Word count: abstract 133; main body 7863; references 1681; total 9677

Child care availability and fertility

Ronald R. Rindfuss
University of North Carolina
and
East-West Center

David K. Guilkey
University of North Carolina

S. Philip Morgan
Duke University

Øystein Kravdal
University of Oslo

Acknowledgements. The analyses reported here were partially supported by a grant from NICHD (RO1-HD038373). Rindfuss and Kravdal also received support from the Centre for Advanced Study of the Norwegian Academy of Science and Letters. Thanks to Statistics Norway, especially Halvor Strømme and Kåre Vassenden, for making the data available to us. Erika Stone provided excellent programming assistance and Ann Takayesu provided excellent manuscript preparation assistance.

Child care availability and fertility

Abstract.

The child care and fertility hypothesis has been in the literature for a long time and is straightforward: As child care becomes more available, affordable, and acceptable, the antinatalist effects of increased female educational attainment and work opportunities decrease. As an increasing number of countries express concern about low fertility, the child care and fertility hypothesis takes on increased importance. Yet data and statistical limitations have heretofore prevented empirical agreement on the hypothesis. Using rich longitudinal data and a fixed-effects, discrete-time hazard model that controls for unobserved heterogeneity at the individual and locality level, we show that increased availability of child care clearly and consistently has a positive effect on fertility. We discuss the generalizability of these results to other settings and their broader importance for understanding low fertility variation and trends.

Child care availability and fertility

Over one-half of the global population currently lives in countries with a total fertility rate[1] below the *replacement level* of 2.1 (Balter 2006; Morgan and Taylor 2006), which implies that the average woman would have less than one daughter surviving to adulthood and thus she does not replace herself. The decline in the number of countries with high fertility rates (and rapidly increasing populations) has been welcomed for a variety of reasons; yet the emergence of below replacement level fertility in more than 60 countries has raised its own set of concerns. First, in many counties fertility rates are so low that, absent massive immigration, they imply dramatic population aging and rapid population decline, which, in turn, are linked to a wide variety of economic and social policy concerns. A second set of concerns is that low fertility can have its own inertia. No country has rebounded from having a TFR below 1.5 for a decade or more, which has led to claims of a low fertility trap hypothesis (Lutz and Skirbekk 2005), whereby the society accepts and young adults expect very small families. (See related arguments in Fernández and Fogli 2005; Sacerdote and Feyrer 2008.)

Concern over low fertility is not new. In 1937 (290; 1997:612), Davis argued that effective birth control and the exigencies of industrial and post-industrial economies produced a "ripening incongruity between our reproductive system (the family) and the rest of modern social organization." Davis argued that this incongruity is fundamental to modern societies. Of course, the increases in fertility in Europe and North America after

[1] The total fertility rate (TFR) is the average number of births that a woman would have if, hypothetically, she lived through the reproductive years experiencing the age-specific fertility rates observed in a given calendar year.

World War II resulted in our forgetting Davis' incongruity, especially in the United States where the TFR has been at or near replacement levels for more than a generation. In contrast, many countries in Europe (e.g. Italy, Germany, Austria and Spain) and in Asia (e.g. Japan, South Korea and Singapore) have been experiencing very low fertility (TFRs 1.4 or below) for a decade or more, and commentators (Demeny 2003; Caldwell and Schindelmayer 2003; Reher 2007) have again argued that low fertility will persist since it seems insensitive to policy interventions – echoing Davis' incongruity.

In this paper, we show that institutional arrangements can reduce this incongruity. We focus on the role of child-care centers in reducing the tension between work and family. In industrial and post-industrial societies it is difficult for mothers of young children to be in the paid labor force. It is usually impossible to bring a very young child to the workplace and the child cannot be left unattended. At the individual (micro) level this has led to the well-known negative relationship between female labor force participation and fertility. To the extent that women need to choose between work and fertility at the macro level, the result has been very low fertility levels in numerous countries. The availability of centers that care for children during the hours when their mothers are working and commuting should be pronatalist. However, empirical support for this claim has been lacking and herein lays one source of the pessimism captured in the *inevitable incongruity* claim.

Using high quality data from Norway and appropriate statistical modeling techniques that combine the power of fixed-effects, parity-specific models with the discrete factor method pioneered by Heckman and Singer (1984), we show that making high quality, affordable, worker-friendly child care available leads to higher levels of childbearing. Moving from having no child care slots available for pre-school age children to having slots available for 60% of pre-school children, leads the average woman to have 0.7 more children. For countries struggling with the ramifications of very low levels of fertility, this would be sufficient to bring them close to or above replacement level fertility.

Background: Changes in Education, Work, and Their Relationship to Childbearing

Child-bearing and –rearing is now occurring in a social and economic landscape that has changed markedly in the past half century. Consider education first. The proportion completing secondary school and going to tertiary education has increased dramatically – more than doubling in the past 50 years in most economically advanced countries, and this increase has been much steeper for women than men. Now women are now more likely to complete university education than men (Schofer and Meyer 2005; UNESCO 2009). The more rapid educational increase for women has been linked to a number of factors including changes in family structures and women's increasing incentives to obtain market-linked skills (Buchmann and DiPrete 2006). Concomitant with the rise in female educational attainment there has been a substantial increase in women's participation in the paid labor force (e.g., Adsera 2004; Pettit and Hook 2005; Raley et al. 2006; van der Lippe and von Dijk 2001). The rise in educational attainment is intricately linked to the increase in female labor force participation. Higher educational attainment produces greater economic returns to employment as well as being associated with better jobs -- those with more benefits, more pleasant working conditions, and higher status. A variety of other factors also likely contributed to the increased female labor force participation, including the increased demand for service workers and for workers in female dominated occupations, increases in age at marriage, and the relative stagnation in male earning power (England and Farkas 1986; Oppenheimer 1994; Pettit and Hook 2005). Further, government attempts at work-family reconciliation may now also lead to additional increases in female labor force participation (Apps and Rees 2004; Lewis et al. 2008; Mandel and Semyonov 2005; Spiess and Wrohlich 2008; Wrohlich 2008).

Prior to the dramatic increase in female educational attainment and labor force participation, developed countries that had the highest fertility level had the lowest proportion of women in the paid labor force, and vice versa. This negative correlation was consistent with sociological and economic theory. But the relationship changed during the 1980s, and by the 1990s there was a positive correlation at the country level between fertility and female labor force participation (Ahn and Mira 1999; Brewster and Rindfuss 2000; Del Boca 2002; Rindfuss et al. 2003). This anomalous change initially produced disbelief (Kogel 2004) and then considerable theoretical as well as empirical speculation about its causes (Bonoli 2008; Bratti and Tatsiramos 2008; Fernandez and Fogli 2006; Hirazawa and Yakita 2007; Matzsiak and Vignoli 2008; Morgan and Taylor 2006; Rendall et al. 2009).

A persistent theme in the discussion of the change from a positive to a negative relationship has been differential institutional responses to changes in employment and demographic behavior. The emphasis varies from female employment, the wage gap between employed men and women, and the timing/quantity of childbearing, but the underlying argument is the same: institutions in different countries reacted differently with the result that these institutional differences have led to quite different outcomes across countries (e.g., Mandel and Semyonov 2005; Rindfuss et al. 2003; Morgan 2003; Stier and Lewin-Epstein 2001). With respect to employment and wages, a central institutional hypothesis involves the facilitating role of paid maternity leaves and the availability of high-quality child care – both of which are also central to the fertility literature. We now turn to the child care and fertility hypothesis.

The Child-Care and Fertility Hypothesis.

With its roots in both sociology and economics, the child-care and fertility hypothesis is straightforward: As child care becomes more available, affordable, and acceptable, the antinatalist effects of increased female educational attainment and work opportunities decrease. Sociologists focus on the incongruity or incompatibility of the mother and worker roles (e.g., Davis 1937; Presser and Baldwin 1980; Rindfuss 1991; Stycos and Weller 1967; Brewster and Rindfuss 2000; McDonald 2000; Morgan 2003). In today's developed economies, with few exceptions, job responsibilities and workplace settings do not permit children to be present on a routine basis. Flextime, part-time and shift work can all ease the incompatibility between the worker and mother roles, but the incompatibility remains. Even mothers with young children who work from home typically require help with child care (Gerson 1988). The use of a child care center while the mother works substantially reduces worker-mother role incompatibilities.

The economic argument involves opportunity costs (Becker 1960; Becker and Lewis 1973; Hotz et al. 1997; Willis 1973). These opportunity costs include foregone wages while out of the labor force, along with the loss of skill development that can affect wage rates upon reentry. Using available child care, whose costs presumably are well below the woman's wage rate[2], allows mothers to return to work sooner, thus reducing the opportunity costs associated with having children.

The hypothesis that available, affordable, and acceptable child care should increase fertility has been in the research literature for more than 65 years (c.f. Myrdal 1941), but available evidence has been inconsistent at best and often contrary to theoretical expectations. In the U.S., two studies (Blau and Robins 1989; Presser and Baldwin 1980) found some tentative support for the hypothesis, while two others did not (Leher and Kawasaki 1985; Mason and Kuhlthau 1992). European studies (Andersson, Duvander and Hank 2004; Del Boca 2002; Hank and Kreyenfeld 2003; Kravdal 1996) also report mixed results, with none finding strong positive effects of child care availability. Recent evidence from Norway (Rindfuss et al. 2007) finds the expected effect of child care availability on the timing of the first birth.

