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Mother's employment and fertility in Norway

Abstract:
This paper concerns the effect of employment status on second- and third-birth intensities for Norwegian mothers in the period 1994-2002. Due to unobserved heterogeneity possibly affecting both the birth and the employment processes we employ a simultaneous equations approach for hazard models, originally suggested by Lillard (1993). Our results show that there is a slightly positive effect of currently being in employment on the second-birth intensity, whereas the third-birth intensity is larger for women who are currently non-employed, even when unobserved heterogeneity is taken into account. This suggests that even in a society such as the Norwegian in which there is a high compatibility between motherhood and labour market attachment there are still certain costs associated with childbearing and that this is taken into account by Norwegian women, in particular when it comes to the progression to third child.

Keywords: Fertility, employment, family policy

JEL classification: J01, J13

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Introduction

There have been large changes in patterns of employment and family life during the last few decades in industrialised countries. In Norway, the employment rate for females in childrearing age (25-54 years) has increased from 55% in 1975 to 84% in 2009. The total fertility rate was 1.98 in 2009, the same level as in 1975. In the past, low fertility has been linked to increasing female employment (Becker, 1981), but more recently studies find a positive correlation between female employment and fertility (Esping-Andersen, 2002; Billari and Kohler, 2004; Rindfuss et al. 2003). It has been argued that countries facilitating social policies that make female employment and childrearing more compatible, experience higher female employment as well as higher fertility (e.g. Brewster and Rindfuss 2000; Esping-Andersen, 2002; Rindfuss et al 2003). Scandinavian women are described as following a so-called dual *strategy*, i.e. they choose both work and childbearing (and -rearing) which is possible in Norway due to generous arrangements allowing mothers to pursue a work life (Ellingsæter and Rønsen 1996). Nevertheless, correlations of macro indicators of this kind do not give much insight into the relationship between the two processes. Furthermore, some studies suggest that the correlation between women's employment and fertility is spurious, caused by common antecedents of the two variables (e.g. Engelhardt et al 2004; Engelhardt and Prskawetz 2004).

In this study, we examine how employment and fertility are related for Norwegian mothers in the period from 1994 through 2002. The main interest will be on the effect of the (current) employment status of Norwegian one-child mothers on their subsequent childbearing, i.e. on their second and third birth intensities. Another important aspect of the study concerns the extent to which the birth process and the employment process might be jointly determined and the possible selection issues arising from this. For example – as we will elaborate on later, it is reasonable to assume that some women are more inclined to having more children and in general value family life (as opposed to e.g. employment) higher than other women. On the other hand, some women are more prone towards pursuing a career than others and to those women, a strong labour market attachment is more important. This could give rise to results regarding the effect of employment on fertility which do not correspond to an effect of the employment status *per se*, but rather due to the spurious relationship arising from the unobserved characteristics described above. The relationship between employment and fertility might be influenced by the institutional context in which women's choices are made. Norway represents countries with institutional conditions that gives good opportunities for combining family and work.

This analysis employs a simultaneous equations approach for hazard models which distinguishes between second and third birth. These models were originally suggested by (Lillard 1993) and in the present case their use is motivated by the unobserved heterogeneity possibly affecting both the birth and the employment processes as described above.

In Norway, childlessness is low and around 90% of all young women have fertility intentions (Lyngstad and Noack 2005). Norway displays a relatively high progression from parity one to two (84%), while around 46% of two-child mothers proceed to parity three. Hence, it seems reasonable to expect that deciding for a second child is a question of *when*, whereas the third child is a question of *if*. Therefore, we might also expect the effect of the woman's employment status to be different across the two parity transitions.

The analysis is based on information from Norwegian registers and available data form complete fertility and employment histories for the mothers in our study.

Conceptual Framework

Structural approach to understand the relationship between employment and fertility – and the Norwegian setting

The most common approach when trying to identify and understand the relationship between employment and fertility is the seminal New Home Economics theory (Becker, 1981) in which childbearing is subject to a rational decision, based on individual preferences, the costs and benefits of children, and the family's income constraint. A rational household will weigh the *utility* of having a child against the costs, which in addition to direct costs (e.g. food, clothing, and schooling) also include indirect costs related to the time needed to take care of the child, the so-called *opportunity costs* of childbearing.

*Employment—fertility arguments***.** The opportunity costs associated with childbearing comprise a rather broad range of issues that women (or couples) are expected to take into account in their childbearing considerations: first, there is the forgone income due to the absence from the labour market at the time of and immediately following the birth of a child; also, there is the forgone accumulation of human capital, such as skills and knowledge, during the period when the mother or the father is away from the labour market. Lower accumulation of skills is expected to lead to a reduction in future earnings (Gangl and Ziefle 2009). Hence, together with the more direct costs of

childrearing these factors are assumed to be part of the decision process concerning childbearing and are to be taken into account along with the pleasures and the satisfaction of being a parent.

