Family Policy, Women's Employment, and Below-Replacement Fertility in Developed Countries: A Hierarchical Bayesian Approach

Christin Hilgeman
Department of Sociology
University of California, Irvine

Carter T. Butts
Department of Sociology and
Institute for Mathematical Behavioral Sciences
University of California, Irvine

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Abstract

In this paper, we examine the relationship between individual attributes, aggregate female labor force participation, and family policies, (e.g., child care and family leave) on fertility in developed countries using a hierarchical Bayesian model. Data from the European Values Survey, the World Values Survey, and the Organization for Economic Cooperation and Development are employed in this analysis. Results indicate that women's full-time employment and country-level employment rates decreases expected fertility. However, child care services mitigate the decline in fertility, possibly by reducing labor force exit among women with young children. These effects persist when controlling for individual-level predictors, including marital status, educational attainment, and individual labor force participation. Some cross-national variation in individual-level effects is observed, but the qualitative behavior of these predictors is broadly similar across developed nations.

Introduction

Arguably, the most significant demographic trend in contemporary times has been the sharp decline in birth rates throughout much of the globe (Guerrina 2002). This decline in fertility has been nearly universal in scope, though the magnitude varies by region. Within developed countries, Western and Northern Europe have significantly higher fertility rates than Southern and Eastern Europe (Bongaarts 2002; Caldwell et al. 2002; McDonald 2000; Chesnais 1996; Lesthaeghe 1995). This pattern is difficult to explain at first blush because Southern Europe, in particular, places significant value on family ties for the provision of resources and support. One possible explanation for low fertility is that women's educational and occupational opportunities have expanded such that they now face competing interests between employment and family time (McDonald 2002; Guerrina 2002; Jones and Brayfield 1997; Baxter and Kane 1995; Lesthaeghe 1995). Previous studies suggest that where there are few social policies addressing family needs and women are assumed to be primary caregivers at the expense of occupational opportunities, women will limit and/or delay childbearing (McDonald 2000; Guerrina 2002).

To examine the relationship between social policies and fertility, we employ a hierarchical Bayesian model to analyze individual and macro-level determinants of women's realized fertility across developed countries. A multi-level model is employed because social and economic conditions in a country are the context in which individual decisions are made, particularly fertility decisions (Hakim 2003; McDonald 2000). A hierarchical model allows for the estimation of contextual effects produced by country-level variables, while controlling for variations in individual-level characteristics. The present study is focused on developed nations: even though they have substantial fertility differences, developed countries share similar national characteristics such as low levels of mortality (Bagavos and Martin 2000), relatively high levels of education and employment for women, and access to contraceptives (Mason 2001). By concentrating on countries with similar background characteristics, we can more readily isolate

the effects of social policy differences and minimize the influence of confounding factors. Developed countries also have comparable social policy data (i.e., child care enrollment), information that is not available for, or in some instances applicable to, developing countries.

Previous studies of child care and fertility have generally focused on either macro-level or individual-level characteristics, rather than combining both in a multi-level model. In contrast, this research will determine how macro-level characteristics interact with individual-level characteristics and life-course effects in determining individual fertility rates. The individual-level model examines the effect of employment, education, age, parental co-residence, and marital status on the respondent's realized fertility. These data are drawn from the World Values Survey 1995-1997 and the European Values Study 1999-2000. The macro-level model incorporates the country-level percentage for child care enrollment of children under the age of four and the number of weeks provided for family leave (maternity and parental) based on data from the Organization for Economic Cooperation and Development (OECD). In addition, the percentage of women in employment is included with data provided by the Eurostat European Union Labour Force Surveys, Current Population Survey (United States), and the Labour Force Survey (Australia). These data are combined in a single model to estimate the extent to which these variables can explain the observed variation in fertility rates among women in developed countries.

This unified model posits a latent fertility hazard for each woman which varies across the life course. This hazard is modified by a national baseline hazard, as well by the above-mentioned individual-level predictors (whose effects vary with national context). The national baseline, in turn, is affected by the country-level variables. By fitting this model within a Bayesian framework, we can obtain not only point estimates of individual, national, and life-course effects, but also expressions of posterior uncertainty; hierarchical Bayesian models scale gracefully in high-dimensional contexts, and avoid many of the problems associated with maximum likelihood estimation (Gelman et al. 2004). We are not aware of previous attempts to model individual fertility using combined macro, micro, and life-course effects in this manner. This modeling approach also allows us to examine several largely untested hypotheses from the literature. These include the hypothesized positive effects of child care availability and macro-level female labor force participation on individual fertility As we shall show, there is evidence for the reversal of some of these effects when controlling for other factors.

To establish the context for this research, we briefly discuss four relevant issues: the demographic transition, changes in family size and establishment, and trends in women's employment and social policies. While our findings suggest that individual-level characteristics are of primary importance for determining fertility rates, it is important that these be interpreted within the national context.

Trends in Fertility, Family Structure, and Women's Employment

The Demographic Transition

The decline from high levels of mortality and fertility to low levels of mortality and fertility is commonly known as the "demographic transition" (Jones et al. 1997). As early as the 1920s, half of the countries in Europe were at below replacement fertility levels (Frejka and Ross 2001). Fertility levels increased temporarily in the 1950s during a short baby boom in Western and Northern European countries and the English-speaking countries, only to begin the decline

again in the 1960s (Frejka and Ross 2001). From the 1950s to the 1990s the total fertility rate in the developed world dropped 44%, from 2.8 births per woman to 1.57 births per woman (Bongaarts 2002).

Among developed countries, the highest fertility rates are found in North America (2.00), Oceania (1.8), and Northern Europe (1.67), while the lowest fertility rates are found in Japan (1.41), Southern Europe (1.32), and Eastern Europe (1.28) (Bongaarts 2002). A low fertility rate is defined as 1.6 to 2.0 births per woman, while a very low fertility rate is considered to be 1.5 births per woman or fewer (McDonald 2002). Low fertility is of great significance to individuals and nations due to the restructuring that must take place to accommodate these new trends. With current fertility, mortality, and migration rates, the populations of Eastern, Southern and Central Europe are expected to decline by 67% within a century (Sleebos 2003). A significant population decline could alter the structure of the labor force and cause diminished productive capacity due to the lack of workers. However, lower levels of fertility and increased longevity can increase the demand for women in the labor force due to a smaller labor force, and the shortened span of time women spend bearing and rearing children frees up their time for employment (Mason 1997). Population declines can also place temporary stress on small working populations due to population aging leading to greater needs for health plans and pensions (Mason 2001).

Very low fertility could partially be the result of a delayed mean age at first birth. Women in the developed world have had a general increase in age at first birth by 2-3 years where fertility is delayed and later "recuperated" at an older age (McDonald 2002). When fertility is "recuperated," it means that women condense their childbearing into fewer years at later ages and "make up" for not having children while they were young. If current low fertility is due to delays in age at first birth, then the fertility rate will rise as women age. However, many women who delay childbirth find that later conditions do not support childbearing (i.e., they are not able to find a suitable partner, or experience unstable employment, financial problems, and/or health complications) or they decide they no longer wish to have children, thus keeping the fertility rate low (McDonald 2002).

Recuperation rates vary by country and in some the recuperation rate is higher than others (Sleebos 2003; McDonald 2002). Norway and the Netherlands have higher levels of recuperation while Spain and Italy have very low levels of recuperation, indicating that their very low fertility rate is unlikely to be a result of delayed fertility (McDonald 2002; Lesthaeghe 1995). For the birth cohort of 1950, 67% of countries have completed cohort fertility of below 2.1 (Frejka and Ross 2001). Of these countries, two thirds have completed cohort fertility below 1.9. Some countries have completed cohort fertility rates as low as 1.66 (Germany), 1.65 (Russia), 1.60 (Spain), and 1.59 (Italy) (Frejka and Ross 2001; Bagavos and Martin 2000). This leaves no possibility for recuperation in fertility, because the women have already passed their reproductive ages (Sleebos 2003).

Fertility and the Life Course

Childbearing is often an expected part of the life course. Most men and women express the desire to have children (Arnold et al. 1975; Zelizer 1985), and pronatalist norms create the expectation that most people have should have children (Jones and Brayfield 1997). Such norms tend to have a particularly strong impact on women as the responsibility of childrearing has fallen disproportionately on them (Jones and Brayfield 1997; McDonald 2000). This is considered one of the main reasons why fertility is delayed or restricted. There has been a shift in

the peak first birth ages from 20-24 to ages 25-29 in much of Europe and in the United States and Australia (Frejka and Ross 2001). The mean age at birth in Europe is now 27.1, compared to 24.1 in 1970 (Sleebos 2003). One reason why the mean age at first marriage and childbirth has been rising in countries such as Japan and Italy is that women, once they get married, are expected to "return" to the traditional division of labor, where men are primarily wage earners and women perform most of the household and child care labor (Presser 2001; Tsuya and Mason 1995). This limits their opportunities outside of the home. In addition, in Southern Europe and Japan, fertility outside of marriage is very low, so if marriage is postponed, fertility is likely to be limited and delayed as well (Bagavos and Martin 2000). The expansion of higher education also delays marriage as students are very unlikely to marry or have children (Carlos and Maratou-Alipranti 2000).