In reviewing these prior inconsistent results, we stress that this hypothesis is extremely difficult to test in a methodologically defensible manner. First and most crucial, there are local, generally unmeasured factors that can affect the availability of child care. Some of these factors are idiosyncratic (e.g. a local activist) and others are systematic. In short, one cannot assume that day care centers are "randomly assigned" to neighborhoods as in a carefully designed experiment. Rather, the demand for day care services, and their emergence, would likely be greatest where work/family conflict was most strongly felt. This same work/family conflict would likely produce low levels of fertility. Thus, simple comparisons can show greater day care availability associated with *lower* fertility. In fact, below, using our data, we show that not controlling for

[2] The increased education of women, combined with the greater labor force experience they have due to delayed childbearing patterns, means that the differential between the wages of well-educated mothers and relatively low-skilled child-care workers has increased (see Martinez and Iza 2004).

unmeasured local characteristics produces this anomalous result. Such counter-intuitive findings are not novel. Early studies of the association between proximity to family planning clinics and fertility levels in developing countries often found a positive association – family planning clinics were found in areas with *higher* fertility. But this anomalous association was produced by *endogenous* placement of clinics -- in centrally administered family planning programs, administrators placed clinics in high fertility areas. When this endogeneity was controlled statistically, the expected negative association was found (Rosenzweig and Wolpin 1986). In a parallel way our research must take into account the placement of day care centers. We do so using a fixed-effects modeling strategy.

Second, the data demands for a defensible test, whether using a fixed-effects approach or not, are substantial. Measures of child care availability throughout a woman's reproductive period are needed, which means knowing all her places of residence as well as a time series of child care accessibility in those locations. Third, potential parents can move from areas with a paucity of child care to areas where it is more readily available. Such selective migration must be taken into account[3] complicating statistical analyses. Fourth, there is unobserved heterogeneity at the individual level. Perhaps the best example is fecundity. Women and their partners vary with respect to their fecundity, and it is essentially impossible to adequately measure fecundity. Unobserved fecundity and other unobserved heterogeneity must be modeled. All four factors must be addressed simultaneously in order to provide a rigorous test of the child-care availability and fertility hypothesis. In general, appropriate data and

[3] Details and an example can be found in Rosenzweig and Schultz (1982).

statistical techniques have not been available or have not been used in previous research. Thus, the empirical literature on this important question remains inconclusive.

The Norwegian Setting

The data for this article are from Norway, a Scandinavian country with slightly less than five million people. In 2008, its total fertility rate was approximately 2.0 – among the highest in Europe.

Norway has adopted a number of policies that together reduce the incongruity of the work and mother roles. These policies have been motivated by an interest in promoting gender equality, improving the well-being of women and families, and stimulating the economy through increased female labor force participation (see Brandth and Kvande 2009; Rønsen 2004). Norway is one of the Scandinavian countries that Esping-Anderson (1990, 1999) classifies as "social Democratic," promoting equality and socializing family costs. Since 1956, Norway has been extending its parental leave which now totals 52 weeks at 80% pay or 42 weeks at 100% pay, with 4 weeks of leave reserved for the father. There have also been policies affecting the workforce that are parent friendly. The mother is entitled to two-hours each day to facilitate breastfeeding. Parents have the right to stay home with sick children 20-30 days per year. And, not surprisingly, in comparison to a variety of other countries, Norway ranks high on egalitarian gender attitudes (de Laat and Sevilla Sanz 2006) and the share of child care help provided by fathers (Sacerdote and Feyrer 2008; Sullivan et al. 2009).

Norway provides a substantively interesting setting for a strong test of the child care and fertility hypothesis. Not only does it have the appropriate data, but during the time period under examination, Norway experienced a substantial expansion of child care availability (Rindfuss et al. 2007; Rønsen 2004). In 1973, the percent of children aged 0 to 6 in child-care centers was close to 0. This increased to over 40% by the late 1990s and is still increasing. There are public day care centers, established by municipalities, as well as private ones. Private day-care centers are nonprofit, and are typically started in response to insufficient availability in public day care centers. Regulations regarding the training of child care providers, ratio of adult providers to children, and the like are set by the national government. These regulations cover both public and private day-care centers, and the consensus is that the resulting care is of very high quality. Considerable variation in availability of child care centers remains across municipalities.

Both public and private day-care centers are heavily subsidized by the national government. At the end of the period studied here (1998), both types of centers received government subsidies of approximately $500U.S per month per enrolled child, which is slightly more than half the total cost (Håkonsen et al. 2003). Many public centers also receive a subsidy from the local municipality. Low income parents are sometimes further subsidized. Because of government subsidies, the parents' share of the cost of child care is affordable given the level of Norwegian household income. To provide a referent for child care costs, for couples with a median after-tax income of approximately $65,000 and at least one child younger than 5, the price for a year of day care isles than $4,000 in 2007 (Statistics Norway 2008). Although the original motivation for providing child care was to prepare children for school independent of parental resources (Bernhardt et al. 2008), the motivation soon switched to accommodating working parents and promoting gender equality. Given this motivation, centers' hours of operation are designed to accommodate the work and commuting schedules of parents; they are open until the time when most parents return from work. Hence Norwegian day-care centers have features that should strongly reduce the incompatibility between the worker and mother roles.

Data

Data is obtained from two sources. At the municipality level, we use data on two variables (child care availability and the level of female unemployment, with the latter measured as the number of women reported unemployed divided by the total number of women aged 16-66) from the Norwegian Social Science Data Services, available for each of the 435 Norwegian municipalities. The child care data are available beginning in 1973 when the expansion in child-care facilities was starting. Our measure is the percentage of preschool-age children in day care centers by municipality and year. As such, this is literally a measure of utilization rather than availability. However, throughout the period we examine, the demand for child care exceeded the supply (Asplan-Viak 2005; Rindfuss et al. 2007), and hence our variable measures both availability and utilization. In addition to availability, theories about child care and fertility (e.g. Andersson et al. 2004; Rindfuss and Brewster 1996) also include consideration of quality, cost and acceptability. We do not have measures of these three dimensions, but we would argue that their absence is unlikely to affect our results because there is little variation on them across the 435 Norwegian municipalities. Quality standards are set by the national government rather than municipalities. Since these standards are very high, there is little incentive for municipalities to exceed them. Similarly there is little variation in cost across municipalities (Rauan 2006). The long-running support for subsidized child care centers across Norway with no organized opposition provides evidence that the acceptability of using child care centers is high.

The second source of data is individual-level records for women from various Norwegian registers that cover the entire country, linked together by means of a personal identification number[4] assigned to all individuals who have lived in Norway since 1960. The Norwegian population registration system is of very high quality, constantly being updated and cross-checked against other Norwegian data systems.

The 1973 starting date for child-care center data influenced the cohorts we analyze; given our statistical approach it is important to start the discrete-time hazard analyses at the beginning of childbearing process to avoid problems caused by left censoring. The 1957 birth cohort turned 15 in 1957. To capture most of the childbearing of the cohorts examined, we wanted to follow cohorts through at least age 35. (Only approximately 0.2 births occurred after age 35 for these and neighboring cohorts, and so we are capturing almost all their fertility experience.) Given that our data ends in 1998 and the 1962 cohort turned 35 in 1998, we examine the childbearing of cohorts 1957-1962. As described below, the analysis sample is large, permitting complex analyses with stable results.

At the individual level, a number of background and time-varying variables are available. Background variables include the woman's mother's and father's education, coded into six categories: no information available, compulsory or less, 10 years, high school or vocational school, some college, college or more. The other background variable is birth cohort (1957-1962). Cohort is included for the transition to parenthood (parity 0 to parity 1) to control for possible cohort trends. Cohort is not included as a

[4] To maintain confidentiality, Statistics Norway removed all identifiers, including place identifiers, after construction of the work file used in this paper.

control variable in subsequent parity transitions because age at first birth and duration since last birth are sufficient trend controls (cf. Ni Bhrolchain 1992).

A variety of time-varying controls are in the analysis, including three that track aspects of time. In the transition to first birth, the woman's age is entered as both a main effect and interacted with all other variables in the model. The need to interact age with other variables when examining the transition to parenthood is well established in the fertility literature (e.g., Rindfuss et al. 2007). After the first birth, age is no longer controlled. Rather we control for age at first birth (an indicator of the stage in the life course when the woman became a mother) and duration since last birth (indexing a number of possibilities including experiences with the previous child, fecundity impairments, and/or non-family aspects of their lives).

Both enrollment in school and educational attainment are controlled. The categories for the woman's education are the same as for her parents except that there is no missing data category.

We include two additional time-varying variables. The first controlled for whether the woman lived abroad during some years, perhaps to obtain more education. This indicator variable signals that we do not have relevant child-care availability for these years. The second time-varying variable is the mother's location vis-à-vis her daughter. This variable is relevant because mothers may provide child-care for their daughters affecting the import of child care centers. There are four categories for mother's location: same municipality as the woman (potentially available to help with child care), different municipality, dead or abroad, and no information. This last category, "no information," requires additional discussion. The links between the woman's records and her parents' records were established by Statistics Norway with the 1970 census. If, for whatever reason, the woman was not residing with her parents then, no link was established and hence missing data on the mother's location as well as her mother's and father's education. To avoid losing women without links to their parents' records, our procedure makes missing parental information the omitted variable (reference category) for all three sets of variables.

Time-varying variables are lagged two years, allowing for a 9 month gestation, 5 month average waiting time to conception and an average birth occurring during the middle of the calendar year. One exception is age, for which there is no need to lag by a constant amount. The second exception involves the municipality-level variables, including the fixed-effects municipality variables. For the municipality variables, we used municipality where she lived for the year indexed by the fertility dependent variable, and then lagged that variable back two years. For women who moved from one municipality to another, this gives preference to the destination municipality's characteristics, and makes the assumptions that people are aware of a migration many months before it occurs and that they are aware of relevant characteristics at the destination before they actually migrate.

Methods

Our analysis procedures include a discrete-time hazard model to estimate the determinants of the timing of births on a parity-by-parity-transition basis and a simulation model that uses the statistical results to estimate the total number of children born to women by age 35 given different child-care availability scenarios. We allow the effects of child-care availability and other variables to vary by birth interval and we control for unobserved heterogeneity using a non-linear heterogeneity variation of the Heckman-Singer (1984) procedure, which allows for very general patterns of correlation across birth intervals. Municipality-level fixed effects are included to control for endogenous or idiosyncratic placement of child-care facilities as well as selective migration of respondents to areas with better child-care availability. Finally, as noted above, the effects of child care and other variables on the first birth are expected to vary by age (Rindfuss et al. 2007), thus we include age interactions with all predictor variables when modeling age at first birth, but not in subsequent birth intervals.

