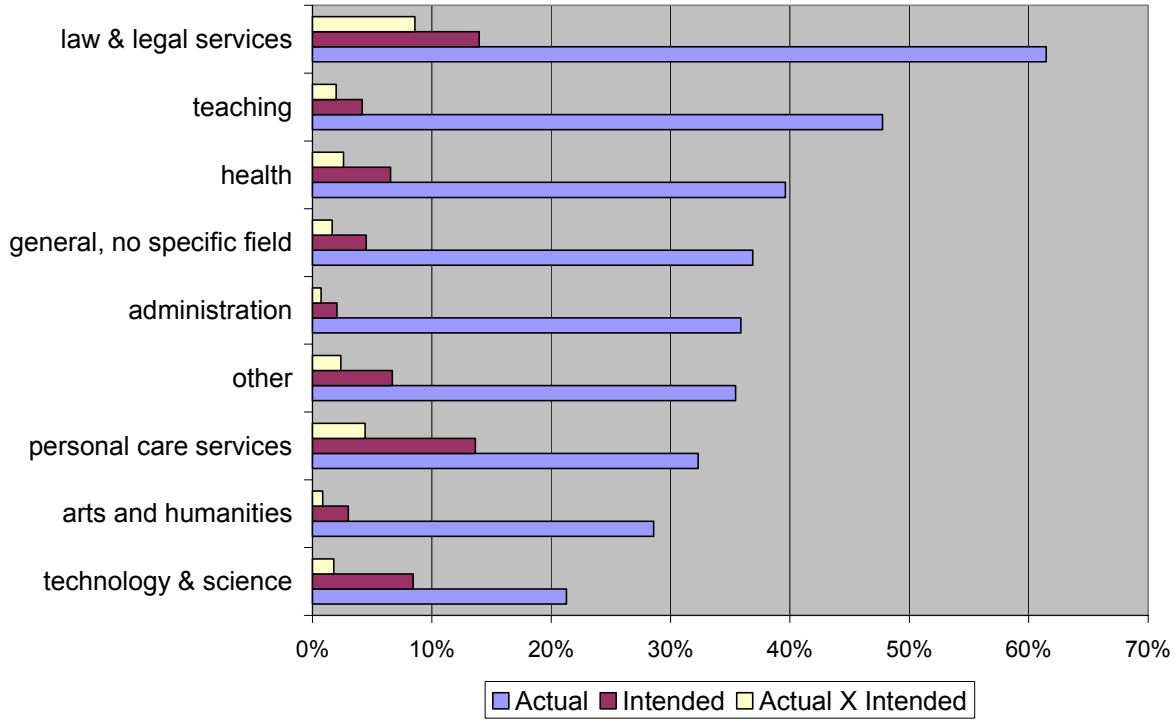


While women educated in law, in health care or as teachers were on the high extreme of actual childlessness, only the former group (law) is still on top of the list if we look at intentions. Health care workers and teachers are more likely, on average, to be childless than women trained to work in personal care services (i.e. the reference group). But if childless indeed, the former groups leave open the possibility of childbearing more often than the reference group. The rank order of the reference group has changed completely: those educated in personal care serves are relatively unlikely to still be childless at any given age, but if they have remained childless, the odds are high that they intend to remain childless or at least postpone motherhood for another three years. Again, this can best be understood as a selection effect: those who remain childless are a special subgroup, whose intentions differ from the ones that have, in the meantime, become a parent. For a fuller interpretation, we will have to look at characteristics not included in the models presented in this paper. One

possibility may be that those who are childless are more often self-employed business women who feel that childbearing entails very high opportunity costs.

Figure 11. Predicted proportion actually childless and predicted proportion intended childlessness at age 30

Women in paid work, medium level of education, married, cohabiting with partner since 5 years