Even though fertility and employment preferences interact and change throughout a person's life course (Budig 2003), a downward shift in family size has been widespread in much of the developed world. In the 1960s, first and second order births as a percentage of total births was 64%, and by 1990 this had changed to 84%, with much of the increase being in first order births (Frejka and Ross 2001). Many couples opt to have only one child, as this can grant the benefits and status of being a parent with fewer costs (Bagavos and Martin 2000). The additional benefits of a second child may then be too low to justify the material and non-material costs (Presser 2001). Brewster and Rindfuss (2000) also propose that families become more aware of work-family conflicts after having their first child and this could reduce higher order births. Women in demanding careers tend to be childless or to have one child while those who reduce their labor force participation during their childbearing years have two children on average (Bagavos and Martin 2000).

Women's Employment Patterns

As labor force demand increased in the 1960s throughout the developed world, married women with children began to enter the labor force; men and single women already had high rates of labor force participation (Lesthaeghe 1995; Goldin 1990). Up until the 1960s, European women were expected to exit the labor force at marriage or childbirth and then care for their children and elderly parents (Esping-Andersen 1999). By 1970, about half of women ages 20-64, were in the labor force in developed countries (Lesthaeghe 1995). Today, 74% of childless women work, while 70% of mothers with one child work, and 62% of mothers with two children work, though these rates vary significantly by country (Sleebos 2003). Nowhere in Europe does the "breadwinner" model, in which men work full-time and women remain out of the labor force, represent more than 30% of all households (Esping-Andersen 1999).

Studies of fertility and employment find that these two variables are not independent of one another (Budig 2003; Hakim 2003). The more children women have, the less likely they are to participate in the labor force. Those who participate in the labor force tend to have fewer children (Lesthaeghe 1995; Sundtröm 2000). In a recent United States study using the National Longitudinal Study of Youth for the years 1982 to 1994, Budig (2003) found that having a preschool child increases likelihood of exit from the labor force by 13% per preschooler. For each preschool child, women are 10% less likely to enter full-time employment. Compared to women who are not in the labor force, women who are employed full-time are 16% less likely to become pregnant, while those employed part-time are 15% less likely to become pregnant (Budig 2003).

Throughout Europe, approximately half of women with children under the age of six work part-time (OECD 2001). The macro-level associations of part-time employment with fertility are mixed. Countries with low levels of part-time work also have low fertility (McDonald 2000). In many countries part-time work availability is scarce, and where it has been prevalent (Scandinavian countries), it is on the decline (OECD 2002). Part-time jobs can lead to high levels of job segregation, as in Sweden, the Netherlands, and Norway (Baxter and Kane 1995; Pinnelli 1995). In a study of European family policy, Weiss (2000, p. 138) states:

> Part-time work offers women the opportunity to combine both family and employment. However, the traditional division of labor between men and women is not really questioned. Women remain primarily responsible for raising children and tending to the household. As a result, their chances for a professional career drop considerably.

The effect of part-time work, on the one hand, seems to increase fertility because it allows women to combine parenthood with employment (OECD 2002). On the other hand, part-time work lowers women's wages and occupational attainment, leading to low fertility since the opportunity costs of children remain high. The effects of part-time work are long-lasting, meaning that the longer women remain in part-time jobs, the less likely they are to move on to full-time jobs. In the United States, each additional year of part-time employment on average reduces the likelihood of entering a full-time position by 12% (Budig 2003).

Fertility and the Work-Family Balance

McDonald (2000) states that while gender equity is not a sufficient condition for higher fertility, it is a necessary condition in the developed world. As opportunities have opened up for women in employment and education, the conflict between career and home responsibilities has deepened, particularly in countries which maintain traditional family arrangements (McDonald 2000). By "traditional family arrangements," McDonald means that women are expected to do most of the housework and child care labor, with paid employment being secondary or absent, while men are expected to be the primary wage earners. According to McDonald (2000; 2001; 2002) "if women are provided with opportunities nearly equivalent to men in education and market employment, but the opportunities are severely curtailed by having children, then on average women will restrict the number of children that they have," resulting in low fertility (2000, p.1). This relationship should hold true unless social policy mediates the impact of having children. Schulze and his colleagues (2000) and Bagavos and Martin (2000) find that when the gender gap in employment rates is small (due to high availability of child care services), fertility tends to be higher than in countries with wide gender gaps in labor force participation.

Economic Theories of Fertility

Women have improved their levels of education, job stability, income, and work experience, giving them a higher status in the workplace (Lesthaeghe 1995; Ermisch 2003). Between 1960 and 1980, men's and women's educational attainment converged, and fertility declined rapidly in many Western and Northern European countries (Caldwell 2001). Many studies have found that a high level of education is negatively correlated with fertility (Mason

2001; Wang and Famoye 1997; OECD 2002). This type of investment in human capital raises both wage potential and opportunity costs (Budig 2003; Caldwell 2001; Mason 2001). As women's wages increase, the opportunity cost of home production increases for women, yet women continue to perform most of the housework and child care (Ermisch 2003; McNicoll 2001; Brewster and Rindfuss 2000; Jones and Brayfield 1997; Baxter and Kane 1995).

Children clearly require time investments, and the responsibilities of parenting fall disproportionately on women. Mothers who work full-time spend twice as much time on child care and household labor as do fathers, and housewives spend three times as much time on child care and two and a half times as much time on household labor than do fathers (OECD 2001). As women's household and child care labor increases, wage potential (present and future earnings) decreases correspondingly (OECD 2002). This income loss escalates as women's income and job opportunities increase. These opportunity costs continue to prevail as long as "traditional definitions of women's obligations to husbands and children" hold sway (Lesthaeghe 1995, p.69). The implication is that very low fertility is a characteristic of societies where traditional roles for mothers and wives interfere with women's realization of gains from the significant improvement in education and employment opportunities (McDonald 2002).

Studies consistently find that labor force participation, wages, and hours of work during the childbearing years are crucial in determining future labor force success (Bagavos and Martin 2000). There is evidence that women respond to these circumstances by limiting the number of children that they have (Esping-Andersen 1999). For instance, a British time series study on married couples for the years 1950 -1983 revealed that as women's wages increased, the number of childless families increased and the number of three-child families decreased (Ermisch 2003). Countries in which female labor force participation has increased the most in recent decades have the lowest fertility rates. A study for the OECD (2001) showed a correlation of -.60 between individual employment and fertility. Based upon these findings, we hypothesize:

> **Hypothesis 1: Full-time work will have a stronger negative association with fertility rates than part-time work, while remaining out of the labor force will have a positive association with fertility rates.**

Part-time jobs have a large concentration of mothers who, through need or choice, wish to remain employed while being primary care-takers (OECD 2002). Part-time work provides women with a source of income (and some benefits in certain countries) and a flexible schedule but fewer opportunities for advancement (OECD 2002). Some studies posit that women who work part-time are balancing family and career using a "combination strategy" (Hakim 2003; Bagavos and Martin 2000). Hakim (2003) and Bagavos and Martin (2000) propose three descriptive typologies of women. The first category is for women who are career-oriented and have demanding careers (i.e., managerial and professional occupations). Most will remain childless or have one child. The second category is for home-centered women who tend to have several children and remain out of the labor force permanently or during most of their lives to focus on childrearing and household production. The third category is for women who are said to be "adaptive" in their combination of work and family responsibilities. These women will vary in the number of children they have according to family and own income, family demands, and family policies. Women who fit the "adaptive" type are seen as the "middle-ground" for fertility. However, it is possible that women who work part-time (i.e., "adaptive") have more similar fertility rates to home-centered than full-time workers. This could indicate a dichotomy between

women who work full-time and have low fertility and women with intermittent or no labor force participation who maintain higher fertility.