In the remainder of this methods section we discuss important methodological and statistical decisions; readers only interested in the substantive findings can proceed directly to the results section.

Fixed effects with heterogeneity correction. We jointly estimate models for the timing of age at first birth through the timing of the birth of the respondent's fifth child (birth intervals zero through four) for women between age15 and 35 who were born in Norway. Very few women had more than five children and so we account for over 99% of all births. The statistical specification for the set of five equations that we estimate is as follows:

$$\ln\left[\frac{P(B_{ijtk}=1 \mid B_{ij,t-1,k}=0)}{P(B_{ijtk}=0 \mid B_{ij,t-1,k}=0)}\right] = X_{ijtk}\beta_k + C_{jtk}\alpha_k + CD_{jtk}\lambda_k + \mu_{ik} \qquad (1)$$

where the dependent variable is the log odds that woman i from municipality j had the birth of her k^{th} child at time t. The X's represent time varying individual level characteristics such as the woman's age and level of education that may affect the likelihood of a birth. Note, as discussed above, that we allow the set of variables to change by birth interval. We also have several time invariant explanatory variables such as the level of education of the woman's parents. However, we simply represent all these variables by X to avoid notational clutter. C represents time-varying municipality-level variables such as day-care availability and CD represents a set of municipality dummy variables – more will be said about these below, but here we note that the t subscript on CD indicates that we take into account the possibility that women sometimes move from one municipality to another.

The β's, α's, and λ's represent unknown regression coefficients to be estimated where we allow the effects of all variables to vary by birth interval. The μ's represent unobserved characteristics of woman i that are fixed by birth interval, that is, they do not change within the interval but can change across intervals. We assume that the μ's are correlated across birth intervals. The implication of this assumption is that estimation of the parameters for any birth interval beyond the first interval will potentially lead to biased results due to selectivity issues if it is estimated in isolation (see, for example, Heckman and Singer, 1984 and Wooldridge, 2002). Rather than make a specific parametric assumption about the distribution of the μ's, for example, multivariate normality is often assumed, we use a variation of the discrete factor approximation (Heckman and Singer, 1984). Specifically, we use what Mroz (1999) refers to as non-linear heterogeneity where mass points are estimated for each interval along with a common set of probabilities. This form for the discrete factor model allows for very general patterns of correlation across birth intervals.

In order to provide more details on the estimation method, we rewrite the above equation using more compact notation:

$$\ln\left[\frac{P(B_{ijtk}=1 \mid B_{ij,t-1,k}=0)}{P(B_{ijtk}=0 \mid B_{ij,t-1,k}=0)}\right] = Z_{ijtk}\pi_k + \mu_{ik} \qquad (2)$$

where Z represents the entire set of explanatory variables and π represents the set of coefficients. Assume that M points of support are used to approximate the distribution for each of the μ's. Then, conditional on mass point $\mu_m = (\mu_{1m}, \mu_{2m}, \ldots, \mu_{Km})$, woman i from community j would contribute the following to the likelihood function:

$$A_{ijm}(\mu_m) = \prod_{k=1}^{K}\prod_{t=1}^{T_{ijk}}\left(\frac{e^{(Z_{ijtk}\pi_k + \mu_{km})}}{1+e^{(Z_{ijtk}\pi_k + \mu_{km})}}\right)^{B_{ijkt}}\left(\frac{1}{1+e^{(Z_{ijkt} + \mu_{km})}}\right)^{(1-B_{ijkt})} \tag{3}$$

where it is assumed that the woman had K children with the first child born when the woman is age $15+T_{ij1}$, the second at age $15+T_{ij1}+T_{ij2}$ and so on until the end of the woman's 35th year. The unconditional contribution for woman i from community j is:

$$A_{ij} = \sum_{m=1}^{M} w_m A_{ijm}(\mu_m) \tag{4}$$

where the w's are a set of weights to be estimated that sum to one.

The likelihood function can now be written as follows:

$$L = \prod_{j=1}^{J}\prod_{i=1}^{I} A_{ij} \quad . \tag{5}$$

The likelihood function is maximized with respect to the β's, α's, and λ's as well as the mass points and weights. If a constant is included in each equation, one mass point per equation is not identified and so it is normalized to zero. In addition, the weights sum to one which means that K(M-1) mass points and M-1 weights are estimated. Using a suggestion due to Mroz (1999), we add mass points until the improvement in the likelihood function is less than the number of additional parameters.

Our sample consists of 171,101 women born in Norway. The size of this data set proved to be too large for our estimation program and so we drew a 50% random sample for use in estimation. We then estimated our final model on the "hold out" sample and obtained substantively identical results. This is not surprising given the large sample sizes.

Specification issues. We discuss two major specification issues: a) the use of municipality fixed effects to control for endogenous placement of daycare facilities and selective migration and b) the use of the discrete factor specification to control for unobserved heterogeneity. Three versions of our empirical model were estimated:

1. A model with neither municipality fixed effects nor controls for individual unobserved heterogeneity, the "naive model";
2. A model with municipality fixed effects[5] but without controls for individual unobserved heterogeneity, the "fixed effects" model; and
3. Our preferred model with both municipality fixed effects and controls for individual unobserved heterogeneity, "fixed effects with heterogeneity correction" model.

Table 1 presents the log likelihood function for each model along with the number of estimated parameters. The table also presents likelihood ratio tests of the null hypothesis that the parameters added by models 2 and 3 to the simple model are jointly statistically significant. As can be seen in the table, the p values in both cases are zero indicating a clear rejection of the null hypotheses of zero effects. Therefore, model 3 (that has both municipality fixed effects and controls for unobserved heterogeneity) is the preferred model.

[5] In preliminary work we used a full set of fixed effects (434 fixed effects represented by dummy variables), but many of the municipalities are very small, making estimation over time on the municipal variables very volatile, and some of the municipality-level variables show levels and changes that are not believable. For the results presented here we use 99 fixed effects for the largest 99 municipalities. The child care results are robust whether we use the full set of fixed effects or the 99 representing the largest places.

Table 1 about here

Table 2 presents estimates from the discrete factor model. Empirically, it was determined that we needed to use four points of support. Panel A presents the probability weights (the w's in equation (4)) and Panel B the mass points (the μ's in equations (1)-(3)). Note again that mass point 1 is set equal to zero for identification. We also present the standard errors for the mass points. Note that they are typically very precisely estimated.

Table 2 about here

Simulation procedure. This statistical modeling approach produces a large number of estimated parameters (i.e., over 700 parameters in the preferred model including municipality effects and heterogeneity distribution parameters)[6]. Appendix Table 1 shows the coefficients and standard errors for the three models (naive model, fixed effects, and fixed effects with heterogeneity correction). The table begins with the transition from parity 0 to 1, and then proceeds through the higher order transitions. Very few women reach the transition from the fourth to the fifth birth, and they are highly selected on a number of observed variables. Some variables were deleted from this transition because no longer showed any variation.

We focus on the effect of the availability of child care on the number of children a woman would have. Since the estimated parameters do not lend themselves to easy interpretability (see Appendix Table 1), to help quantify the size of the effects of the key explanatory variables we used simulation methods. These simulations require a complete set of explanatory variables for each woman. This meant that we need to throw out the

[6] Given their limited substantive interest, to conserve space Appendix Table 1 does not include coefficients and standard errors for the municipality effects nor the heterogeneity parameters.

right censored women that were included in the estimation – the women who either died or moved out of Norway permanently before age 35. Fortunately, this resulted in the loss of only 3,515 out of 85,550 women.

The simulation proceeded as follows. We used the estimated coefficients, mass points and probability weights to predict the probability of whether or not woman i from municipality j had a child at age 15. We then compared this predicted probability to a random draw from a uniform distribution with endpoints zero and one. If, for example, the predicted probability of a birth were .05, we would assign a birth to the woman if the uniform random variable was between 0 and .05. If the woman was not assigned a child at age 15, we incremented her age by one year and repeated the procedure. Once the woman was assigned a first child, we then used the coefficients for the first interval (the interval between the first and second birth) to determine the timing of the second child. This process continued through age 35 with end result being that the woman was assigned zero to five births.

This process was followed for each woman in the sample; in the tables we report averages for the sample of 82,035 women. The simulated child care effects are calculated by repeating the above procedure with the child care variable for each woman set at some level throughout the 15 to 35 age interval. In some simulations, the specified child care level was reached instantaneously; in others it was reached in 5, 10 or 15 years. All other explanatory variables were kept at their actual values for each woman so that we could isolate the day-care effect.

Note that the simulation results are based on estimated coefficients. We can add confidence intervals to the predicted number of births through the use of parametric bootstrap methods. To do this, we assumed that the entire set of estimated coefficients, mass points, and mass point weights follow a multivariate normal distribution centered at the estimated values of the parameters with covariance matrix equal to the estimated covariance matrix for the entire set of parameters. We then drew a set of normally distributed random variables from this distribution and conducted the simulation exercise. We repeated this process 250 times. The standard deviation across the 250 bootstrap samples can then be used to construct confidence intervals.

Since our large sample size resulted in precisely measured coefficients, the estimated standard errors were extremely small. For example, for our most complicated model (one with both municipality fixed effects and controls for unobserved heterogeneity), the simulated average number of births for our sample of women is 1.85. The parametric bootstrap with 250 replications yields a standard deviation of 0.0328 which means that the standard error of the mean number of births is 0.0001. The end result was that all pairwise differences in the simulated effects of daycare are statistically significant at all standard levels of significance. Hence we do not report standard errors in the tables showing the simulated number of children ever born.

Results

To interpret the simulated numbers of children ever born under varying child care availability scenarios, keep in mind that the actual number of children borne by the average woman (at age 35) in these cohorts was 1.85. Table 3 shows the simulated average number of children ever born by age 35 for various levels of child-care availability. These simulations assume that the given level of child care was achieved immediately in 1973, when members of the study cohorts were aged 13 or younger.

(Later we relax this assumption.) The magnitude of these differences, a 0.67 child difference between 0% and 60% in child care, is large but not incredulously large. For each 10% increase in child-care availability there is slightly more than a tenth of a child increase in the average number of children born. If Norway had left its level of child care availability at the level it had in 1973, which was just slightly above 0%, the simulated average number of children ever born would be 1.5 or slightly higher, which is comparable to the low levels of fertility found today in many European countries.