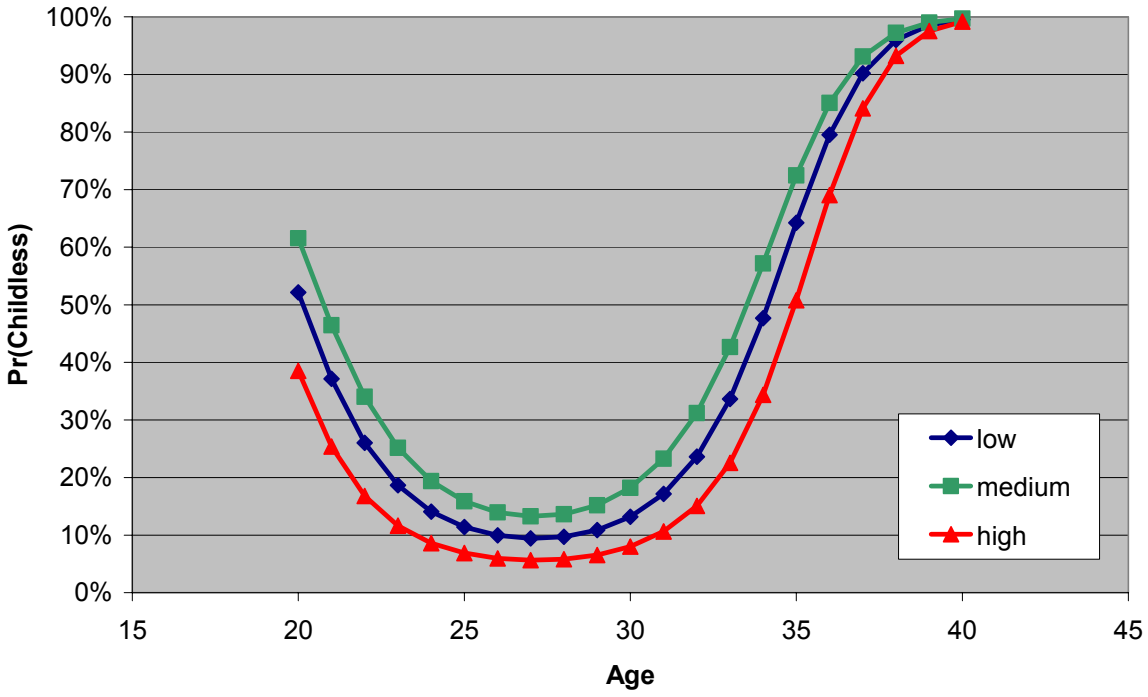


The white bars in Figure 11 represent the predicted proportions childless at age 33 if childlessness intentions at age 30 would actually be fulfilled. Law students clearly stand out as the groups most likely to remain childless, as both actual childlessness and postponement intentions are high. Women trained in personal care services are second in this rank order: they combine relatively low actual childlessness with high childlessness intentions. Low childlessness would be found among women educated in administration, arts and the humanities, and in technology and science.

Like main activity and field of education, also the level of education has a different effect on *intentions* than on *de facto* childlessness. Whereas women with high educational attainment are most likely to be observed childless, on average, they are

least likely to say that they definitely do not plan to have a child during the next three years. Among childless women, postponement intentions are strongest among women with a medium level of educational attainment. Again, the rank order is different from the one found in the previous model. Again, selection mechanisms may be at work. An alternative interpretation, in this case, is that highly educated women are generally less inclined to make very "definite" statements.

Figure 12. Model probability of intended childlessness by age and level of education for a woman in paid work, trained in health care, living with a partner from age 20, and not married (model b2)



Conclusion and discussion

This paper was inspired by a recent contribution by Hoem, Neyer, and Andersson (2006) that showed that the field of education matters a lot for childlessness in Sweden, even after taking the level of the degree obtained into account. That general conclusion can no doubt be extended to other European countries: all analyses

carried out here indicate that field of education is significantly related to both de facto childlessness and postponement intentions.

The dependent variable in this paper was not permanent childlessness but rather two different things, analysed in two steps. In the first step, de facto childlessness at any age between 20 and 40 was analysed. In the second step, the dependent variable was the intention of childless women to postpone childbearing for at least three more years.

The level and field of education seem to be related in diverging ways to de facto childlessness on the one hand, and conditional postponement intentions on the other. For example, women trained to become a teacher were nearly double as likely, on average, to be childless than women trained to work in personal care services. Yet, teachers were less than half as likely to intend remaining childless for another three years as women in personal care services. This may suggest two things. First, the pathway to actual delays in childbearing may be different from the determinants of intended postponement. Second, it is very likely that a selection mechanism is at work during the first step, selecting particular subgroups of childless women in each field of education.

A major limitation of this paper is that it treats the causal mechanisms involved largely as a black box. We have not discussed the substance of fields of educations nor formulated hypotheses about the aspects of educational domains that matter for childlessness. In order to do that, we would have to learn more about educational systems in different European countries. In order to unravel causal mechanisms, we need both more theoretical thinking and more detailed information and data.

Related to this is a second limitation: it is very likely that the effect of educational domain differs significantly from country to country. Yet, I did not succeed in estimating a random slopes model, probably because the data are ill-conditioned to this end. The models presented in this paper only account for heterogeneity between countries in their average overall level of actual and intended childlessness (random intercepts), as well as for heterogeneity stemming from differences in covariate distributions.

References

Bates, Douglas and Deepayan Sarkar (2006), *lme4: linear mixed-effects models using S4 classes. R package version 0.995-2.*

Hoem, J. M., G. Neyer, and G. Andersson (2006). "Education and Childlessness. The Relationship Between Educational Field, Educational Level, and Childlessness Among Swedish Women Born in 1955-59." *Demographic Research,* 14 (15): 331-380.

Jowell, R. and the Central Co-ordinating Team (2005), *European Social Survey 2004/2005: Technical Report*. London: Centre for Comparative Social Surveys, City University.

Noack, T. and L. Østby (2002), "Free to Choose - but Unable to Stick to It? Norwegian Fertility Expectations and Subsequent Behaviour in the Following 20 Years." Pp. 103-116 in *Dynamics of Fertility and Partnership in Europe. Insights and Lessons From Comparative Research. Volume II*, eds. E. Klijzing and M. Corijn. New York/Geneva: United Nations.

R development Core Team (2006), *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing (URL http://www.R-project.org).

Schoen, R., N. M. Astone, Y. J. Kim, C. A. Nathanson, and J. M. Fields (1999). "Do Fertility Intentions Affect Fertility Behavior?" *Journal of Marriage and the Family,* 61 (3): 790-799.