Using data from the General Social Survey for the years 1972-1986, Glass (1992) found that married women of childbearing age who worked part-time were more similar in demographic characteristics and gender ideology to housewives than to women who worked full-time. There were no significant differences between housewives and women who worked part-time on several key demographic characteristics, including education, number of children, and income, as well as attitudinal measures about the division of labor and mothers' employment. Housewives and women in part-time employment had higher fertility, less education, and less income than women who worked full-time. Housewives and women who were employed part-time were less likely to believe that working women could maintain a warm relationship with their children and were more likely to consider the husband's career as a priority over their own when compared to women who worked full-time. Therefore, we hypothesize:

Hypothesis 2: The effect of part-time work on fertility will be more similar to the effect of being out of the labor force than the effect of full-time work.

Rindfuss and his colleagues (2003) show that there is a positive correlation of .5 between female labor force participation rates and national fertility rates. While this may appear counter-intuitive, countries with low female labor force participation are thought to have such low rates because of the difficulties reconciling work and family responsibilities. In countries where most women enter the labor force, accommodations must take place. Where there is a smaller gap in employment between men and women, the effect of children on women's wages and employment is less severe (Harkness and Waldfogel 1999). When a greater number of women are employed, family policy or market-based services may be more salient in response to women's occupational and familial demands. This, in turn, would increase fertility and labor force participation. Thus, in keeping with past studies we posit the following:

Hypothesis 3a: Female labor force participation rates will be positively correlated with fertility.

Although hypothesis 3a expresses the relationship most often discussed in the literature, we note that the *theory* articulated by Rindfuss and others (Brewster and Rindfuss 2000; Rindfuss et al. 2003; Sleebos 2003) is actually more consistent with a *moderating* effect of female labor force participation on fertility than a direct effect. In particular, if we imagine that the barriers to fertility posed by employment at the individual level are decreased by total female labor force participation, then we would expect labor force participation to have a positive moderating effect on the (negative) effect of individual employment. Because (unlike the papers cited above) our data permits a multi-level analysis, we can examine this hypothesis directly. Specifically:

Hypothesis 3b: Total female labor force participation will positively moderate the direct effect of individual employment on fertility.

Fertility and Social Policy

In 1996, 23 out of 64 countries with below-replacement fertility had policies to raise fertility (Tsui 2001; Caldwell et al. 2002). Countries vary in the level of concern expressed by leadership or popular sentiment on the country's total fertility rate. In some countries the costs to implementing social welfare programs are high, fertility is not very low or low rates are perceived as temporary, the population has not yet declined because of population momentum, or immigration has offset the declines in births (Caldwell et al. 2002). In some countries, population decline may be perceived as a positive factor to improve the environment and ease urban crowding (Sleebos 2003; Caldwell et al. 2002). In other countries, intervention is seen as intrusive, and there is opposition to defining a preferable family size and type, because it stigmatizes and discriminates against alternate lifestyle choices (Caldwell et al. 2002). Support for social policy on the basis of gender equity or social welfare is perceived as more acceptable.

Social policies that ease the pressures on working parents may be crucial in enabling individuals to reach their fertility goals without interrupting their occupational goals or hindering women's progress (Bagavos and Martin 2000). Such policies include access to child care services, maternity leave, paternity leave, parental leave, flexible employment schedules, and paid health benefits. Generally, countries that provide women with fewer opportunities to combine a career with parenthood have very low fertility rates (Caldwell et al. 2002; Esping-Andersen 1999; Chesnais 1998). For example, East Germany's total fertility rate declined by 50% after reunification with West Germany, at least in part because of the loss of Socialist child friendly policies and child care centers (Chesnais 1996; Schulze et al. 2000; Brewster and Rindfuss 2000). Sweden's total fertility rate had been 2.1 in 1990 when spending on social welfare was high and then decreased to 1.6 in 1996 after significant budget cuts in 1992 (Chesnais 1998; Caldwell et al. 2002).

In his research on welfare states, Esping-Andersen (1999) identified three European types: liberal, conservative, and social democratic. Liberal states are those that focus on individual self-reliance and promote market-based services. Family policies, when available, focus on gender equity in employment but make few provisions for caretaking and benefits (i.e., maternity and parental leave, flexible employment, health care). The countries in this group are England, Ireland, United States, Australia, New Zealand, and Canada. Social democratic countries have more comprehensive risk coverage based on citizenship. Provisions tend to be universal entitlements and minimize market dependency. Family policy is well-established through the provision of child care, flexible and part-time employment schedules, paid maternity and parental leave, and health benefits. These countries are Denmark, Norway, Sweden, and Finland. Conservative states tend to adopt the breadwinner model in which the male head of household is protected though job stability and higher income levels. Few social policies are available for families, because it is presumed that women will care for children and the elderly and remain out of the labor force (at least periodically) while being supported by men. Benefits that are available tend to be tied to the individual's occupational record. The countries in this group are Austria, Germany, France, Belgium, Italy, Japan, Switzerland, Spain, and the Netherlands.

Within the conservative typology, Southern European countries (Italy, Spain, Portugal, Greece) tend to be more familistic, unemployment rates are higher, market services are costly and difficult to find, and children tend to reside with their parents for much longer periods of

time, often until the children are in their late twenties or early thirties (Esping-Andersen 1999; Flaquer 2000; Laaksonen 2000). In Southern Europe, Germany, and Japan, the male breadwinner model still shapes policies (Sleebos 2003). Women are often viewed as dependents and caretakers rather than as independent employees. This limits state intervention in the provision of child care and flexible employment while upholding traditional distributions of labor in the home. When conservative family policy is applied, "welfare responsibilities are internalized within the family and this is incompatible with women's demand for economic independence and careers" (Esping-Andersen 1999, p.174).

When looking at Esping-Andersen's typologies, it becomes apparent that the countries which provide limited family policies have the lowest fertility. Southern Europe and the conservative countries have the fewest provisions for family, and these are the countries with the lowest fertility. The social democratic countries that provide extensive family benefits have higher fertility. The liberal countries do not provide many public family benefits, presumably because these can be found in the market. Market services in these countries do not tend to be of high quality, but they are available at a lower cost than in much of Europe (Esping-Andersen 1999).

Economic incentives such as tax allowances and cash benefits have not proven to be effective in increasing fertility, most likely because of the limited benefit provided to balance the high costs of having children (McDonald 2002; Bagavos and Martin 2000). In a study of 22 developed countries, Gauthier and Hatzius (1997) found that over a twenty-year time span, cash and tax benefits, preferential and subsidized housing, and child benefits only increased fertility by 4%. The effects of maternity and parental leave benefits are mixed but overall appear to be weak predictors of fertility (OECD 2001).

Most European countries provide paid maternity leave for 16 weeks, and many provide an extended period of parental leave. However, family leave is not long enough for either parent to provide continuous care up until the child is enrolled in school. In addition, family leave requires that one parent exit the labor force. Since the person most likely to leave the labor force is currently the mother, this reproduces gender inequality in labor force participation. (Fathers tend not to make use of parental or paternity leave unless it is for short periods of time and paid (OECD 2001).) While maternity and parental leave can help parents reconcile work with family obligations and reduce some of the gap in pay between women with children and childless women, long periods of leave can reduce women's labor force participation and career attainment (Waldfogel 1998; Sleebos 2003). Consistent with prior research, we hypothesize:

Hypothesis 4: Family leave will not be associated with fertility.

Being able to purchase child care weakens the link between women's labor force participation and fertility, particularly when these benefits are subsidized by employers or the government (Ermisch 2003). The availability of child care allows mothers to work and can also encourage women who are out of the labor force to seek further education or employment (Sleebos 2003; Eydal 2000). Child care services appear to be the most effective strategy for ensuring greater equality in accessing the labor force (Greve 2000). The access to child care for children above the age of three is fairly high throughout Europe (average 75%), but the availability of child care for younger children is very limited in some countries, particularly in Southern Europe (see Table 1) (Sleebos 2003; OECD 2001). Sleebos (2003) reports that the enrollment in child care services for children under the age of three explains 43% of the variance

in total fertility rates for European countries. Child care would seem to be a powerful means of decreasing conflict between labor force participation and childbearing. Child care for young children is particularly important because it does not impose a long waiting period for women's return to paid employment. Consistent with this, we hypothesize the following:

Hypothesis 5: Child care enrollment will have a positive effect on individual fertility levels.

Even given a positive overall relationship, however, child care may not have the same effect in every country because of differences in quality, price, hours of operation, and social norms about the acceptability of child care (Mason and Khulthau 1992; McDonald 2001; Esping-Andersen 1999). In a study of the Detroit area, for instance, Mason and Kuhlthau (1992), conclude that child care does not have a significant effect on fertility. Child care constraints only limited the number of children for 8% of the respondents. However, this study did not include women who did not have children. Women who did not have children could have been those who faced the most severe constraints on child care availability. Excluding these women could thus result in an underestimation of the effect of child care on fertility.