Table 3 about here

It might be argued that only after becoming a parent does one really know the time demands placed on parents, especially mothers. Hence, there might be smaller effects of an expansion in child care availability for the transition to parenthood than for subsequent parity transitions. Further, in a setting where only approximately 8% of the women have four or more children, those who have a fourth and a fifth child are by definition unusual and probably less influenced by child care availability. To examine these hypotheses we calculated simulated parity progression ratios (i.e., the proportion at parity X who go on to have the X+1th child) for 4 levels of child-care availability: 0, 20, 40, and 60%. The first column in Table 4 shows the parity progression ratios actually experienced by these cohorts. Most have had a first child (86%). For those who have had a first child, slightly more than three-quarters have a second. Past the second child, the parity progression ratios drop off rapidly. This pattern of the majority of women having a first and second child but relatively few having a third, fourth or fifth is a typical pattern in contemporary, economically-developed countries.

Table 4 about here

The remainder of Table 4 shows simulated parity progression ratios for levels of child care availability at 0, 20, 40, and 60%, as well as the absolute and relative differences between the extremes (0 and 60%). The simulated parity progression ratios confirm our expectations. The largest absolute difference is found for the transition to the second child (0.22) and the largest relative difference is for the transition to the third child (1.64). But more importantly, a substantively significant positive effect of increased child care availability is found for all parity transitions.

So far our simulations assume that the target level of child-care is reached instantaneously in 1973, but such large instantaneous jumps in child-care availability are unrealistic. In Table 5 we show the simulated number of children ever born by age 35 for 20, 40, and 60% child-care availability levels under the assumptions that it takes 0, 5, 10, and 15 years to reach the specified level. As would be expected, the sooner the designated level of child care is reached, the larger the number of children borne by age 35. Note that compared to the level differences shown in Table 3, the implementation timing differences are modest as would be expected given the low levels of childbearing in Norway in the teens and early 20s. Yet, these timing differences are not trivial. If the ultimate goal is to have 60% child care availability, then reaching that goal immediately results in 7% more births compared to taking 15 years to reach 60% availability (i.e., relative difference 0 versus 15 years equals 1.07 – see the 0/15 column).

Table 5 also addresses a different but related question: does the impact of moving from 20% to 60% availability vary depending on the number of years it takes to reach 60%? The answer is yes, and again the differences are modest. If the change is instantaneous from 20 to 60%, then fertility is increased by a factor of 1.25 (25%

increase). In contrast, if one assumes a steady increase across a 15-year period, then the increase is 21%.

Table 5 about here

Sensitivity issues. Our model includes two time-varying education variables for the woman: attainment and whether enrolled in school. Many would argue that a woman's educational career is endogenous with the fertility process, especially in a country like Norway with its open educational system (i.e., it is possible and common to drop out of school and then return later). To make sure that our child care results were not sensitive to the possibility that the woman's education is an endogenous process, we also ran the statistical model without educational enrollment and attainment. Doing so did not appreciably change the child care results.

Our preferred model, the one used for the simulations in Tables 3-5, has municipality fixed effects and a heterogeneity correction. Appendix Table 1 also shows the results form the naïve model, that is a model with neither municipality fixed effects nor controls for unobserved heterogeneity. We show these results because much of the literature on the effects of child care availability (as well as the broader set of studies looking at the effects of other institutional changes) uses variations of this naïve model. Table 6 shows simulations from the naïve model that are analogous to the simulations in Table 3 based on our preferred model -- from the model with municipality fixed effects and a heterogeneity correction. In interpreting Table 6 remember that the actual number of children ever born to these cohorts was 1.85 and that theory predicts a strong *positive* relationship between availability of day care and children ever born. The results in Table 6 are the opposite of theoretical expectations and the opposite of results from our preferred model. While the differences due to changes in child-care availability are not large, they show a negative relationship between child care availability and fertility! We show these results to indicate the import of controlling for unobserved characteristics of municipalities and unobserved individual level heterogeneity. The former is likely the more important as it controls on the endogenous growth of child-care availability.

Discussion

To summarize, the Norwegian experience shows that institutional adjustments can reduce the tension between work and family responsibilities, leading to a fertility level much closer to replacement level than absent these changes. Depending on the speed with which the availability of child care slots moved from 0 to 60%, children ever born by age 35 increased by 0.5 to 0.7 children. This is a substantial increase, but not so large as to lead one to doubt the validity of the results. It casts doubt on the inevitable "incongruity" between family and work that Davis and others have discussed.

To put these results in a broader context, we note that the availability of child care slots for 60% of preschool-age children as the upper limit used in our simulations is probably close to as high as child care availability is likely to go in Norway. Remember that there are generous paid parental leaves available which all but eliminate the need for child care slots for infants. And if the average mother has two children with the typical child-spacing of 2-3 years, this further reduces the need for child care slots even if some parents of infants want to have their oldest in child care while they stay at home with the youngest. Finally, some parents will want to personally care for their children, perhaps with some help from a grandparent or other relatives, again reducing the need for child care slots.

So, if we take 60% as a reasonable upper bound for child care availability, and realize that the counties concerned about their low levels of fertility have TFRs in the 1.3 to 1.6 range, then, if the Norwegian results reported here are applied to these other countries, moving to 60% child care availability would bring their TFRs close to replacement levels. This raises an important question: to what extent are the Norwegian results applicable to other countries?

On the one hand, since these results are the expected ones given sociological and economic theory (reduced role incompatibility and opportunity costs respectively), we would expect to see similar effects in other countries. But there are several factors that suggest caution. First, Norway, like some of its Scandinavian neighbors, has characteristics that might influence its reaction to the increased availability of child care slots. It is a social democratic country whose policies promote equality and socialize family costs. The Norwegian child care policies have not been motivated by concerns about the fertility level, which has remained high by European standards; rather they have been driven by an interest in promoting gender equality and improving the well-being of individual families. Further, even among high income countries, Norway is a relatively wealthy country. And, Norway is characterized by relatively egalitarian gender relations (providing many women with a helpmate in raising children and performing household chores).

Consider this last characteristic of Norway – relatively egalitarian gender relations. Several recent papers (de Laat and Sevilla Sanz 2006; Sacerodote and Feyer 2008) show a positive correlation between the level of a country's TFR and a measure of that country's egalitarian gender attitudes or behavior. In Figure 1 we show a simple scatterplot of an index of gender care equality circa 2000 (Plantenga et al. 2009) with that country's TFR circa 2004 (VID 2006) for 14 EU countries[7]. The country in the lower right corner of the scatterplot, Ireland, is an outlier to the general pattern. If we exclude Ireland, there is a clear, positive relationship between this indicator of gender equality and TFR.

Figure 1 about here

A positive relationship between a measure of gender equality and a country's TFR is consistent with the theoretical arguments made by McDonald (2000) and raises the possibility that there are a bundle of factors (such as greater gender equality in the family and in the labor market, paid paternal leave during the first year following childbirth) that need to be present before substantial increases in child care availability have a major influence on the TFRs in countries that have had low fertility for more than a decade. The countries that have had the most substantial increases in child care availability are Norway's neighbors, who also have relatively high gender equality, generous parental leave policies, and relatively high TFRs. Paradoxically, they are also among the very few countries with appropriate data to test the child care availability hypothesis in a methodologically defensible manner.

Hence, for now, the extension of our Norwegian results to countries such as Austria, Germany, Italy, Japan and Spain – countries with low levels of fertility for more than a decade – will have to remain an open question. We expect that the Norwegian results are generalizable, but perhaps the effects will be attenuated.

[7] The countries are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and United Kingdom. Note that Norway is not a member of the EU.

We close by noting that Germany is the first country that has expressly expanded child care availability (along with other policy changes) in an attempt to increase fertility levels. Until quite recently Germany has been a conservative welfare state, with a strong male-breadwinner model, high wages and protection for the core male work force, a generous maternal leave policy and a tax code that benefitted families (Esping-Anderson 1990, 1999; Lewis et al. 2008; Spiess and Wrohlich 2008). There is little availability of child care slots for children less than three; child care for children 3-6 as well as primary school is half-day; there is limited development of a private child care market; and there is a heavy reliance on grandparents and other relatives for child care (Coneus et al. 2009; Hoem 2005; Kreyenfeld 2004; Wrohlich 2008). Under this conservative policy regime Germany's TFR has been below replacement since the early 1970s (under 1.5 much of that time) and its actual population size has been declining since 2003 (Dorbritz 2008).

Because of concern about population aging and its attendant socio-economic consequences, German policy makers on both the left and the right have had a policy paradigm shift, now adopting policies of the Nordic countries (Coneus et al. 2009; Dorbritz 2008; Lewis et al. 2008; Ruling 2008). For example, a December 2008 law establishes the right to a child care slot for all preschool children age one and above by 2013. Other changes and goals include cutting time for maternal leave to the Nordic level, increasing the proportion of fathers who assume substantial care responsibilities and, in general, a better reconciliation of work and family life for women. Depending on how the child care programs are implemented, the German experience could begin to provide an answer to the generalizability of the Norwegian findings presented here.

References

Adsera, Alicia. 2004. "Changing Fertility Rates in Developed Countries. The Impact of Labor Market Institutions." *Journal of Population Economics* 17: 17-43.

Ahn, Namkee and Pedro Mira. 2002. A Note on the Changing Relationship between Fertility and Female Employment Rates in Developed Countries." *Journal of Population Economics* 15: 667-682.

Andersson, Gunnar, Ann-Zofie Duvander, & Karsten Hank. 2004. "Do Child Care Characteristics Influence Continued Childbearing in Sweden? An Investigation of Quantity, Quality, and Price Dimension." *Journal of European Social Policy* 14(4): 407-418.

Angeles, G., D.K. Guilkey, and T.A. Mroz. 1998. "Purposive Program Placement and the Estimation of Program Effects: The Impact of Family Planning Programs in Tanzania." *Journal of the American Statistical Association* 93:884-99.