Empirical studies using Scandinavian data found mixed results in the correlation between female employment and second- and third-birth rates. For instance, Kravdal (1992a) studied the effect of female labour force participation on the probability of having a third child in Norway up until 1988. He found a very weak impact of employment on the third birth. Contrary, findings from Sweden showed a higher second-birth rate among mothers staying at home and those working part-time than those working full-time (Hoem and Hoem 1989; Olah 2003). More recently, Kravdal (2002) studied the impact of both individual and aggregate unemployment in Norway for the period 1992-1998. This study showed a slightly higher first-birth rate but slightly lower higher-order birth rates for mothers in employment.

According to the New Home Economics theory, any reduction in the cost of children (as a result of e.g. a public subsidy) or an increase in income (as a result of transfer payments) is expected to increase the demand for children. Consequently, family policies that reduce the direct or indirect (opportunity) cost of children are expected to have a positive impact on fertility. Two central components of the Norwegian setting are the right to *paid leave* (in connection with birth) and the availability of *subsidised childcare*. In the study period there was a maximum leave period of 52 weeks with 80 per cent wage compensation or 42 weeks with full wage compensation. The only part of the leave period which is reserved for the mother comprises 3 weeks before and 6 weeks after childbirth; the remaining weeks may be taken by either the father or the mother. Furthermore, the father has 2 weeks of unpaid leave (in many cases paid by the employer) following immediately after childbirth and apart from that four weeks of paid leave are *reserved* for the father. In order to be eligible for leave, a person must have worked at least 6 out of the previous 10 months. A comparative study of Finland and Norway renders some support for the hypothesis that parental leave extension may stimulate fertility (Rønsen 2004), while findings from Sweden and Norway indicate e.g. that measures encouraging an active participation from the father in child care may stimulate fertility, as women are more likely to have another child if the father took parental leave with the first child (Duvander and Andersson 2006; Duvander et al 2010, Lappegård 2010). The costs of subsidised day-care are covered by the municipalities, the state and the parents, and during the study period the fee was not centrally regulated and there were rather large variation in the price paid by the parents which may or may not be income-dependent. A new regulation on maximum fees came into force in 2004, reducing the parental payment gradually to €280 per month for an ordinary fulltime place from January 2006. The

coverage rate was 66% in 2002 when counting preschool children older than 12 months. This number corresponded to a coverage rate of 83% for children aged 3-5 and 41% for children aged 1-2. Evidence from Norway indicates that there may be a slight positive effect on first birth of increasing day-care supply (Rindfuss et al. 2007). In 1998, a cash benefit was introduced for parents with 1-2 year old children who did not have their children in publicly subsidized day-care; see e.g. (Aassve and Lappegård 2009) for details. The aims of the reform were, among others, to provide a cash benefit to parents who wished to care for their children at home and to offer compensation to those parents who were not offered external childcare provision. Higher birth-rates have been reported among Finnish and Norwegian mothers who make use of similar cash benefit programme for child-care (Vikat 2004; Aassve and Lappegård 2009).

Sex-segregation arguments It might also be reasonable to assume that the opportunity costs are greater for women in certain kinds of jobs than others. This is discussed thoroughly by Del Bono et al (2008) who used Austrian data to investigate how fertility decisions are influenced by job displacements, i.e. employment interruptions arising due to the closing down of workplaces. They argue that career interruptions due to job displacement might influence fertility to a larger extent for white collar than for blue collar women, since the latter face fewer opportunities for career advancements in their jobs and hence the loss of *job-specific* human capital is less important for blue collar than for white collar women (Del Bono et al 2008). A high level of sex-segregation and a high degree of female part-time workers characterise the Norwegian and Nordic employment structures (Birkelund 1992; Hansen 1995). Such employment structures can be used to explain the high degree of mothers continuing in the labour force after and between childbirths. A sex-segregated workforce and good opportunities for part-time work have been considered as favoured by women, e.g. (Rosenfeld and Birkelund 1995), and from an economic perspective it has been argued that it will be most rational for mothers who choose to stay in the labour market to have jobs that can best be combined with childcare responsibilities, e.g. (Polachek 1987). It is thereby argued that women choose to take female-dominated jobs because they fit conveniently into their own domestic commitments (Polachek 1987; Jacobs 1995). Consequently, women working in female-dominated jobs might see that these jobs provide good opportunities for combining labour work with childcare, and thereby be more likely to have another child. However, this is not unproblematic; not all female-dominated jobs are family friendly, e.g. some may have fixed working hours with little flexibility. Also, part-time work is not always voluntary.

Fertility—employment arguments. The issues discussed above are some of the channels through which an effect of employment on fertility might work. On the other hand, one might also expect an effect