Also, child care may not have an effect on fertility when parents are unwilling to place their children in day care. For Australia, McDonald (2001) found that long hours of care (over 20 per week) were considered inappropriate for children under the age of four by 71% of men and 65% of women. If much of the population is opposed to using child care facilities when children are very young, then the availability of child care for this age group would not be expected to increase fertility.

Data

To assess the impact of family policies (specifically, family leave and child care enrollment) and of women's employment on fertility across national contexts, we employ both individual-level data and country-level data. For individual-level data we use the 1995-1997 wave of the World Values Survey (WVS) and the 1999-2000 wave of the European Values Study (EVS). These two surveys are national, multi-stage, random probability samples. The surveys use very similar, standardized questionnaires to gather data. Separate model fits were performed for each data set, and the results were not qualitatively altered by merging the two data sets; results shown here are from the merged sample. A total of twenty countries are included the analysis. Specifically, we use seventeen countries from the EVS and three countries from the WVS (countries that were not available from the EVS). The EVS countries are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom. The countries provided by the WVS are Australia, Norway, and the United States. Other countries are excluded due to missing values or lack of macro-level data. We restrict our sample to women of childbearing ages (18 to 45) for a total sample size of 7,080 cases.

Data on child care enrollment for children under the age of four is provided by the OECD. The data on child care includes any type of child care that is reported to the government by individual families. This includes private or public day care, play-groups, family centers, early childhood education through the educational system, or registered baby-sitters and child-minders. This does not include provision of care by a member of a child's immediate family, as

this is generally considered an informal arrangement and is often not recorded by the government. National statistics offices collected original data on child care arrangements between the years of 1997 and 2000. In the United States (1995) and Australia (1999), household surveys were used to gather information on child care arrangements. Because data for child care services were only gathered recently, the effect of child care on older women may be overestimated in the sample. To provide some insight into the magnitude of change in child care enrollment, data from 1993-1994 were compared to current data for those countries in which they were available. Out of 14 countries for which data were available, four experienced significant change (see Table 2). Results for older women, especially the four countries that experienced significant change (Sweden, Great Britain, Denmark, and Finland), should be interpreted with caution because their childbearing predates the child care environment examined. On the other hand, ten countries did not experience any significant change (less than 10% change) indicating that estimates may be more accurate in these countries.

The data on women's total labor force participation rate for the ages of 25-54 is drawn from Eurostat European Union Labour Force Survey (European Commission 2002), the Current Population Survey (United States), and the Labour Force Survey (Australia). The total labor force participation rate is calculated by dividing the number of women employed by the total number of women in the corresponding age bracket.

Dependent variable

The dependent variable for this study is the total number of children ever born (realized fertility), at the time of the interview. This data is available for 7,080 women ages 18-45, and is provided by the EVS and the WVS. Detailed fertility histories were not available, making conventional hazard modeling problematic; our treatment to this problem is described in detail below.

Individual-level variables

Individual-level variables are those given by each respondent in the EVS and WVS. These include: Current marital status, highest level of education, employment status, parental co-residence, and an attitudinal variable - whether the respondent believes that "women need children in order to be fulfilled".[1] In this analysis, current marital status is converted into three dummy variables: married, cohabiting, or divorced. The omitted category consists of people who have never married. Due to differences in educational systems across different countries, we coded respondents dichotomously as having a high level of education (1) if any post-secondary schooling is completed (i.e., university-level degree/certificate and higher), and a low level of education (0) otherwise. We converted employment status into four dummy variables representing full-time work, part-time work, student, and unemployed (not currently employed but seeking employment). The omitted category is women who are housewives and/or otherwise out of the labor force. Parental co-residence has previously been found to be negatively

[1] Two individual-level variables, religion and household income (women's income was not available), were excluded in the final model as they were not significant. Household income was provided in 10 categories ranging from very low income to very high income levels. These were standardized to account for cross-national differences in income levels.

correlated with fertility (Flaquer 2000). Women who live at home attend school for longer periods of time and are likely to delay marriage and childbirth (Flaquer 2000; Laaksonen 2000). To control for this, we code the respondent as 1 if she lives with her parents and 0 if not. Self-reported attitudes on the "need for having children" are included to determine if fertility responds to these perceived needs. People who see children as more central to a person's life are likely to have higher fertility than those who do not. In particular, when asked, "Do you think that a woman has to have children in order to be fulfilled or is this not necessary?" respondents answering in the affirmative were coded 1, with those answering negatively coded 0 (no option of indifference was provided).

Macro-level variables

The macro-level variables employed here are the percentage of children ages three and younger who participate in some form of child care; family leave; and women's total labor force participation. Child care is measured as the percentage of children under the age of four in a given country who attend or are enrolled in any type of child care arrangement, whether from a private or public source, excluding care by immediate family members. Family leave is measured as the total number of weeks parents are entitled to take off from work at the birth or adoption of a child and/or to care for young children. Further analysis was done by including benefit/payment levels; since these were not found to be significant, paid and unpaid leave are combined. Women's total labor force participation rate is the percentage of women between the ages of 25 and 54 who are employed (either part-time or full-time).[2]

Methods

As the dependent variable for this study (realized fertility at the time of the interview) is both discrete and bounded, a conventional (e.g., ordinary least-squares) linear model is clearly inappropriate. While a hierarchical variant of a standard hazard analysis might seem reasonable, we are also limited by the lack of detailed fertility histories: we cannot be certain when respondents' births took place, except inasmuch as they were prior to the time of the interview. Furthermore, we know that fertility hazards change dramatically across the life course, ruling out a model based on constant hazards. As a compromise between the limitations of available data and the requirements of prior knowledge, we here model fertility as an inhomogeneous Poisson process with piecewise constant hazards[3]. Specifically, we model age effects on fertility via a

[2] Several macro-level variables were excluded because they were not significant. These are women's part-time employment rates, total unemployment rate, and the Gender Empowerment Measure. Women's part-time employment rate was measured as the percentage of women who work part-time as a percentage of total female employment. The total unemployment rate was measured as the total percent of people who are unemployed in each country. The Gender Empowerment Measure (GEM) is an index developed by the United Nations. The GEM gives a rating between 0 and 1 to each country based on the number of women who hold parliamentary and legislative seats, technical jobs, managerial jobs, and professional jobs, as well as the ratio of female to male estimated earned income. This index was not found to be significant and each individual component was also not significant.

[3] Inhomogeneous Poisson models are widely used in survival analysis (see, e.g., Cox and Oates, 1984; Blossfeld and Rohwer, 1995): our restriction lies in the use of a piecewise constant rate function whose time-varying parameters are homogeneous with respect to the respondent population. Detailed fertility histories would allow for a more fine-grained resolution of the hazard curve.

series of age-specific hazard multipliers. Age hazard multipliers are estimated for six age categories of equal length: 15-19, 20-24, 25-29, 30-34, 35-39, and 40-45. For the purposes of the model, the age hazard multipliers are assumed to be constant in each age category and are shared across countries (as with a synthetic cohort model). For example, all other things being equal, a woman who is twenty is expected to have the same hazard as a woman who is twenty-three. While it would be desirable to have a more fine-grained parameterization of the intertemporal aspects of the hazard curve, the data does not supply enough information to do so reliably; nevertheless, the results shown here appear reasonably robust to choice of categories. The age-specific hazard multipliers are interpreted relative to the reference category (ages 25-29) for reasons of model identifiability (see below). Multiplier estimates are thus evaluated based on the extent to which they are higher or lower than the hazard for the third age category.

To account for overall national fertility differences, baseline fertility hazards (determined by country-specific offsets), are assigned to each individual based on country membership. Each country's offset is taken to be a priori normally distributed with a mean given by a linear combination of country-level covariates and coefficients. All individuals in a particular country are assigned the same offset and hence can be thought of as "starting out" with the corresponding baseline fertility hazard. This baseline fertility hazard is then modified (increased or decreased depending on the direction of the effect) by age effects and individual-level covariates. Individual fertility is predicted by multiplying and then exponentiating the individual-level covariates and coefficients, country-specific offsets, and age-specific hazards according to the amount of time the individual spent in each age interval (exposure time).