Apps, P. and R Rees. 2004. "Fertility, Taxation and Family Policy." *Scandinavian Journal of Economics* 1006: 745-763.

Asplan-Viak. 2005. Analyse av barnehagetall pr 20.09.2005. Arbeidsrapporter Oktober 2005_v5. Oslo.

Balter, Michael. 2006. "The Baby Deficit." *Science* 312(5782): 1894-897.

Becker, G.S. 1960. "An Economic Analysis of Fertility." Pp. 209-31 in *Demographic and Economic Change in Developed Countries*. Princeton, NJ: Princeton University Press.

Becker, G.S. and H.G. Lewis. 1973. "On the Interaction between the Quantity and Quality of Children." *Journal of Political Economy* 81(2, part 2):S279-S288.

Bernhardt, Eva, Turid Hovde and Torkild Hovde Lyngstad. 2008. "Shared Housework in Norway and Sweden: Advancing the Gender Revolution." *Journal of European Social Policy* 18(3): 275-288.

Blau, D.M. and P.K. Robins. 1989. "Fertility, Employment and Child-care Costs." *Demography* 26: 287-299.

Bonoli, Giuliano. 2008. "The Impact of Social Policy on Fertility: Evidence from Switzerland." *Journal of European Social Policy* 18: 64-77.

Brandth, Berit and Elin Kvande. 2009. "Gendered or Gender-Neutral Care Politics for Fathers." *The ANNALS of the American Academy of Political and Social Science* 624: 177-189.

Bratti, Massimiliano and Konstantinos Tatsiramos. 2008. "Explaining How Delayed Motherhood Affects Fertility Dynamics in Europe." IZA Discussion Paper No. 3907.

Brewster, Karen and Ronald R. Rindfuss. 2000. "Fertility and Women's Employment in Industrialized Countries." *Annual Review of Sociology* 26: 271-296.

Buchman, Claudia and Thomas A. DiPrete. 2006. "The Growing Female Advantage in College Completion: The Role of Parental Resources and Academic Achievement." *American Sociological Review* 71: 515-541.

Caldwell, John and Thomas Schindelmayer. 2003. "Explanations of the Fertility Crisis in Modern Societies: A Search for Commonalities." *Population Studies* 57(3): 341-263.

Coneus, Katja, Kathrin Goeggel and Grit Muehler. 2009. "Maternal Employment and Child Care Decision." *Oxford Economic Papers* 61 (Supplement 1): i172-i188.

Davis, K. 1937. "Reproductive Institutions and the Pressure for Population." *American Sociological Review* 29:289-306.

Davis, K. 1997. "Kingsley Davis on Reproductive Institutions and the Pressure for Population." *Population and Development Review* 23:611—24.

de Laat, Joost and Almudena Sevilla Sanz. 2006. "Working Women, Men's Home Time, and Lowest-Low Fertility." ISER Working Paper 2006-23. Colchester: University of Essex.

Del Boca, Daniela. 2002. "The Effect of Child Care and Part-Time Opportunities on Participation and Fertility Decisions in Italy." *Journal of Population Economics*. 15: 549-573.

Demeny, Paul. 2003. "Population Policy Dilemma in Europe at the Dawn of the Twenty-first Century." *Population and Development Review* 29(1): 1-28.

Dorbritz, Jurgen. 2008. "Germany: Family Diversity with Low Actual and Desired Fertility." *Demographic Research* 19: 557-598. Available at: www.demographic-research.org/Volumes/Vol19/17/

England, Paula and George Farkas. 1986. *Households, Employment and Gender: A Social, Economic and Demographic View*. New York: Aldine.

Esping-Anderson, Gosta. 1990. *The Three Worlds of Welfare Capitalism*. Cambridge: Polity Press.

Esping-Anderson, Gosta. 1999. *Social Foundations of Postindustrial Economics*. New York: Oxford University Press.

Fernández, Raquel and Alessandra Fogli. 2005. "Culture : An Empirical Investigation of Beliefs, Work and Fertility." National Bureau of Economic Research Working Paper 11268.

Gerson, Judith M. 1988. "Clerical Work at Home or in the Office: The Difference it Makes." In Kathleen Christensen, Editor, *The New Era of Homework: Directions and Responsibilities*. Boulder: Westview Press.

Håkonsen, L., T. Kornstad, K. Løyland and T Thorsen. 2003. "Politikken Overfor Familier med Førskolebarn - Nen Veivalg." Økonomiske Analyser 5/2003. Statistics Norway, Oslo-Kongsvinger.

Hank, Karsten and Michaela Kreyenfeld. 2003. "A Multilevel Analysis of Child Care and Women's Fertility Decisions in Western Germany." *Journal of Marriage and Family* 65: 584-596.

Heckman, James and Burt Singer. 1984. "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data." *Econometrica* 52: 271-320.

Hirazawa, Makoto and Akira Yakita. 2009. "Fertility, Child Care Outside the Home, and Pay-as-you-go Social Security." *Journal of Population Economics*. 22: 565-583.

Hoem, Jan M. 2005. "Why Does Sweden Have Such High Fertility?" *Demographic Research* 13: 559-572. Online at: www.demographic-research.org/Volumes/Vol13/22/

Hotz, V.J., J.A. Klerman and R. J. Willis. 1997. "The Economics of Fertility in Developed Countries" in Mark R. Rosenzweig and Oded Stark (eds) *Handbook of Population and Family Economics*. Amsterdam: Elsevier 275-347.

Kogel, Tomas. 2004. "Did the Association between Fertility and Female Employment within OECD Countries Really Change Its Sign?" *Journal of Population Economics* 17: 45-65.

Kravdal, Øystein. 1996. "How the Local Supply of Day-care Centers Influences Fertility in Norway: A Parity-Specific Approach." *Population Research and Policy Review* 15: 201-218.

Kreyenfeld, M. 2004. "Fertility Decisions in the FRG and GDR: An Analysis with Data from the German Fertility and Family Survey." *Demographic Research*, Special

Collection 3: 275-318. Available online at: http://www.demographic-research.org/special/3/11/.

Lehrer, E. and S. Kawasaki. 1985. “Child Care Arrangements and Fertility: An Analysis of Two-earner Households.” *Demography* 22: 499-513.

Lewis, Jane, Trudie Knijn, Claude Martin and Ilona Oster. 2008. “Patterns of Development in Work/Family Reconciliation Policies for Parents in France, Germany, the Netherlands and the UK in the 2000s.” *Social Politics* 15: 261-286.

Lutz, Wolfgang and Vegard Skirbekk. 2005. “Policies Addressing the Tempo Effects of Low-Fertility Countries.” *Population and Development Review* 31(4):699-720.

Mandel, Hadas and Moshe Semyonov. 2005. Family Policies, Wage Structures, and Gender Gaps: Sources of Earnings Inequality in 20 Countries.” *American Sociological Review* 70: 949-967.

Martinez, Dolores Ferrero and Amaia Iza. 2004. “Skill Premium Effects on Fertility and Female Labor Force Supply.” *Journal of Population Economics* 17: 1-16.

Mason, K.O. and K. Kuhlthau. 1992. “The Perceived Impact of Child Care Costs on Women's Labor Supply Fertility.” *Demography* 29: 523-543.

Matysiak, Anna and Daniele Vignoli. 2008. “Fertility and Women’s Employment: A Meta-analysis.” *European Journal of Population* 24: 363-384.

McDonald, P. 2000. “Gender Equity Theories of Fertility Transition.” *Population and Development Review* 26:427-39.

Morgan, S. Philip. 2003. “Is Low Fertility a Twenty-First-Century Demographic Crisis?” *Demography* 40(4): 589-603.

Morgan, S. Philip and Miles G. Taylor. 2006. “Low Fertility at the Turn of the Twenty-First Century.” *Annual Review of Sociology* 32:375-399.

Mroz, T. 1999 “Discrete Factor Approximations for Use in Simultaneous Equation Models: Estimating the Impact of a Dummy Endogenous Variable on a Continuous Outcome.” *Journal of Econometrics* 92: 233-274.

Myrdal, A. 1941. *Nation and Family*. Cambridge, MA: Harvard University Press.

Ni Bhrolchain, Maire. 1992. “Period Paramount? A Critique of the Cohort Approach to Fertility.” *Population and Development Review* 18:599-629.

Oppenheimer, Valerie K. 1994. “Women’s Rising Employment and the Future of the Family in Industrial Societies.” *Population and Development Review* 20(2):293-342.

Pettit, Becky and Jennifer Hook. 2005. “The Structure of Women’s Employment in Comparative Perspective.” *Social Forces* 84(2): 779-801.

Plantenga, Janneke, Chantal Remery, Hugo Figueiredo and Mark Smith. 2009. “Towards a European Union Gender Equality Indes.” *Journal of European Social Policy* 19: 19-33.

Presser H.B. and W. Baldwin. 1980. “Child Care as a Constraint on Employment: Prevalence, Correlates, and Bearing on the Work and Fertility Nexus.” *American Journal of Sociology* 85: 1202-1213.

Raley, Sara B., Marybeth J. Mattingly and Suzanne M. Bianchi. 2006. “How are Dueal-income Couples? Documenting Change from 1970-2001.” *Journal of Marriage and the Family* 68: 11-28.

Rauan, Estralitta C. 2006. ”Undersøking om Foreldrebetaling i Barnehager, Januar 2006.” Notater 2006/32. Statistics Norway. Oslo-Kongsvinger.

Reher, David S. 2007. “Towards Long-term Population Decline: A Discussion of Relevant Issues.” *European Journal of Population* 23: 189-207.

Rendall, Michael S., Olivia Ekert-Jaffe, Heather Joshi, Kevin Lynch and Remi Mougin. 2009. “Universal versus Economically Polarized Change in Age at First Birth: A French-British Comparison.” *Population and Development Review* 35: 89-115.

Rindfuss, Ronald R. 1991. "The Young Adult Years: Diversity, Structural Change, and Fertility." *Demography* 28(4):493-512.

Rindfuss, Ronald R., David Guilkey, S. Philip Morgan, Øystein Kravdal and Karen B. Guzzo. 2007. “Child Care Availability and First-Birth Timing in Norway.” *Demography* 44: 345-372.