going the other way, i.e. that childbearing might influence a woman's employment status. Arguments for this relationship evolve around the fact that having a child might reduce the benefits of having a job, for example because motherhood might lead to a penalty in wage rates (Budig 2003, Gangl and Ziefle 2009). A study by Kravdal (1992a) of forgone labour participation due to childbearing among Norwegian women shows that a woman born in 1950 who has had two children at ages 21-22 for the first and 24-25 for the second worked 6.6 (full-time equivalent) fewer years until the age of 37 compared to a childless woman with the same education (as registered at age 37). Analyses, from Norway and Sweden, of the relationship between the (re-)entry into the labour market following first, second and third births find that the most important factor for keeping mothers in the labour market is the right to paid maternity leave (Rønsen 1995; Rønsen and Sundström 1996). Angrist and Evans (1998) employ an instrumental variable approach for analysing the effect of childbearing on the subsequent labour supply of the parents using data from the US. Their main focus is on the use of the *sibling sex mix* (in families with at least two children) as an instrument. This exploits the fact that parents with two children of the same sex are more likely to have a third child than parents with two children of the opposite sex. They show that the presence of more children in the family leads to a reduction in the labour supply for the mothers but they also show that this effect is rather small for college-educated women. They find no effect of children on the labour supply of the fathers. Budig (2003) examined the effect of employment on fertility and vice versa by means of standard intensity regression, using data from the US. Her main finding was that the presence of pre-school children in the family tends to keep non-employed mothers from entering the labour force and push employed mothers out of employment. However, her approach did not take into account possible selection issues. On the other hand, Aassve et al. (2006) used a rather elaborate modelling approach in a study of the relationship between childbearing, union formation and employment using British data taking into accounts the possible selection problems that might arise due to unobserved characteristics influencing the women's childbearing and employment decisions. They found, among other things, that being in employment has a negative impact on fertility, even when controlling for unobserved heterogeneity, but the effect is not very large.

Cultural approach to the relationship between employment and fertility

So far we have discussed how social *structural* factors might possibly influence the degree to which the roles as mother and worker can be combined. The degree to which such factors play a role in a woman's labour market behaviour and her childbearing decisions is probably influenced by *cultural* factors, unobserved as well as observed. Cultural factors comprise e.g. values and attitudes, societal norms toward mothers participating in the labour market, the duration of supervision for children, and

maybe also religious affiliation. They might influence the compatibility of the roles as mother and as worker (Lesthaeghe and Sukyn 1988; Rindfuss and Brewster 1996). In the so-called "Preference theory", proposed by Hakim (2000), the heterogeneity of lifestyle preferences within a population is given a central role in the explanation of differences in women's fertility and work choices, and it emphasizes the importance of cultural factors behind the recent changes in family and fertility patterns that have occurred in all modern industrialized societies (Vitali et al. 2009). Three different "types" of women are identified in terms of their life-style preferences and family models. Being *family oriented* means regarding family life and children as the main priorities in life, thus, deciding not to work, at least unless pushed to enter the labour market by economic need (Vitali et al. 2009). This is in line with what we argued above that some women might be more inclined to having children and in general value a family life higher than other women. This is most likely shaped by e.g. the (size of the) family in which the woman grew up (Regnier-Loilier 2006) along with e.g. geography and religious affiliation (Kravdal 1992). According to the Preference Theory, being *career oriented*, means giving value to a life devoted to work, either in paid employment or in the public arena (Vitali et al. 2009). This is in line with what we argued above that some women might be more prone towards pursuing a career than others and to those women, where a strong labour market attachment is more important. Such issues are probably shaped by ideational factors as introduced by Rindfuss and Brewster (1996) and contribute to the notion that fertility and labour market supply are sometimes considered to be jointly determined (Angrist and Evans 1998; Kravdal 1992). The majority of women are, according to the Preference Theory *adaptive women*, which means they have no prevailing preference orientation, but usually want to get the best of both worlds, combining work and family as suggested by Vitali et al. (2009). Their adjustments toward work and family life are most responsive to changes in external conditions. The study of Vitali et al. (2009) tests the link between individual-level preferences and both fertility outcomes and fertility intentions in a variety of societal settings. They do find an association between work-family lifestyle preferences and realized fertility in a variety of European countries, while they do not find the same association between life-style preferences and fertility intentions. One main critique of the Preference Theory is the causality link and whether heterogeneous preferences are actually causing heterogeneous behaviour (e.g. Crompton and Harris 1998; Fagan 2001). Vitali et al. (2009) argue that one possible explanation for their finding is that lifestyle and work-familiy preferences are a result of and not a cause of actual fertility.

The questions addressed in this study

The main focus of this study is to examine the relationship between employment and fertility for Norwegian mothers for the period from 1994 through 2002, taking into account the possible selection

problems arising from unobserved characteristics affecting both processes. For this purpose, we model three different outcomes simultaneously, namely the births of the women, their transitions from non-employment into employment and correspondingly their transitions from employment to non-employment. What remains after having accounted for this can be thought as an effect of the employment status *as such*. This study concerns women who are already mothers, and since Norway displays a relatively high progression from parity one to two (Lappegård 2000), we expect that a large share of the women in the study population will proceed to having a second child. This could be phrased as the second child being a question of *when*, whereas the third child is a question of *if*. Therefore, we might also expect the effect of the woman's employment status to be different across the two parity transitions. In summary, we will address the following two questions:

- How does a mother's current employment status influence her fertility as measured by her second- and third birth rates, net of selectivity? And is a possible effect the same across parities?
- To which extent is this relationship influenced by unobserved characteristics jointly affecting both the fertility and the employment processes?

Data and descriptive statistics

Norwegian register data

The data for this paper have been constructed by extracting information from the Norwegian Central Population Register, the Register of Employers and Employees, and the Educational Database. Every person who has lived in Norway at some time point since 1960 has a unique identifier which is common across the registers. These data have been linked to form complete fertility and employment histories for the women in the study population.