Formal Modeling Framework

Formally, our model is constructed as follows. We begin by defining a series of adjacent, disjoint age intervals, $I_1,\ldots,I_{n_\alpha}$, such that all intervals are of equal length. For each such interval, we posit a nonnegative parameter α_i such that $\alpha_r = 1$ and, for some r in $1,\ldots,n_\alpha, i \neq r$, we have the following prior structure:

$$p(\alpha_i) \propto 1 \qquad (1)$$

and

$$p(\alpha) = \prod_{i=1}^{n_\alpha} p(\alpha_i). \qquad (2)$$

These α parameters are interpreted as *age-specific hazard multipliers* for intervals $I_1,\ldots,I_{n_\alpha}$ with the *r*th interval serving as a reference category. As the above indicates, we take the multipliers to be a priori independent, with noninformative prior distributions on the non-negative reals for each multiplier. While these parameters are shared across countries, we also posit a country-specific offset, denoted β_{0i} for i in $1,\ldots,m$, where m is the number of countries in the data set. These offsets are taken to arise from an a priori normal distribution whose mean

is given by a linear combination of country-level covariates, i.e.

$$p(\beta_{0i}) = N\left(\beta_{0i} \middle| Z_{i\bullet}\gamma, \sigma_\gamma^2\right), \tag{3}$$

where Z is an m by n_c covariate matrix (n_c being the number of country-level covariates), γ is a parameter vector of length n_c, and σ_γ^2 is a non-negative real parameter. While Z is assumed known, we take γ, σ_γ^2 to be uncertain with noninformative prior density.

$$p\left(\gamma, \sigma_\gamma^2\right) \propto \sigma_\gamma^{-2} \tag{4}$$

Note that this leads to a proper posterior distribution if $m>n$ and Z is of full rank. Taken together with α, the offset parameters provide a time-varying, country-specific baseline hazard (as is shown below); fixing one element of α to a constant (see above) is sufficient to permit model identification in this case.

In addition to these baseline effects, we also posit an individual-level covariate set X having n_b elements, with which we associate pairs of hyperparameters μ_i, σ_i^2. The a priori distributions of these hyperparameter pairs are given by

$$p\left(\mu_{i,}\sigma_i^2\right) \propto 1 \tag{5}$$

for i in $1,\ldots,n_b$. (Note that taking the "obvious" noninformative prior $p\left(\mu_{i,}\sigma_i^2\right) \propto \sigma_i^{-2}$ leads to an improper posterior in this case. Using a "flat" noninformative prior resolves this difficulty.) Associated with each covariate is a collection of β parameters, reflecting *country-specific covariate effects*. The conditional relationship of the βs to the hyperparameters is specified by

$$p\left(\beta_{ij} \middle| \mu_{i,}\sigma_i^2\right) = N\left(\beta_{ij} \middle| \mu_{i,}\sigma_i^2\right) \tag{6}$$

for i in $1,\ldots,n_b$, j in $1,\ldots,m$. Thus, $\mu_{i,}$ and σ_i^2 can be interpreted as the mean and variance (respectively) for a hypothetical population from which the country-specific effects for the ith covariate are drawn.

Given these parameters, the likelihood of the realized fertility vector (i.e., the vector containing the number of births per respondent), y, is as follows. For the ith of n respondents, let ε_i be a vector of exposures, corresponding to the time spent by said respondent in each of the n_a age intervals. In additions, let c in $\{1,\ldots,m\}^n$ be a vector of individual country memberships, such that c_i corresponds to the index associated with the country membership of the ith

respondent. Then the likelihood of the *i*th observation is given by

$$p(y_i|\alpha,\beta,\varepsilon,X) = Pois\left(y_i\middle|\exp\left(\beta_{0c_i} + X_{i\bullet}\beta_{\bullet c_i}\right)\left(\varepsilon_i^T\alpha\right)\right) \qquad (7)$$

for i in $1,\ldots,n$. Thus, fertility is assumed to arise from an inhomogeneous Poisson process with a piecewise constant rate function which depends on age, individual covariates, and country membership. The assumption that respondents' realized fertilities are conditionally independent combined with the previously defined prior structure then leads to the joint posterior

$$p(\alpha,\beta,\mu,\sigma,\gamma,\sigma_\gamma|y,\varepsilon,X,Z) \propto \left(\prod_{i=1}^{n} p(y_i|\alpha,\beta,\varepsilon,X)\right)\left(\prod_{i=1}^{n_b}\prod_{j=1}^{m} N\left(\beta_{ij}\middle|\mu_i,\sigma_i^2\right)\right)\left(\prod_{i=1}^{m} N\left(\beta_{0i}\middle|Z_{i\bullet}\gamma,\sigma_\gamma^2\right)\right)\sigma_\gamma^{-2} \qquad (8)$$

Although we cannot sample directly from this distribution, we may use Markov Chain Monte Carlo (MCMC) methods to obtain approximate draws. For this analysis, we employed a combination of Gibbs and sequential draw Metropolis sampling to simulate the joint posterior for each model tested (see Gilks et al. (1996) or Gamerman (1997) for a review of this approach). For each model, a sample of 10,000 draws was taken from a single chain of length 500,000 via uniform thinning after an initial burn-in period of 30,000 iterations; maximum likelihood estimates were used to provide seed values for the Markov chain. (Detailed inspection of the resulting chains verified that the sample size and burn-in period were adequate for convergence.)

Due to the size and complexity of the models under consideration, the full slate of analyses conducted cannot be shown here. In particular, a variety of models based on the previously identified covariate set were considered, with the final model being selected based on the cross-validation predictive likelihood (CVPL) (Gefland 1994). (This quantity is a posterior estimator of the expected predictive power of the model, on a new sample similar to that observed[4].) The CVPL-favored model (shown below) was also preferred under other selection criteria (e.g., the deviance information criterion (Gelman el al. 2004); effects shown here were qualitatively similar under alternative models).

To facilitate interpretation of posterior inferences, we shall focus our presented results on posterior marginals. Posterior means and standard deviations are shown for all scalar estimands, along with 95% central probability intervals and quantiles greater than/less than 0 where applicable (i.e., "Bayesian hypothesis tests"). While, for reasons of familiarity, we mimic the presentation style of frequentist *p*-values, quantiles shown are posterior probabilities rather than quantiles of a hypothetical null distribution. Thus, the statement that $p(\mu_i>0)=0.05$ here means that μ_i is estimated to have a 95% chance of being less than or equal to 0 (given the data and prior structure)[5]. (All quantities shown are one-tailed.) Similarly, 95% posterior probability intervals provide a range such that the relevant estimand lies in the range with probability 0.95 (rather than a random interval with 95% coverage). The ability to make such direct statements of

[4] Note that we cannot employ Bayes Factors here, due to our use of an improper prior structure. The CVPL does not depend on such an assumption.

[5] Contrast this with the (loosely) analogous frequentist statement that the probability of seeing an estimate of μ_i at least as small as that observed under the null hypothesis of $\mu_i=0$ is equal to 0.05.

posterior probability – as opposed to statements about hypothetical replications – is an advantage of the Bayesian approach (Robert 1994).

Results

Overall we find that individual-level variables help to explain fertility differences, but are not sufficient to account for cross-national differences in fertility rates. Even after controlling for individual-level characteristics, country-level variables such as child care enrollment and female labor force participation have a significant association with fertility (see Table 3). In addition, individual-level characteristics do not have the same magnitude of effect in every country.

Individual-level Effects

Across countries, the strongest predictors of fertility are marital and employment status. Being married, for instance, increases fertility by an expected factor of 3.3 (see Table 3). This positive effect is found within all countries, although the magnitude of the increase varies significantly (see Table 4). The effect of being married is strongest in the Eastern and Southern European countries - increasing by a factor of 3 or higher - and weakest in the United States and Great Britain, where being married is only associated with slight increases in fertility. The effect of cohabitation on fertility is not significantly different from single status in any country sampled. The expected effect of being widowed, divorced, or separated, on the other hand, was very similar to that of being married. This likely reflects the presence of children from terminated relationships, which would produce the observed positive association with fertility. Thus, our analysis supports the notion that the salient marital status distinction with respect to fertility is between those who are or have been legally married, and those who have never married.

Employment status is also a significant predictor of fertility. Full-time work decreases fertility to a greater extent than part-time work (on average) while remaining out of the labor force is positively associated with fertility. This is in line with prior research findings (Lesthaeghe 1995; Sundtröm 2000; Budig 2003) and supports Hypothesis 1 (i.e., participation in the labor force (full-time or part-time) decreases fertility). This effect is robust, as well: full-time work is associated with decreased expected fertility in every country sampled. Overall, the average decrease in fertility for full-time workers is approximately 30%. Part-time, by contrast, appears to decrease fertility by 15%. This does not lend support to Hypothesis 2 (i.e., that the effect of part-time work is more similar to the effect of being a housewife than a full-time worker). This does, however, vary by country. In six countries (Germany, Austria, Great Britain, Netherlands, Australia, and Norway), the effect of working part-time work is much more similar to that of a housewife than a full-time worker. In Spain and Greece, by contrast, the effect of part-time work on fertility is more similar to that of full-time work.