Rindfuss, Ronald R., Karen B. Guzzo and S. Philip Morgan. 2003. “The Changing Institutional Context of Low Fertility.” *Population Research and Policy Review* 22: 411-438.

Rønsen, M. 2004. “Fertility and Public Policies—Evidence from Norway and Finland.” *Demographic Research* Vol. 10, Article 6. Available online at http://demographic-research.org/volumes/vol10/6/10–6.pdf.

Rosenzweig, Mark R. and Kenneth I. Wolpin. 1986. "Evaluating the Effects of Optimally Distributed Public Programs: Child Health and Family Planning Interventions." *The American Economic Review* 76(3): 470-482.

Rosenzweig, Mark R. and T. Paul Schultz. 1982. "Child Mortality and Fertility in Columbia." *Health Policy and Education* 2: 305-348.

Ruling, Anneli. 2008. "Re-Framing of Childcare in Germany and England: From a Private Responsibility to an Economic Necessity." Anglo-German Foundationa: CSGE Research paper.

Sacerdote, Bruce and James Feyrer. 2008. "Will the Stork Return to Europe and Japan? Understanding Fertility Within Developed Nations." National Bureau of Economic Research Working Paper 14114.

Schofer, Evan and John W. Meyer. 2005. "The Worldwide Expansion of Higher Education in the Twentieth Century." *American Sociological Review* 70: 898-920.

Spiess, C. Katharina and Katharina Wrohlich. 2008. "The Parental Leave Benefit Reform in Germany: Costs and Labour Market Outcomes of Moving towards the Nordic Model." *Population Research and Policy Review* 27: 575-591.

Stier, Haya and Noah Lewin-Epstein. 2001. "Welfare Regimes, Family-Supportive Policies, and Women's Employment along the Life-Course." *American Journal of Sociology* 106: 1731-1760.

Sullivan, Oriel, Scott Coltrane, Linda Mcannally and Evrim Altintas. 2009. "Father-Friendly Policies and Time-Use Data in a Cross-National Context: Potential and Prospects for Future Research." *The ANNALS of the American Academy of Political and Social Science* 624: 234-254.

Stycos, J.M. and R.H. Weller. 1967. "Female Working Roles and Fertility." *Demography* 4:210-17.

UNESCO. 2009. *Global Education Digest 2009*. Montreal: UNESCO Institute for Statistics.

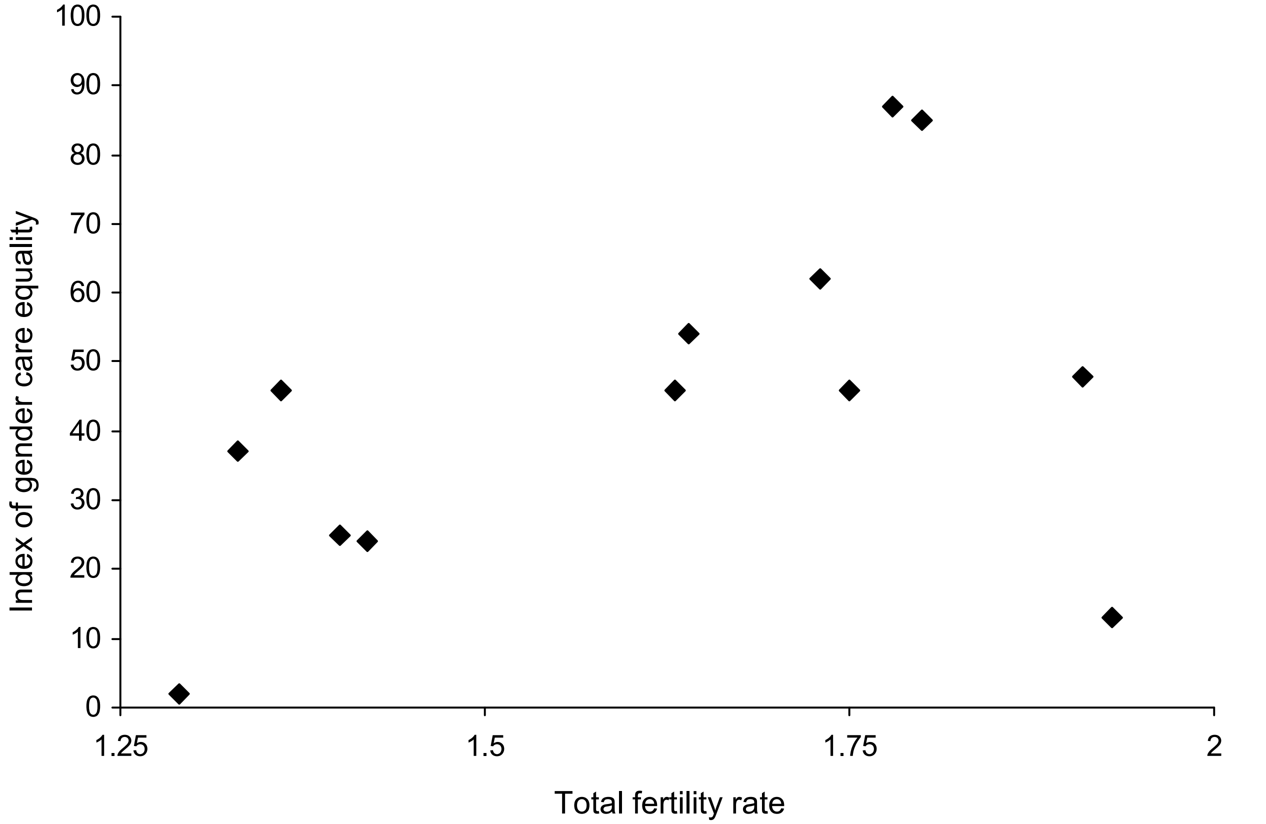
van der Lippe, Tanja and Liset van Dijk. 2001. *Women's Employment in Comparative Perspective*. Hawthorne NY: Aldine de Gruyter.

VID. 2006. European Demographic Data Sheet 2006. Vienna: Vienna Institute of Demography. www.oeaw.ac.at/vid/popeurope/index.html.

Wooldridge, J.M. 2002. *Econometric Analysis of Cross Sectional and Panel Data*. Cambridge: The MIT Press.

Wrohlich, Katharina. 2008. "The Excess Demand for Subsidized Child Care in Germany." *Applied Economics* 40: 1217-1228.

Figure 1. Scatter Plot of Index of Gender Care Equality by Total Fertility Rates for 14 European Union Countries



Sources: Total fertility rate (VID 2006); index of gender care equality (Plantenga et al. 2009, Table 4, Column 3).

Table 1. Specification Tests for the Three Models

Model 1. Naive Model			
Number of estimated parameters:	202	Log likelihood function:	-551371.4
Model 2. Fixed Effects			
Number of estimated parameters:	687	Log likelihood function:	-548954.3
Model 3. Fixed Effects with Heterogeneity Correction			
Number of estimated parameters:	705	Log likelihood function:	-545896.5
Likelihood ratio tests			
Test Model 1 versus Model 2:			
Number of additional parameters:	485	$\chi^2 = 4833$ (p=0)	
Test Model 2 versus Model 3:			
Number of additional parameters:	8	$\chi^2 = 6116$ (p=0)	

Table 2. Heterogeneity Parameters for Model 3

Panel A. Probability Weights

1	0.2066
2	0.2682
3	0.2819
4	0.2433

Panel B. Mass Points

	Interval 0		Interval 1		Interval 2		Interval 3		Interval 4	
	Mass Point	SE	Mass Point	SE	Mass Point	SE	Mass Point	SE	Mass Point	SE
1	0	0	0	0	0	0	0	0	0	0
2	2.298	0.095	1.410	0.075	7.233	0.082	1.392	0.488	1.819	0.321
3	1.989	0.065	0.796	0.078	-11.122	0.082	0.063	0.446	0.292	0.029
4	0.400	0.163	1.011	0.068	6.817	0.090	0.654	0.468	1.827	0.397

Table 3. Simulated* average number of children ever born by level of child care availability

Percent Child Care Availability	Number of Children Ever Born
0	1.51
10	1.62
20	1.74
30	1.85
40	1.97
50	2.08
60	2.18

*Under the assumption that the indicated level of child care availability was reached in 1973.

Table 4. Simulated* parity progression ratios by level of child care availability

	Parity Progression Ratios					Differences between 60 and 0% simulated child care availability	
		Simulated level of child care					
Parity Progression	Actual	0	20	40	60	Absolute (60-0)	Relative (60/0)
0 to 1	.86	.80	.84	.88	.91	0.11	1.14
1 to 2	.78	.65	.74	.82	.88	0.22	1.35
2 to 3	.38	.28	.35	.41	.46	0.18	1.64
3 to 4	.19	.18	.20	.22	.24	0.06	1.33
4 to 5	.16	.14	.16	.19	.22	0.08	1.57

*Under the assumption that the indicated level of child care availability was reached in 1973.

Table 5. Simulated average number of children ever born with child care availability rising to 20, 40, or 60%, by the number of years it takes to reach the indicated level of child care

Percent child care availability	Years to reach indicated level of child care availability				Differences between 0 and 15 years to reach indicated level of child care availability	
	0	5	10	15	Absolute (0-15)	Relative (0/15)
20	1.74	1.73	1.71	1.68	0.06	1.04
40	1.97	1.95	1.91	1.86	0.11	1.06
60	2.18	2.15	2.10	2.03	0.15	1.07
Difference between 60 and 20% child care availability:						
Absolute (60-20)	0.44	0.42	0.39	0.35		
Relative (60-20)	1.25	1.24	1.23	1.21		

Table 6. Naive model: Simulated* average number of children ever born by level of child care

Percent child care availability	Number of children ever born
0	1.93
10	1.91
20	1.88
30	1.86
40	1.83
50	1.80
60	1.77

*Under the assumption that the indicated level of child care availability was reached in 1973.