The study population

The study population comprises all women of Norwegian origin whose first child reached the age of 15 months during the period from April 1994 through October 2002. We only had access to information about women who became mothers, i.e, no information on nulliparous women. Furthermore, only women who were between 19 and 40 years old at the time of the first birth and registered as having a male partner (cohabiting or married) at the time of first birth are included. Also, we include only women who were not registered as students at the expiry of the statutory parental leave period, i.e. when the child reaches the age of one year. Finally, for some women we were not

able to identify complete employment records throughout the entire study period. Such women are also removed from the study population. From the registers we know the date of when the women give birth to first, second and third child and we have constructed fertility histories on a monthly basis. The first follow-up period begins in the month when the first child reaches the age of 15 months. The reason for this is that during the first 12 months it is not possible to properly determine the employment status of the mothers because they are on maternity leave. Since we furthermore include the employment status with a 2-month lag, the follow-up starts when the child is 15 months old. Follow-up ends when the woman either gives birth to her second child or is censored due to the end of follow up (by the end of 2003) or due to her reaching the age 49. Furthermore, if the woman gives birth to her second child and this child reaches the age of 15 months before end-follow-up the woman is subsequently followed until she either gives birth to her third child or is censored. Finally, women who enrol in education are censored from the time this enrolment takes place.

Also, we construct complete employment histories on a monthly basis for the women apart from the first year after giving birth. We do not, however, distinguish part-time work from full-time work as this information, in the registers, are reported in very broad categories, and more importantly the information are unreliable as changes in working hours often are not reported and we will not have complete work-hour histories. Hence, employment status *refers to* employed *(full- or part-time) versus non-employed.*

Furthermore, we have access to yearly information concerning the highest current educational attainment of the women. Apart from the variables mentioned above, we also include the mother's current age and the calendar time measured in years.

Descriptive statistics

There are 126608 women in the study population, contributing to the estimation of the second birth intensity. Among these, there are 62182 (49.1%) also contributing to the estimation of the third birth intensity. The median age in the population (at the time when the first child reaches the age of 15 months) is 28 and the median age in the population when the second child reaches the age of 15 months are 31. Table 1 shows the estimated quartiles for the distribution of the waiting times to second and third birth for the women in the study population. As can be seen from the table, 25% of the one-child mothers have given birth to their second child before the first child reaches age 2.4 years, whereas half of the one-child mothers have had their second child when the first child reaches the age

3.3 years. For two-child mothers, 25% have given birth to their third child when the second child reaches the age 4.4 years. The median could not be estimated for the two-child mothers.

Table 1. Distribution of birth intervals: Estimated percentiles for the waiting time to second and third birth

Percentile[1)]	Age of previous child	
	Second Birth	Third Birth
25%	2.4 years	4.4 years
50%	3.3 years	-
75%	5.5 years	-

[1)]: These are estimated by means of the Kaplan-Meier estimator for the waiting times. The 50%- and 75%-percentiles could only be estimated for the one-child mothers.

Approximately 65% of the one-child mothers are registered as *employed* when their child reaches age one, whereas this applies to approximately 60% of the two-child mothers at the time when their youngest child turns one, cf. Table 2. There are 66537 women (52.6% of the entire study population) who at some point during the study period are registered as being non-employed (apart from periods of maternity leave). Also, there are 97995 (77%) women who at some point during the study period are registered as being in employment. Note that we do not register whether a woman changes her workplace, i.e. if a woman is employed in one workplace in one month and in another the following month this counts as one employment spell.

Table 2. Distribution of educational attainment and employment status[1)] according to parity

Category	Parity	
	One-child mothers	Two-child mothers
Employed	82 164 (64.9%)	37 007 (59.5%)
Non-employed	44 444 (35.1%)	25 175 (40.5%)
Primary education	19 643 (15.5%)	8 192 (13.2%)
Secondary education	54 486 (43.0%)	27 287 (43.9%)
Lower tertiary education	45 007 (35.6%)	22 815 (36.7%)
Higher tertiary education	7 472 (5.9%)	3 888 (6.3%)
Total	126 608 (100%)	62 182 100%)

[1)]: Measured at the end of each maternity leave.

Statistical methods

We set up a system of *simultaneous hazard equations* for the outcomes described previously, following the schedule first suggested by Lillard (1993). The notion of *simultaneous equations* is well-known in the econometric literature and has been employed for a number of demographic studies over the past 15 years (see e.g. Upchurch et al 2002, Steele et al. 2005 and Aassve et al. 2006). For our purposes we introduce a system of 3 simultaneous hazard equations corresponding to the outcomes described in the previous section. We set up a hazard model for the two births and two hazard models for entering and leaving employment, respectively. We allow for unobserved heterogeneity terms to enter into each equation. The unobserved heterogeneity terms are allowed to be correlated; such a correlation arises if unobserved characteristics influencing the fertility intensity are correlated with unobserved characteristics influencing employment intensity.

Fertility outcomes

For each woman in the study population we model the hazard of the transition from parity one to parity two and the (possible) transition from parity two to parity three. Hence, each woman contributes up to two spells in the model for fertility. In this model, the woman's current employment status (with a 2 months lag) is included as an explanatory variable.