Effects for individual-level control variables appear to be consistent with previous research findings (Esping-Andersen 1999; Flaquer 2000; Mason 2001; Wang and Famoye 1997; OECD 2002). Parental co-residence on average decreases fertility by 88%. Agreeing that “it is necessary for women to have children in order to be fulfilled” leads to an average increase of 9% as opposed to believing that having children is unnecessary. Having a high level of education (university degree or certificate and above) decreases fertility by 18% when compared to those who have less education. Being a student decreases fertility substantially - 99% on average,

though there is a wide range of effects across countries (see Table 4). The effect of unemployment (versus the reference category of "housewife") is small or not statistically significant in most countries but leads to an average fertility decline of 10% across the whole sample.

Country-level Effects

As expected, country-level effects are diffuse but consequential. (Figure 1 shows the posterior marginals for each effect parameter (and the associated variance parameter), along with medians and 95% probability intervals.) For each percentage of increase in the availability of child care, the country offset is increased by an average of 2% (see Table 3). Thus, while a small increase in the availability of child care would not be expected to increase fertility substantially, increasing the availability of child care in Southern European countries with very low availability to a level similar to that of the Scandinavian countries could have a significant impact on their fertility rates. For instance, holding all other factors constant, if Italy were to increase its availability of child care from 6% to 64%, to match that in Denmark, the realized fertility per woman would be predicted to increase by an average of 0.97 children. Even if the increase in child care services were moderate and Italy attained the child care enrollment rate in Belgium, which is 30%, fertility for Italian women could increase by 0.27 children per woman. Thus we find significant support for Hypothesis 5 (i.e., that child care has a significantly positive effect on fertility). An important caveat to keep in mind is that this is the expected effect of child care services according to this model, holding all factors constant. Other, unmeasured characteristics present in the nations in which child care services are available and perceived as suitable caretaking alternatives could mitigate the effect of increasing child care in the absence of other types of social and cultural changes.

Controlling for individual factors and policy variables, the expected effect of women's total employment rates on fertility is negative, a finding which differs from those obtained by macro-to-macro studies[6] (Brewster and Rindfuss 2000; Rindfuss et al. 2003; Sleebos 2003). Each percent increase in women's total employment rate multiplies the offset by -.04, thus decreasing expected fertility by approximately 4% . This contrast in findings may stem from the fact that the above-mentioned studies used the country-level total fertility rate, while this study directly models individual-level fertility. To assess whether the negative association between fertility and labor force participation in this study is due to the policy variables, the model was estimated excluding the policy variables. The association between fertility and macro-level employment rates remained significantly negative (results available upon request). Thus, we do not find support for Hypothesis 3a, which states that as women's labor force participation increases, fertility will increase as well. It is interesting to note, in this regard, that the positive effect of child care services does not appear to fully compensate for the effect of labor force participation on a 1:1 basis, though the former would soften the effect of the latter. Note too that the labor force effect reported here is in addition the individual-level effect described above.

With respect to Hypothesis 3b (the moderating effect of total female labor force participation), our results also run contrary to our initial predictions. Examination of the posterior distribution of the correlation between total female labor force participation and the (individual) full-time employment effect across countries indicates that the moderating effect is most likely

[6] Conducting a pure macro-to-macro analysis on the data used here yields results similar to those cited.

negative. Although the magnitude of the correlation does not appear to be large (median of -0.25, IQR of 0.20), the posterior probability that the correlation is less than zero is approximately 92%. On average, this correlation accounts for approximately 7.9% of the cross-national variance in full-time employment effects; thus, while the impact of female labor force participation is non-negligible, it clearly does not provide a complete explanation of cross-national differences in employment effects. It is also noteworthy that no significant correlation was observed for part-time employment, suggesting that this phenomenon is limited to full-time work. Taken together with the results for Hypothesis 3a, these findings would seem to undercut the "barrier reduction theory." Although the uniformly negative effect of total female labor force participation on individual fertility has many possible explanations, one factor may be the increased opportunities for occupational attainment (in terms of income, status, autonomy, etc.) for women in economies with high participation rates. Thus, "economic enablement" may play a more central explanatory role vis a vis women's fertility (so far, at least) than the gradual reduction of barriers to fertility among working women[7]. Factors such as the association of participation rates with other, unmeasured characteristics of those countries (i.e., division of household labor, availability of market-based services, etc.) could also be implicated. Disentangling these effects would seem to be an important avenue for future research.

The effect of family leave on fertility is not significant, a finding which is in agreement with several previous studies (Gauthier and Hatzius 1997; OECD 2001). This confirms Hypothesis 4, (i.e., family leave has no effect on fertility). Maternity leave, although usually paid, is of short duration and would not be of sufficient duration to provide care for young children. Parental leave, which in some countries is available for up to a few years, is not fully compensated and requires that one parent (almost always the mother) exit the labor force for an extended period of time (if care is to be provided for young children until they begin school). This reduces women's job attachment and labor force participation (Waldfogel 1998; Sleebos 2003) and can result in a loss of wages and occupational attainment. Women will then be reluctant to have children where other sources of caretaking are not available.

Age Effects

The age-specific hazard multipliers for this data indicate that women have the highest fertility rates during the age category of 25-29 (see Table 5 and Figure 2). Fertility declines substantially by age 35, with women becoming very unlikely to have (more) children by age 40. This is consistent with past research on fertility patterns over the life course, and with recent studies suggesting an increased postponement of fertility into the late 20s (Bongaarts 2002; Frejka and Ross 2001; Lesthaeghe 1995). The range of estimates within the Table 5 for earlier age intervals reflects the difficulty of precise estimation of intertemporal effects from count data; detailed cross-national fertility histories would permit more refines estimation of such effects.

Discussion and Conclusion

Our findings underscore the importance of including both, country-level and individual characteristics when modeling women's fertility. Importantly, individual attributes do not act

[7] By turns, we would expect that the continued expansion of economic opportunities for women within the developed world may eventually saturate this effect, leading to greater *relative* importance for issues such as work-family balance. Whether this transpires in the coming decades remains to be seen.

identically across national contexts, and considerable differences in base rates persist even after controlling for these effects. In particular, aggregate female labor force participation rates and child care availability appear to exert a non-negligible effect on national fertility rates. Previous studies have indicated that there is a demand for mechanisms to resolve conflicts between family and work roles. This study suggests that child care services may act in this capacity to some extent, while family leave does not seem to have a comparable effect.

It has been suggested that observed work-family tradeoffs are regarded as suboptimal by a non-negligible fraction of women in the developed world (OECD 2001). Women in most countries report a desire to increase their labor force participation, being unable to do so due to household constraints. A 1998 survey carried out in several European Union countries asked 30,000 couples with children under the age of six to describe their current employment situation and their preferred employment pattern (see Table 6). Families were organized according to three typologies: dual-earners, man works full-time while woman works part-time, and man works full-time while women remain out of the labor force. What they found was that the actual number of dual-earner families was much lower than what respondents preferred. This suggests that women in these countries were under-employed, likely due to their family responsibilities.

As women's educational and career attainment increases, it is likely that fertility will continue to decline. However, our findings suggest that child care availability can mitigate some of this decline. In so far as the fertility decline is due to changing norms regarding family size or the desire not to have any children, there may be limits to this mitigating effect. For instance, there is some evidence that the ideal family size has dropped below two in some countries (Goldstein et al. 2003). On the other hand, for those individuals who are having fewer children than what they would like due to work-family time constraints, increasing the availability of child care may improve the compatibility between employment and parenthood.