Appendix Table 1. Estimated Effects and Standard Errors: Naive Effects Model, and Fixed Effects with Heterogeneity Correction Model

	Naive Model		Fixed Effects*		Fixed Effects and Heterogeneity Correction**	
Variable	Coefficient	SE	Coefficient	SE	Coefficient	SE
Parity 0						
Constant	-2.510	0.137	-2.731	0.138	-3.006	0.148
Age (ref. = 30-35)						
15-19	0.785	0.139	1.001	0.140	-0.175	0.158
20-24	1.833	0.139	1.996	0.139	1.577	0.165
25-29	1.801	0.156	1.855	0.156	2.033	0.170
Cohort (ref. = 1957)						
1958	0.001	0.041	-0.009	0.041	0.006	0.048
1959	0.160	0.041	0.145	0.042	0.175	0.049
1960	0.187	0.043	0.168	0.043	0.181	0.050
1961	0.213	0.043	0.177	0.043	0.175	0.050
1962	0.225	0.044	0.177	0.044	0.182	0.051
Cohort x age interactions						
1958, 15-19	-0.018	0.050	-0.023	0.050	-0.080	0.056
1958, 20-24	0.164	0.046	0.135	0.046	0.083	0.053
1958, 25-29	0.062	0.049	0.060	0.049	0.091	0.053
1959, 15-19	-0.122	0.050	-0.145	0.051	-0.250	0.057
1959, 20-24	0.154	0.047	0.099	0.047	0.006	0.054
1959, 25-29	-0.039	0.049	-0.046	0.049	0.009	0.054
1960, 15-19	-0.112	0.052	-0.168	0.053	-0.336	0.059
1960, 20-24	0.246	0.049	0.172	0.049	0.044	0.056
1960, 25-29	-0.050	0.050	-0.072	0.050	0.027	0.055
1961, 15-19	-0.112	0.053	-0.194	0.053	-0.415	0.060
1961, 20-24	0.267	0.049	0.195	0.050	0.061	0.056
1961, 25-29	-0.090	0.050	-0.114	0.050	0.022	0.055
1962, 15-19	-0.015	0.054	-0.124	0.055	-0.409	0.062
1962, 20-24	0.268	0.051	0.193	0.051	0.046	0.058
1962, 25-29	-0.085	0.051	-0.113	0.051	0.044	0.057
% Aged 0-6 in Day Care	-0.846	0.100	0.458	0.108	0.988	0.120
Day Care x Age interactions						
Day care, 15-19	0.998	0.143	1.203	0.146	1.893	0.163
Day care, 20-24	0.507	0.114	0.536	0.115	1.161	0.130
Day care, 25-29	-0.237	0.117	-0.147	0.118	0.168	0.131
Enrolled in School (ref. = no)	-0.218	0.039	-0.193	0.039	-0.231	0.042
Enroll x age interactions						
Enroll, 15-19	-1.009	0.044	-1.015	0.044	-1.042	0.048
Enroll, 20-24	-0.277	0.043	-0.298	0.043	-0.336	0.047
Enroll, 25-29	-0.156	0.044	-0.172	0.045	-0.219	0.048
Education (ref. = compulsory or less)						
10 years	0.236	0.059	0.226	0.060	0.294	0.066

(continued)

(Appendix Table 1, continued)

	Naive Model		Fixed Effects*		Fixed Effects and Heterogeneity Correction**	
Variable	Coefficient	SE	Coefficient	SE	Coefficient	SE
Parity 0, continued						
High school or vocational school	0.522	0.057	0.523	0.058	0.561	0.065
Some college	0.647	0.061	0.691	0.061	0.716	0.069
College or more	0.788	0.059	0.793	0.059	0.853	0.066
Education by age interactions						
10, 15-19	0.166	0.063	0.137	0.064	0.157	0.070
10, 20-24	-0.253	0.062	-0.259	0.063	-0.355	0.069
10, 25-29	-0.036	0.069	-0.032	0.069	-0.099	0.074
High school, 15-19	-0.373	0.085	-0.433	0.085	-0.448	0.091
High school, 20-24	-0.858	0.061	-0.879	0.061	-1.077	0.068
High school, 25-29	-0.190	0.067	-0.196	0.067	-0.384	0.072
Some college, 20-24	-0.884	0.068	-0.960	0.068	-1.094	0.076
Some college, 25-29	-0.228	0.071	-0.263	0.071	-0.485	0.077
College +, 20-24	-0.572	0.091	-0.640	0.091	-0.728	0.100
College +, 25-29	-0.297	0.070	-0.319	0.071	-0.472	0.076
Father's Education (ref. = no information)						
Compulsory or less	0.211	0.089	0.178	0.090	-0.053	0.096
10 years	0.279	0.092	0.268	0.093	0.017	0.100
High school or vocational school	0.249	0.092	0.266	0.093	0.026	0.101
Some college	0.303	0.096	0.327	0.097	0.026	0.107
College or more	0.240	0.096	0.266	0.097	-0.053	0.107
Father's Education x Age Interactions						
Compulsory, 15-19	-0.857	0.098	-0.829	0.098	-0.667	0.112
Compulsory, 20-24	-1.112	0.094	-1.091	0.095	-1.233	0.112
Compulsory, 25-29	-0.787	0.101	-0.773	0.101	-1.070	0.111
10 years, 15-19	-1.221	0.107	-1.211	0.107	-1.044	0.121
10 years, 20-24	-1.280	0.099	-1.275	0.100	-1.437	0.117
10 years, 25-29	-0.811	0.105	-0.812	0.105	-1.162	0.117
High School, 15-19	-1.274	0.107	-1.284	0.108	-1.107	0.122
High School, 20-24	-1.208	0.099	-1.224	0.099	-1.379	0.117
High School, 25-29	-0.761	0.105	-0.778	0.105	-1.121	0.117
Some College, 15-19	-1.798	0.136	-1.810	0.136	-1.576	0.148
Some College, 20-24	-1.395	0.106	-1.413	0.107	-1.541	0.125
Some College, 25-29	-0.875	0.110	-0.893	0.111	-1.248	0.123
College +, 15-19	-1.872	0.143	-1.887	0.144	-1.618	0.156
College +, 20-24	-1.537	0.107	-1.556	0.108	-1.661	0.127
College +, 25-29	-0.813	0.110	-0.832	0.110	-1.193	0.123
Mother's Education (ref. = no information)						
Compulsory or less	-0.155	0.270	-0.170	0.272	0.057	0.313
10 years	-0.099	0.270	-0.089	0.273	0.134	0.314

(continued)

(Appendix Table 1, continued)

Variable	Naive Model Coefficient	Naive Model SE	Fixed Effects* Coefficient	Fixed Effects* SE	Fixed Effects and Heterogeneity Correction** Coefficient	Fixed Effects and Heterogeneity Correction** SE
Parity 0, continued						
High school or vocational school	-0.225	0.272	-0.207	0.274	-0.071	0.316
Some college	-0.115	0.273	-0.099	0.276	0.011	0.319
College or more	-0.190	0.275	-0.168	0.278	-0.105	0.322
Mother's Education x Age Interactions						
Compulsory, 15-19	0.640	0.363	0.622	0.363	0.434	0.420
Compulsory, 20-24	0.567	0.327	0.566	0.329	0.425	0.369
Compulsory, 25-29	0.639	0.329	0.619	0.329	0.638	0.359
10 years, 15-19	0.250	0.365	0.213	0.365	0.025	0.422
10 years, 20-24	0.457	0.328	0.443	0.330	0.273	0.370
10 years, 25-29	0.603	0.330	0.574	0.330	0.552	0.360
High School, 15-19	0.162	0.370	0.123	0.370	0.031	0.427
High School, 20-24	0.524	0.329	0.506	0.332	0.425	0.372
High School, 25-29	0.615	0.332	0.581	0.331	0.595	0.362
Some College, 15-19	-0.394	0.392	-0.421	0.392	-0.498	0.446
Some College, 20-24	0.151	0.333	0.137	0.336	0.038	0.376
Some College, 25-29	0.560	0.334	0.524	0.333	0.497	0.364
College +, 15-19	-0.159	0.404	-0.205	0.404	-0.199	0.458
College +, 20-24	0.234	0.337	0.210	0.339	0.191	0.381
College +, 25-29	0.531	0.336	0.491	0.336	0.523	0.367
Mother's Location (ref. = no information)						
Dead or abroad	-0.045	0.292	-0.034	0.295	-0.520	0.336
Same municipality	0.068	0.290	0.055	0.293	-0.475	0.334
Different municipality	0.241	0.290	0.268	0.293	-0.147	0.334
Mother's Location x Age Interactions						
Dead/abroad, 15-19	-1.185	0.388	-1.159	0.389	-0.751	0.447
Dead/abroad, 20-24	-1.567	0.350	-1.572	0.352	-1.629	0.398
Dead/abroad, 25-29	-1.215	0.355	-1.196	0.355	-1.527	0.386
Same, 15-19	-1.492	0.378	-1.440	0.378	-1.047	0.436
Same 20-24	-1.826	0.345	-1.803	0.348	-1.892	0.392
Same 25-29	-1.359	0.352	-1.324	0.352	-1.691	0.382
Different, 15-19	-1.125	0.382	-1.111	0.382	-0.792	0.439
Different, 20-24	-1.493	0.345	-1.507	0.348	-1.648	0.392
Different, 25-29	-1.276	0.352	-1.271	0.352	-1.640	0.382
Respondent Living Abroad (ref. = living in Norway)	-0.268	0.102	-0.160	0.100	-0.074	0.110
R. abroad x Age Interactions						
Abroad, 15-19	0.003	0.219	-0.077	0.218	-0.074	0.232

(continued)

(Appendix Table 1, continued)