The hazard model for second and third birth. The hazard for the jth birth ($j = 2,3$) is assumed to be

$$\log l^{j,B}(t) = b_1 \times empl(t\text{-}2) + b_2 \times educ(t) + b_3 \times A^{j,B}(t) + b_4 \times D^{j,B}(t) + b_5 \times C^{j,B}(t) + e_B.$$

The time variable t, which is measured in months, denotes time since the $(j-1)$st child reached the age of 15 months. In this specification the variables *empl* and *educ* are categorical variables with the levels *employed* and *not employed*, and *primary education*, *secondary education*, *lower tertiary education* and *higher tertiary education*, respectively. The education variable is only updated once every year. The *woman's current age*, the *calendar year* and the *age of the youngest child minus 15 months* (i.e. the baseline time variable) are all included through the specification of piecewise linear spline functions $A^{j,B}(\times)$ (described by a straight line, i.e. no knots), $D^{j,B}(\times)$ (described by a a straight line for the period 1994-1997 and another straight line representing the effect from 1998-2002) and $C^{j,B}(\times)$ (with knots corresponding to ages 2 and 4 years), respectively.

Employment and non-employment outcomes

Another outcome of interest is the transition from non-employment into employment. A woman is considered to be "at risk" of entering into employment when she is registered as being non-employed.

The monitoring starts when the first child reaches age 13 months and the woman can no longer be on maternity leave. Hence, every time a woman is registered as being *non-employed*, she contributes a spell to the model for the transition into employment. If she gives birth to the next child and therefore enters into maternity leave, the spell is censored (2 months before birth). The monitoring is then suspended until the second child reaches age 13 months and then it starts again.

In a similar way, when *non-employment* is the outcome of interest, a woman contributes a spell whenever she is registered as being employed. As was the case when *employment* was the outcome of interest, the monitoring begins when the previous child reaches age 13 months. Previously, we have described the selection bias possibly arising due to unobserved characteristics governing women's labour market behaviour and unobserved characteristics underlying their fertility choices along with the possible correlation between such unobserved characteristics. In the modelling of the outcomes described above, such unobserved heterogeneity will be taken into account as previously described.

The hazard specifications for employment and non-employment We specify the hazard models for entering into employment and non-employment as follows:

$$\log l_E(t)=g_1\times I_{(no.ofchildren=1)}(t)+g_3\times educ(t)+g_4\times Aj,E(t)+g_5\times Dj,E(t)+g_6\times Cj,E(t)+e_E.$$

$$\log l_{NE}(t)=d_1\times I_{(no.ofchildren=1)}(t)+d_3\times educ(t)+$$

$$d_4\times Aj,NE(t)+d_5\times Dj,NE(t)+d_6\times Cj,NE(t)+e_{NE}.$$

The time variable, t, which is measured in months, denotes time since the beginning of the spell (of either non-employment or employment). The piecewise linear splines, $Aj,E(\times)$, $Aj,NE(\times)$, $Dj,E(\times)$, $Dj,NE(\times)$ and $Cj,E(\times)$, $Cj,NE(\times)$ represent the effect of the woman's age (knot in age 28), the duration of the spell (knots in year 1,3 and 5) and the calendar year (knot in year 1998).

Unobserved heterogeneity

We assume the three unobserved heterogeneity terms entering the intensity specifications above, e_B, e_E and e_{NE} to follow a 3-dimensional normal distribution in which all entries of the covariance matrix are allowed to be non-zero. It is assumed that conditional on the random effects vector there is independence between the 3 processes and between spells within each process. The non-zero correlation requires for the equations to be estimated simultaneously, i.e. the estimation procedure is based on simultaneous estimation of all involved equations by integrating out the unobserved heterogeneity terms and subsequently applying standard maximum-likelihood techniques. When

presenting the results from the models described in the above, we also include the results from *standard* hazard regression models. These standard models correspond exactly to the models described above, apart from the fact that no unobserved heterogeneity is included. We use the software aML to fit the simultaneous equations model (Lillard and Panis, 2003).

Results

In the following, we denote the standard hazard model by **Model A** and the model including unobserved heterogeneity by **Model B**.

Birth intensities

Table 3 displays the results concerning the second child. It shows that the rate ratio of a employed woman compared to a non-employed woman is $\exp(-0.074) \approx 0.929$ (Model B).

Table 3. Hazard ratios for the model for second child[1)]

Variable	Model A		Model B	
	Coefficient	SE	Coefficient	SE
Intercept	-2.752	0.020	-2.827	0.023
Age, first child:				
Slope (year -2)	2.359	0.028	2.392	0.029
Slope (year 2-4)	0.108	0.007	0.178	0.010
Slope (year 4-)	-0.543	0.008	-0.516	0.009
Employment:				
Employed (ref)	0	-	0	-
Non-employed	-0.045	0.008	-0.074	0.010
Mother's Age:				
Slope (per year)	-0.027	0.001	-0.028	0.001
Calendar year:				
Slope (year 1994-97)	-0.010	0.006	-0.013	0.006
Slope (year 1998-2002)	-0.018	0.002	-0.020	0.002
Education:				
Primary	-0.264	0.011	-0.267	0.012
Secondary (ref)	0	-	0	-
Lower tertiary	0.368	0.009	0.388	0.010
Higher tertiary	0.519	0.017	0.543	0.018
Number of observations	126 608		62 182	

[1)]: All covariates included in the model are presented in the table.