Appendix

Table 1: Child care enrollment rates and employment patterns in Europe, Australia and the United States for the years 1997-2001

Country	Total Fertility Rate [a]	Child Care Ages 0-3 % [b]	Part-time Employment % [c]	Full-time Employment % [d]	Total Labor Force Participation Rate % [e]
Italy	1.2	6	23	38	51
Spain	1.2	5	17	38	51
Czech Republic	1.2	1	6	56	74
Slovenia	1.2	60	6	57	63*
Germany	1.3	10	34	47	71
Greece	1.3	3	9	40	53
Austria	1.4	4	24	51	74
Slovakia	1.4	46	3	50	65
Portugal	1.5	12	15	58	74
Netherlands	1.5	6	57	42	71
Belgium	1.5	30	35	43	68
Sweden	1.5	48	21	60	82
France	1.7	29	24	50	70
Great Britain	1.7	34	41	50	73
Denmark	1.7	64	24	63	81
Finland	1.7	22	14	62	78
Australia	1.8	15	41	33	67
Norway	1.8	40	34	57	82
Ireland	1.9	38	32	46	53
United States	2.0	54	18	57	74

a Data on the total fertility rate for the years 1995-2000 is provided by the United Nation's Human Development Indicators for demographic trends. This data is gathered from national census and registration reports and evaluated for accuracy and completeness by the Statistical and Population Divisions of the United Nations.

b Data is provided by the Organization for Economic Cooperation and Development (years 1997-2000). Original data was gathered by national statistics offices responsible for the collection of data on child care arrangements for each family. In the United States and Australia household surveys are used to gather information on child care arrangements.

c Part-time employment is defined as less than 30 hours per week (35 in Australia). Data is provided by the Organization for Economic Cooperation and Development (2002). Data was gathered from labor force surveys (Eurostat European Union Labour Force Survey and national labor force surveys (Europe), Current Population Survey (United States), Labour Force Survey (Australia)).

d Full-time employment is defined as working 30 hours or more per week. Data is provided by the Organization for Economic Cooperation and Development (2002). Data was gathered from labor force surveys (Eurostat European Union Labour Force Survey and national labor force surveys (Europe), Current Population Survey (United States), Labour Force Survey (Australia)).

e Total labor force participation for women between the ages of 25-54. The figure is calculated by dividing the number of women employed by the total number of women in the corresponding age bracket. Data is provided by the European Commission and was originally gathered by Eurostat and national labor force surveys for the year 2001.

* Data for Slovenia is provided by the United Nations Economic Commission for Europe. Data was gathered with the use of a standardized questionnaire by the Statistical Office of the Republic of Slovenia.

Table 2: Percentage Change in Child Care Services Enrollment between 1993-2000

Country	Child Care Ages 0-3 % 1993-1994 [a]	Child Care Ages 0-3 % 1997-2000 [b]	Change
Czech Republic		1	--
Greece	3	3	0
Austria	3	4	+1
Spain	2	5	+3
Italy	6	6	0
Netherlands	8	6	-2
Germany	West: 2 East: 41	United: 10 West: 3 East: 36	+1/-5
Portugal	12	12	0
Australia		15	--
Finland	32	22	-10
France	23	29	+6
Belgium	30	30	0
Great Britain	2	34	+32
Ireland		38	--
Norway	31	40	+9
Slovakia		46	--
Sweden	33	48	+15
United States		54	--
Slovenia		60	--
Denmark	48	64	+16

a Neyer, Gerda. 2003. "Family Policies and Low Fertility in Western Europe." Working paper for the Max Planck Institute of Demographic Research.
b Organization for Economic Cooperation and Development. 2001. "Balancing Work and Family Life: Helping Parents Into Paid Employment." Organization for Economic Cooperation and Development Employment Outlook.

Table 3: Individual and Macro-level Effects on Fertility for Women Ages 18-45

	Point Estimate Mean (s.d.)	Exponentiated	95% Probability Interval Lower	Upper	$p(\beta>0)$	$p(\beta<0)$	
Individual-level effects							
Married	1.20 (.17)	3.32	.86	1.54	1.00	.00	***
Cohabit	-.04 (.16)	.96	-.18	.09	.34	.66	**ns**
Divorced	1.10 (.16)	3.00	.78	1.43	1.00	.00	***
Full-time	-.36 (.04)	.70	-.45	-.28	.00	1.00	***
Part-time	-.16 (.04)	.85	-.23	-.09	.00	1.00	***
Unemployed	-.10 (.05)	.90	-.22	.02	.01	.99	**
Student	-14.40 (28.96)	.001	-27.69	-1.28	.02	.98	**
Education	-.20 (.03)	.82	-.27	-.14	.00	1.00	***
Parental Co-residence	-2.15 (1.52)	.12	-5.19	.84	.07	.93	+
Need Child	.09 (.02)	1.09	.04	.14	1.00	.00	***
Country-level effects							
Child Care	.02 (.01)	1.02			.92	.08	+
Employment Rate	-.04 (.01)	.96			.00	1.00	***
Family Leave	-.004 (.005)	.99			.17	.83	**ns**

Expected Absolute Error = .63

Median Absolute Error = .41

CVP Harmonic Estimator = -7892.19

N = 7080

Countries = 20

$p < .1$ + $p < .05$ * $p < .01$ ** $p < .001$ ***

Table 4: Individual-level Point Estimates (Posterior Means) by Country

Country	TFR	Country Offset	Marital Status (Reference category = Single)			Employment Status (Reference category = Housewife)				Education	Parental Co-residence	Need Child
			Married	Cohabit	Divorced	Full-time	Part-time	Unemployed	Student			
Italy	1.2	-3.43	1.39***	-.05	1.20***	-.32***	-.17***	-.19*	-.23	-.21***	-.80***	.09*
Spain	1.2	-3.73	1.90***	-.03	2.14***	-.28***	-.16**	-.16*	-73.57***	-.20**	-1.02***	.09*
Czech Republic	1.2	-3.14	1.50***	-.02	1.48***	-.32***	-.17***	-.06	-30.76***	-.15*	-.15	.06
Slovenia	1.2	-2.64	.96***	-.03	.95***	-.29**	-.17***	-.17*	-74.83***	-.18**	.10	.08*
Germany	1.3	-2.74	.86***	-.01	.87***	-.45***	-.14*	-.09	-1.04***	-.17*	-.62***	.11*
Greece	1.3	-4.95	3.02***	-.01	2.73***	-.20+	-.15*	-.10	-1.76***	-.19***	.01	.09+
Austria	1.4	-2.90	1.20***	-.08	.83***	-.46***	-.15**	-.09	-.28	-.20***	.06	.09+
Slovakia	1.4	-3.94	2.28***	.01	2.06***	-.28***	-.18*	-.08	1.23***	-.21***	-.21*	.05
Portugal	1.5	-3.01	1.14***	-.01	1.07***	-.36***	-.17***	-.02	-2.46***	-.23***	-.45***	.11**
Netherlands	1.5	-3.16	1.35***	-.09	1.25***	-.40***	-.14*	-.11	-61.96***	-.20***	-11.15***	.13***
Belgium	1.5	-2.72	1.11***	-.01	.89***	-.32***	-.15*	-.07	-1.54***	-.18***	-.32+	.07+
Sweden	1.5	-2.77	1.14***	-.06	.93***	-.35***	-.16**	-.07	-.29+	-.20***	-25.38***	.07
France	1.7	-2.51	.96***	-.03	.79***	-.37***	-.17***	-.13+	-35.22***	-.17***	-1.39***	.09*
Great Britain	1.7	-1.80	.25***	-.10	.28*	-.44***	-.19***	-.11	-2.22***	-.26***	.43*	.09*
Denmark	1.7	-2.37	.65***	-.17	.81***	-.33***	-.17*	-.09	-.32+	-.18**	-.94***	.10*
Finland	1.7	-2.11	.68***	-.09	.55***	-.26**	-.16**	-.11+	-1.10***	-.20***	1.72***	.08
Australia	1.8	-2.76	1.13***	-.05	.99***	-.54***	-.18***	-.16	-.66*	-.22***	-.55***	.10**
Norway	1.8	-3.03	1.46***	-.08	1.12***	-.43***	-.17**	-.10	-.43+	-.21***	-.15	.08+
Ireland	1.9	-2.29	.82***	.01	.84***	-.38***	-.17**	-.14+	-.05	-.23***	-1.11***	.10*
United States	2.0	-1.56	.12	.05	.25**	-.38***	-.20***	-.03	-.36*	-.23***	-.75***	.10*

$p < .1$ + $p < .05$ * $p < .01$ ** $p < .001$ *** (Bayesian significance levels based on posterior quantiles)

Table 5: Age-Specific Hazard Multipliers

Age Category	Mean	Standard Deviation	95% Probability Interval	
			Lower	Upper
15-19	.78	.12	.59	1.07
20-24	.62	.18	.32	1.02
25-29	1.00	.00	1.00	1.00
30-34	.57	.17	.30	.96
35-39	.24	.10	.05	.46
40-45	.01	.05	.001	.20

Table 6: Actual and Preferred Employment Combinations for Couples with Children Under the Age of Six

Country	Man full-time/ Woman full-time %	Man full-time/ Woman part-time %	Man full-time/ Woman not employed %
Finland			
Actual	49.3	6.4	32.8
Preferred	80.3	8.6	10.2
Sweden			
Actual	51.1	13.3	24.9
Preferred	66.8	22.2	6.6
Greece			
Actual	42.2	7.9	36.1
Preferred	65.6	10.6	9.4
Italy			
Actual	34.9	11.8	43.3
Preferred	50.4	27.7	10.7
Portugal			
Actual	74.5	4.7	18.7
Preferred	84.4	8.0	4.0
Spain			
Actual	25.6	6.3	56.9
Preferred	59.7	11.6	19.7
Ireland			
Actual	30.8	18.7	37.0
Preferred	31.1	42.3	8.1
United Kingdom			
Actual	24.9	31.9	32.8
Preferred	21.3	41.8	13.3
Austria			
Actual	19.1	28.2	48.1
Preferred	35.6	39.9	3.9
Germany			
Actual	15.7	23.1	52.3
Preferred	32.0	42.9	5.7
Netherlands			
Actual	4.8	54.8	33.7
Preferred	5.6	69.9	10.7
Belgium			
Actual	46.0	19.4	27.3
Preferred	54.8	28.8	13.4
France			
Actual	38.8	14.4	38.3
Preferred	52.4	21.9	14.1
Average			
Actual	34.4	19.1	37.9
Preferred	47.7	29.0	10.2

Adapted from the Organization for Economic Cooperation and Development Employment Outlook 2001, p. 136.
Source: Employment Options of the Future survey 1998.