Variable	Naive Model		Fixed Effects*		Fixed Effects and Heterogeneity Correction**	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Parity 0, continued						
Abroad, 20-24	-0.237	0.151	-0.278	0.151	-0.306	0.167
Abroad, 25-29	-0.101	0.127	-0.085	0.125	-0.140	0.137
% Female Unemployment	-0.122	0.012	-0.159	0.012	-0.091	0.013
Unemployment x Age Interactions						
Unemploy, 15-19	0.437	0.018	0.464	0.019	0.469	0.020
Unemploy, 20-24	0.339	0.014	0.355	0.015	0.395	0.016
Unemploy, 25-29	0.154	0.014	0.151	0.015	0.147	0.016
Parity 1						
Constant	-3.403	0.039	-3.580	0.042	-4.122	0.066
% 0-6 in Day Care	0.259	0.037	1.248	0.053	1.680	0.064
Enrolled in School (ref. = no)	-0.633	0.018	-0.608	0.018	-0.652	0.018
Education (ref. = compulsory or less)						
10 years	0.188	0.013	0.162	0.013	0.171	0.014
High school or vocational school	0.335	0.015	0.301	0.015	0.270	0.016
Some college	0.567	0.019	0.561	0.019	0.526	0.020
College or more	0.800	0.020	0.769	0.020	0.765	0.021
Father's Education (ref. = no information)						
Compulsory or less	-0.038	0.027	-0.064	0.028	-0.171	0.031
10 years	0.013	0.030	-0.003	0.030	-0.130	0.034
High school or vocational school	-0.004	0.030	-0.003	0.030	-0.116	0.034
Some college	0.029	0.033	0.038	0.034	-0.104	0.038
College or more	0.053	0.034	0.065	0.035	-0.090	0.038
Mother's Education (ref. = no information)						
Compulsory or less	-0.104	0.117	-0.122	0.114	-0.069	0.121
10 years	-0.060	0.117	-0.063	0.115	-0.020	0.121
High school or vocational school	-0.079	0.118	-0.071	0.116	-0.046	0.122
Some college	-0.021	0.120	-0.011	0.117	-0.001	0.124
College or more	-0.034	0.122	-0.022	0.119	-0.011	0.126
Mother's Location (ref. = no information)						
Dead or abroad	-0.011	0.119	0.016	0.116	-0.174	0.124
Same municipality	-0.118	0.117	-0.101	0.115	-0.311	0.122
Different municipality	0.073	0.117	0.083	0.115	-0.107	0.122

(continued)

(Appendix Table 1, continued)

Variable	Naive Model Coefficient	Naive Model SE	Fixed Effects* Coefficient	Fixed Effects* SE	Fixed Effects and Heterogeneity Correction** Coefficient	Fixed Effects and Heterogeneity Correction** SE
Parity 1, continued						
Respondent Living Abroad (ref. = living in Norway)	0.136	0.055	0.195	0.055	0.240	0.058
% Female Unemployment	0.077	0.004	0.048	0.005	0.070	0.006
Age at First Birth (ref. = 30-35)						
15-19	0.609	0.025	0.682	0.026	0.293	0.034
20-24	0.596	0.021	0.635	0.021	0.437	0.025
25-29	0.449	0.019	0.463	0.019	0.353	0.022
Duration since Previous Birth (ref. = 85+ months)						
0-36 months	0.775	0.019	0.851	0.020	0.687	0.026
37-60 months	1.421	0.019	1.487	0.019	1.407	0.023
61-84 months	0.884	0.021	0.935	0.021	0.908	0.022
Parity 2						
Constant	-3.975	0.072	-3.778	0.074	-10.153	0.070
% 0-6 in Day Care	0.102	0.058	0.366	0.070	2.031	0.090
Enrolled in School (ref. = no)	-0.204	0.035	-0.188	0.035	-0.282	0.039
Education (ref. = compulsory or less)						
10 years	0.053	0.021	0.011	0.021	0.051	0.028
High school or vocational school	0.135	0.023	0.096	0.023	0.103	0.031
Some college	0.421	0.030	0.409	0.030	0.446	0.039
College or more	0.637	0.028	0.603	0.028	0.640	0.037
Father's Education (ref. = no information)						
Compulsory or less	0.067	0.046	0.037	0.046	-0.042	0.061
10 years	0.098	0.049	0.082	0.049	-0.001	0.065
High school or vocational school	0.010	0.050	0.016	0.050	-0.019	0.066
Some college	0.137	0.055	0.155	0.055	0.036	0.071
College or more	0.239	0.055	0.249	0.055	0.123	0.071
Mother's Education (ref. = no information)						
Compulsory or less	-0.202	0.199	-0.163	0.201	-0.393	0.237
10 years	-0.204	0.200	-0.148	0.202	-0.377	0.238

(continued)

(Appendix Table 1, continued)

Variable	Naive Model Coefficient	Naive Model SE	Fixed Effects* Coefficient	Fixed Effects* SE	Fixed Effects and Heterogeneity Correction** Coefficient	Fixed Effects and Heterogeneity Correction** SE
Parity 2, continued						
High school or vocational school	-0.130	0.201	-0.053	0.203	-0.284	0.239
Some college	-0.072	0.203	0.010	0.205	-0.257	0.241
College or more	-0.091	0.205	-0.017	0.207	-0.283	0.243
Mother's Location (ref. = no information)						
Dead or abroad	0.073	0.204	0.064	0.206	0.249	0.249
Same municipality	0.009	0.201	-0.004	0.203	0.027	0.243
Different municipality	0.133	0.201	0.101	0.203	0.177	0.242
Respondent Living Abroad (ref. = living in Norway)	0.216	0.079	0.164	0.080	0.382	0.096
% Female Unemployment	0.027	0.006	0.013	0.007	0.087	0.008
Age at First Birth (ref. = 30-35)						
15-19	0.761	0.059	0.701	0.059	0.778	0.074
20-24	0.631	0.057	0.588	0.057	0.770	0.064
25-29	0.403	0.056	0.388	0.056	0.494	0.060
Duration since Previous Birth (ref. = 85+ months)						
0-36 months	0.350	0.024	0.345	0.025	-0.373	0.037
37-60 months	0.841	0.023	0.839	0.023	0.257	0.034
61-84 months	0.592	0.024	0.593	0.024	0.220	0.031
Parity 3						
Constant	-3.710	0.321	-3.600	0.323	-4.460	0.105
% 0-6 in Day Care	-0.275	0.125	-0.097	0.145	0.067	0.160
Enrolled in School (ref. = no)	-0.077	0.083	-0.074	0.083	-0.074	0.083
Education (ref. = compulsory or less)						
10 years	-0.096	0.042	-0.120	0.042	-0.107	0.043
High school or vocational school	-0.077	0.048	-0.100	0.049	-0.120	0.050
Some college	0.077	0.069	0.088	0.069	0.088	0.070
College or more	0.197	0.063	0.186	0.064	0.177	0.065
Father's Education (ref. = no information)						
Compulsory or less	0.092	0.111	0.084	0.112	-0.004	0.121

(continued)

(Appendix Table 1, continued)

Variable	Naive Model Coefficient	Naive Model SE	Fixed Effects* Coefficient	Fixed Effects* SE	Fixed Effects and Heterogeneity Correction** Coefficient	Fixed Effects and Heterogeneity Correction** SE
Parity 3, continued						
10 years	0.095	0.120	0.103	0.121	-0.008	0.130
High school or vocational school	0.053	0.122	0.085	0.122	-0.022	0.132
Some college	-0.020	0.140	0.024	0.141	-0.108	0.150
College or more	-0.033	0.140	0.017	0.140	-0.115	0.150
Mother's Education (ref. = no information)						
Compulsory or less	-0.314	0.434	-0.331	0.435	-0.321	0.442
10 years	-0.342	0.436	-0.331	0.437	-0.341	0.444
High school or vocational school	-0.294	0.440	-0.284	0.441	-0.305	0.447
Some college	-0.072	0.445	-0.036	0.446	-0.070	0.452
College or more	-0.024	0.452	-0.003	0.453	-0.039	0.459
Mother's Location (ref. = no information)						
Dead or abroad	0.231	0.444	0.261	0.445	0.107	0.456
Same municipality	0.188	0.439	0.193	0.440	0.036	0.451
Different municipality	0.260	0.440	0.268	0.441	0.114	0.451
Respondent Living Abroad (ref. = living in Norway)	0.154	0.175	0.135	0.177	0.150	0.178
% Female Unemployment	-0.056	0.014	-0.071	0.016	-0.061	0.016
Age at First Birth (ref. = 30-35)						
15-19	0.516	0.311	0.476	0.311	0.005	0.367
20-24	0.414	0.310	0.388	0.310	0.130	0.350
25-29	0.219	0.310	0.216	0.310	0.004	0.347
Duration since Previous Birth (ref. = 85+ months)						
0-36 months	0.352	0.056	0.349	0.057	0.391	0.058
37-60 months	0.509	0.057	0.507	0.057	0.538	0.058
61-84 months	0.261	0.062	0.259	0.063	0.280	0.063
Parity 4						
Constant	-3.326	0.211	-3.295	0.230	-5.118	0.092
% 0-6 in Day Care	0.337	0.283	0.284	0.336	0.291	0.339
Enrolled in School (ref. = no)	-0.176	0.216	-0.214	0.215	-0.214	0.215

(continued)

(Appendix Table 1, continued)

Variable	Naive Model Coefficient	Naive Model SE	Fixed Effects* Coefficient	Fixed Effects* SE	Fixed Effects and Heterogeneity Correction** Coefficient	Fixed Effects and Heterogeneity Correction** SE
Parity 4, continued						
Education (ref. = compulsory or less)						
10 years	-0.113	0.090	-0.097	0.094	-0.098	0.095
High school or vocational school	-0.165	0.108	-0.151	0.110	-0.152	0.110
Some college	0.179	0.153	0.219	0.158	0.218	0.157
College or more	-0.258	0.147	-0.239	0.149	-0.240	0.149
Respondent Living Abroad (ref. = living in Norway)	-0.353	0.506	-0.417	0.514	-0.413	0.513
% Female Unemployment	-0.069	0.032	-0.074	0.037	-0.074	0.037
Duration since Previous Birth (ref. = 85+ months)						
0-36 months	0.471	0.163	0.429	0.165	0.429	0.167
37-60 months	0.451	0.170	0.430	0.172	0.430	0.173
61-84 months	-0.024	0.198	-0.032	0.199	-0.032	0.200

*Fixed effects coefficients not shown.
**Fixed effects coefficients and heterogeneity parameters are not shown.