The results concerning the third birth intensity are shown in Table 4. Comparing employed and non-employed gives a rate ratio of 1.096 (Model B). Note that the (negative) effect of employment on the second-birth rate becomes stronger when we include unobserved heterogeneity, whereas the (positive) effect of employment on the third-birth rate becomes weaker.

Table 4. Hazard ratios for the model for third child[1)]

Variable	Model A		Model B	
	Coefficient	SE	Coefficient	SE
Intercept	-3.561	0.052	-3.696	0.055
Age, second child:				
Slope (year -2)	1.862	0.074	1.860	0.074
Slope (year 2-4)	0.206	0.015	0.218	0.015
Slope (year 4-)	-0.248	0.018	-0.242	0.018
Employment:				
Employed (ref)	0	-	0	-
Non-employed	0.124	0.019	0.092	0.020
Mother's age:				
Slope (per year)	-0.082	0.003	-0.081	0.003
Calendar year:				
Slope (year 1994-97)	-0.038	0.040	-0.012	0.040
Slope (year 1998-2002)	-0.078	0.006	-0.072	0.006
Education:				
Primary	-0.162	0.029	-0.166	0.029
Secondary (ref)	0	-	0	-
Lower tertiary	0.519	0.021	0.532	0.022
Higher tertiary	0.782	0.038	0.799	0.038
No of observations	126 608		62 182	

[1)]: All covariates included in the model are presented in the table.

For both second and third birth there is a J-shaped effect of education, the rate is higher for primary educated than secondary and the rate becomes larger with a higher level of education.
Tables 3 and 4 also show the effect of age of first child on the second birth (log-)hazard (Table 3) and of the age of the second child for the third birth (log-)hazard (Table 4), respectively. As can be seen, the intensity grows until the previous child is 2 years old, and then flattens out and after age 4 the intensity declines.

Employment and non-employment

The results regarding the transitions in and out of employment are shown in Tables 5 and 6.

Table 5. Hazard ratios for entering employments[1)]

Variable	Model A		Model B	
	Coefficient	SE	Coefficient	SE
Intercept:	-0.474	0.015	-1.278	0.025
Duration of spell[2)]:				
Slope (year -1)	-1.138	0.015	-0.216	0.020
Slope (year 1-3)	-0.561	0.015	-0.400	0.017
Slope (year 3-5)	-0.527	0.040	-0.376	0.041
Slope (year 5-)	-0.375	0.087	-0.334	0.088
Mother's age:				
Slope (age 19-27)	-0.006	0.003	0.008	0.005
Slope (age 28-40)	0.029	0.001	0.016	0.002
Calendar year:				
Slope (year 1994-1997)	0.035	0.007	0.007	0.009
Slope (year 1998-2002)	0.016	0.003	-0.028	0.004
No of children:				
One	0.136	0.011	0.041	0.017
Two (ref)	0	-	0	-
Education:				
Primary	-0.141	0.012	-0.285	0.021
Secondary (ref)	0	-	0	-
Lower tertiary	0.092	0.010	0.262	0.019
Higher tertiary	-0.111	0.021	0.090	0.039
Number of observations (Women/Spells)	66537/97630		66537/97630	

[1)]: All covariates included in the model are presented in the table.
[2)]: Duration in non-employment, i.e. when the woman is at risk of entering employment.

The effect of the duration of the spell in non-employment on the intensity of entering into employment can be seen to decline at all time points, since all slopes are negative (Model A and Model B). Hence, the longer a woman is out of employment the lower her rate of entering into employment. When unobserved heterogeneity is taken into account, the effect is less steep. As can also be seen from Table 5, one-child mothers who are currently not in employment are more likely to enter employment than is the case for two-child mothers.

Table 6. Hazard ratios for entering non-employment[1)]

Variable	Model A		Model B	
	Coefficient	SE	Coefficient	SE
Intercept:	-1.869	0.021	-2.214	0.026
Duration of spell[2)]:				
Slope (year -1)	-0.604	0.021	-0.479	0.022
Slope (year 1-3)	-0.298	0.014	-0.253	0.015
Slope (year 3-5)	0.046	0.024	0.100	0.024
Slope (year 5-)	-0.113	0.034	-0.052	0.035
Mother's age:				
Slope (age 19-27)	-0.108	0.004	-0.115	0.005
Slope (age 28-40)	0.023	0.002	0.013	0.002
Calendar year:				
Slope (year 1994-1997)	0.054	0.009	0.038	0.010
Slope (year 1998-2002)	-0.015	0.004	0.028	0.004
No of children:				
One	-1.869	0.021	-2.214	0.026
Two (ref)	0	-	0	-
Education:				
Primary	0.326	0.014	0.329	0.018
Secondary (ref)	0	-	0	-
Lower tertiary	-0.401	0.014	-0.375	0.017
Higher tertiary	-0.588	0.032	-0.554	0.037
Number of observations (Women/Spells)	97995/155114		97995/155114	

[1)]: All covariates included in the model are presented in the table.
[2)]: Duration in non-employment, i.e. when the woman is at risk of entering employment.