Figure 1: Posterior Marginals for Gamma Parameters (with 95% Posterior Intervals)

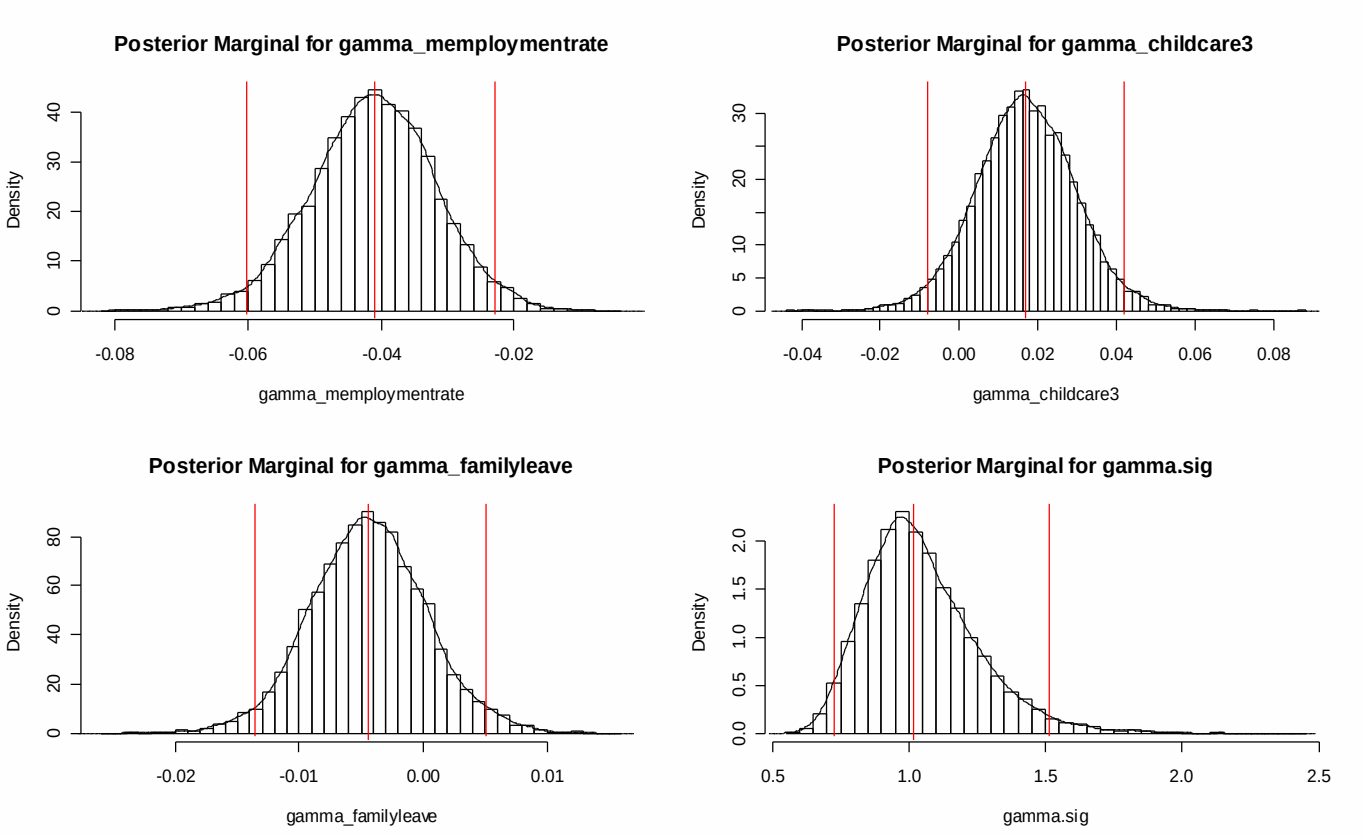
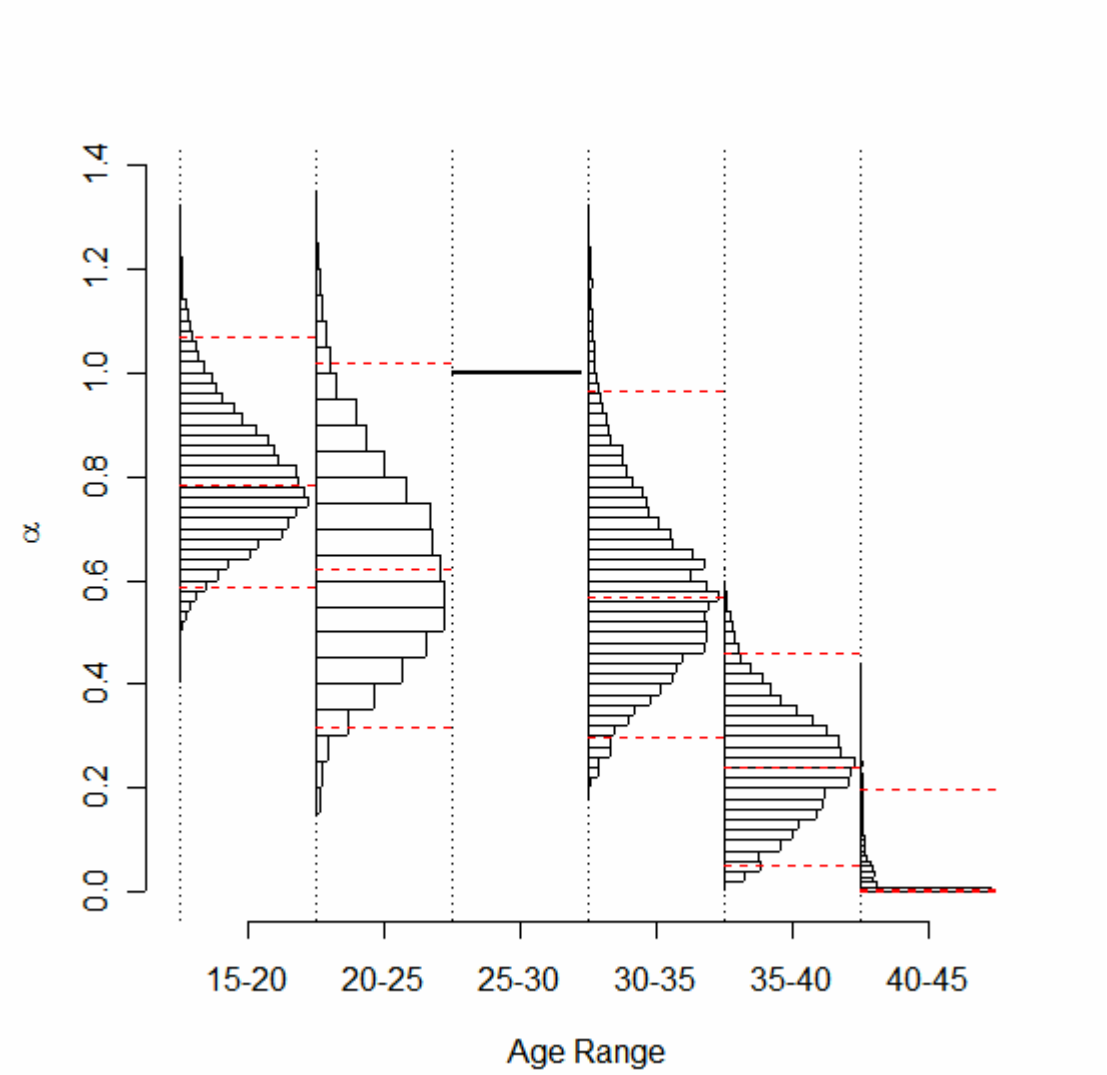


Figure 2: Posterior Marginals for Alpha Parameters, by Age Range (with 95% Posterior Intervals).



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