It is evident from Table 6, that the longer a woman is in employment, the smaller the hazard for leaving employment, but the effect levels off after approximately 3 years. Also, the effect is less steep than for the opposite transition (from non-employment to employment), and it does not change as much, when unobserved heterogeneity is taken into account. Furthermore, one-child mothers who are currently in employment are much less inclined to leave employment than two-child mothers (hazard ratio$\approx\exp(-1.869)\approx 0.154$). This effect becomes even larger when unobserved heterogeneity is included (hazard ratio$\approx\exp(-2.214)\approx 0.109$).

Unobserved heterogeneity

The estimated covariance matrix for the unobserved heterogeneity terms from Model B is shown in Table 7. The table shows that e_B is negatively correlated with both e_E and e_{NE}, which in turn are positively correlated.

Table 7. Estimated covariance matrix from the model including unobserved heterogeneity (Model B)

Random Effect	Random Effect		
	e_B	e_E	e_{NE}
e_B	0.379 (0.023)	-0.245 (0.013)	-0.310 (0.036)
e_E	-0.245 (0.013)	1.436 (0.016)	0.551 (0.016)
e_{NE}	-0.318 (0.036)	0.551 (0.016)	0.782 (0.014)

Note: The entries in this table correspond to the estimated standard deviations and correlations between the random effects in Model B. The numbers in parentheses are the standard errors.

Summary of the results

The results show a rather small but negative effect of being non-employed compared to employed on the second-birth rate: a one-child mother who is currently not employed has a rate of having the second child which is 7.1% lower (Model B) than a one-child mother who is currently employed. On the other hand, a two-child mother who is currently not employed has a rate of having the third child which is 9.6% larger (Model B) than a two-child mother who is currently in employment. When it comes to the transition from non-employment into employment, a one-child mother has a rate of entering employment which is 4.2% higher than a two-child mother. For the reversed transition from employment into non-employment, a one-child mother has a rate of entering non-employment which is only 10.9% of that of a two-child mother. The inclusion of unobserved heterogeneity seems to be of some importance, since some of the above mentioned results are different than the corresponding results obtained by means of standard hazard regression models. This applies in particular to the effect of the number of children on the transitions in and out of employment.

Conclusion

Interpretation

Before we move on to a further discussion of the results found above and the relevant paths for future research, we find it relevant to dwell a little more on their *interpretation*: how should the effect of a woman's employment status net of the unobserved heterogeneity included via these latent factors be understood? In the simultaneous equations modelling approach, the effect of currently being in employment versus currently being out of employment is *net* of the unobserved variables entering into the hazard equations. This means that we can think of the employment effect as a comparison of two women who have the same *score* on the latent variable scale - or we could even think of it as comparing a given woman with herself. Therefore, it is reasonable to link the estimates of the simultaneous equations model to the theoretical considerations regarding opportunity costs which were introduced in the beginning of this paper. For example, what would the birth intensity of this woman who is currently in employment have been, had she (contrary to the fact) not been employed? The results regarding second birth can thus be interpreted as follows: a one-child mother who is currently non-employed has a probability of having her second child which is 7.1% lower than if she had been employed. For third birth the result can be interpreted as follows: a two-child mother who is currently non-employed has a hazard of giving birth to her third child which is 9.6% higher than if she had been employed. Now, why do we see such differences across parities? Norwegians display a strong two-child norm, i.e. the second child is a question of *when*, but the third child is a question of *if*. Due to the parental leave system, it is reasonable to assume that a one-child mother will choose to have her second child at a point in time in which she is entitled to maternity leave; and this is more likely to be the case for a woman who is currently employed than for a woman who is not. On the other hand, the two-child mother who considers having a third child might choose to have it only if the family has the time and opportunity to take care of this child. This might well be more likely the case if the mother is currently not in employment.

We are reluctant to putting too much interpretation into the latent variables and their correlation as such. We mainly consider the latent variables to be tools serving the dual purpose of taking into account the unobserved heterogeneity representing unmeasured characteristics of the women and for handling the recurrent event nature of the data. The main thing is that when unobserved characteristics are represented by latent variables and all 3 equations are modelled simultaneously, the effect of employment can be interpreted as an effect of employment *per se* - net of unobserved characteristics which could potentially give rise to endogeneity problems, as previously described.

Discussion

As previously described, unobserved characteristics might give rise to spurious results in a standard intensity regression model (separately for second or third birth). Our modelling approach takes into account the unobserved heterogeneity governing the hazards in and out of employment and the unobserved heterogeneity governing the hazard for second and third birth. The results found in this paper show that the inclusion of unobserved heterogeneity does in fact change the estimated effects of employment status on the second and third birth intensities, but the differences in birth rates are still evident (and have the same sign). However, employing the simultaneous modelling approach provides no guarantee that *all* selection bias has been taken into account. One could argue that part of the selection is taking place when entering into motherhood. Unfortunately, the data available for the present study did not allow us to include a model for the first birth intensity and it is therefore possible that some selection is still in action in the fertility process. Furthermore, the first spell of the employment process for a woman is the spell which starts after her first maternity leave. This spell might be either *in employment* or *out of employment*. Whether this initial state is one or the other is a matter of choice which might not be fully covered by the unobserved heterogeneity entering into the hazard equations. However, we do not expect this to constitute a problem of any significance in the analysis at hand.

In the previous description of Norwegian family policy, we described the availability of non-marginalised part-time employment in Norway as an important factor in the relationship between childbearing and employment. With the data available for the present study it was not possible to distinguish between part-time and full-time employment, however. As pointed out by Aassve et al. (2006), this might have an influence on the effect of employment on fertility, since it is reasonable to expect that women working part-time are more inclined to having a child than women working full time due to the lower opportunity costs associated with part-time employment. In particular, the distinction between part-time and full-time employment might in this case be relevant for the third child.

Another aspect of the employment history which is potentially important is the accumulated work experience. As mentioned previously, Kravdal (1992a) - using data which are older than the data used for this study - did not find any particular evidence suggesting an effect of employment on the third birth. However, he argued that the women who are non-working after having had a second child comprise a rather heterogeneous group. This heterogeneity stems from factors such as e.g. religious affiliation but also the accumulated work experience. The latter is likely to play an important and

direct role for a woman's opportunity costs of childbearing since women who have accumulated much work experience will have large opportunity costs associated with staying out of employment. Introducing heterogeneity in the modelling approach meets some of the points raised. However, it is possible that not everything is covered. For example, work experience is accumulated over time whereas the unobserved characteristics taken into account in the model employed in this study are assumed to be constant over time. Therefore, it is possible our model may not capture all of the above mentioned issues. This problem was also mentioned by Aassve et al. (2006), who suggested that the possible *adjustment over time* of unobserved characteristics could be relevant. The inclusion of accumulated work experience also relates to the issue which was brought up by Del Bono et al. (2008) who showed that the loss of job-specific human capital was important when considering the effect of employment on fertility. However, we did not have employment information before 1993 and it was therefore not possible to include work experience in our model.

Furthermore, it is possible that some women are involuntarily out of employment for longer or shorter periods (even if Norway displayed a relatively low unemployment rate during the study period). On the other hand, it might also be that some women, who would otherwise have preferred to work, are staying at home due to inadequate access to child-care (Kravdal, 2002). We have not been able to take such factors into account in this study.

Ideally, we would have had more detailed information about employment structure, such as working hour, in order to capture different work-family arrangements. However, we believe that the distinction between employment and non-employment is an important indicator of work-family strategies and that the employment information included in the present analysis does indeed suffice to shed new light on the employment-fertility relationship.

We have included only women who were either married or cohabiting at the time of first birth; on the other hand, we have disregarded any subsequent changes in partnership status and we have not included any information concerning the woman's *current* partnership status, nor any characteristics concerning the possible partner. It would indeed be relevant to assess the extent to which the results found above are influenced by such factors. In particular, it would be interesting to examine how the income of the male partner (or more generally, the entire household income) affects the results found. Butz and Ward (1979) formulated a static economic model for how fertility is influenced by male income and female wage rates. One of their main points was that the probability of a birth rises with male income but it will be less important if the woman is non-employed compared to when she is

employed, because non-employed women have lower opportunity costs associated with childbearing. Their approach has the underlying supposition that if the husband's income is high enough the wife will stay at home and that children are provided for in the household only by women. It is by no means clear to which extent this is a valid assumption in contemporary Norway. Hence, it is rather difficult to judge the extent to which the inclusion of e.g. male income would influence the results found. Also, Aassve et al. (2006) in their study of employment, union formation and childbearing in Great Britain, included a separate process for union formation taking into account possible selection problems concerning the effect of the partnership status on the employment process and the birth process. However, the present study is based on administrative registers, and the information concerning especially cohabitation unions is not very precise. Therefore, it is possible that including this information might even *introduce* rather than remove bias.

Concluding remarks

The above analysis provides to the best of our knowledge new and important insight into the relationship between employment and fertility in Norway. The main findings in this study are: that *(i)* Employment status has a slightly positive but relatively small effect on the second birth intensity. *(ii)* When it comes to the third birth intensity, women who are non-employed display a larger third birth intensity than those who are employed. When controlling for unobserved heterogeneity which might be at least part of the explanation for the higher intensity for non-employed women, the effect remains, even if it does get somewhat smaller. The right to paid maternity leave entails that the forgone income loss due to absence from the labour market around the birth of a child is much smaller than in countries such as e.g. the United States. Also, the relatively high child care coverage is important because it makes the combination of childrearing and employment more feasible compared with countries outside of Scandinavia. On the other hand, there are opportunity costs associated with childbearing; even if Norway has subsidised childcare, it is nevertheless costly for the parents, and other factors such as career interruptions due to maternity leave may contribute to these costs. Our results suggest that even in a society such as the Norwegian in which there is a high compatibility between motherhood and labour market attachment due to leave programs, high degree of childcare coverage and general availability of part-time work there are still certain *costs* associated with childbearing and that this is taken into account by Norwegian women, in particular when it comes to the progression to third child.

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