WORKING PAPER

Desired and Excess Fertility in Europe and the United States: Indirect Estimates from World Fertility Survey Data

Charles A. Calhoun

July 1989
WP-89-41

IIASA
International Institute
for Applied Systems Analysis

Desired and Excess Fertility in Europe and the United States: Indirect Estimates from World Fertility Survey Data

Charles A. Calhoun

July 1989
WP-89-41

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
A-2361 Laxenburg, Austria

Foreword

How many children couples want, and how many unwanted births occur, is essential information for the guiding of family planning programs in Less Developed Countries, and for measures to encourage childbearing in More Developed Countries. The World Fertility Survey was organized for ascertaining such facts; it is said to be the most ambitious piece of social research ever undertaken, with field work by statistical agencies in nearly 60 countries, coordinated by a central staff of unchallenged credentials in statistics and demography. The major effort was in the LDCs, but 16 European countries and the United States were also included, and it is from these latter that have come the data on which the present working paper is based.

Apparently the interpretation of the results requires even more technical skill than the original surveys did. The difficulty to be overcome is that births unwanted at the time they occurred come to be very much wanted afterwards. Hence the retrospective statements of women on how many of the children born to them were unwanted would not be of much value, even if it were feasible to request such statements. It is this gap in information that Charles Calhoun has filled, using from the WFS only the statements on how many children were already born, and how many further children were expected.

As an example of the estimates here published, the United States showed 28.4 per cent of women with two children, and of these 4.8 per cent wanted none, and 2.7 per cent wanted one child. The 28.4 per cent is a directly observed number; the 4.8 and the 2.7 per cent are inferred by the indirect technique here expounded.

It turns out that the women not in the labor force have higher proportions of unwanted births than those in the labor force; even at given levels of education the former may be thought of as more traditional. Working women, moreover, have a stronger incentive to be careful than housewives. The use of this technique on data available in the late 1970s would have forecast the fall in the late 1980s, if it were supposed that sophistication in birth control is spreading through the population. On the same supposition the possibility of further falls in fertility is one of the conclusions from the figures given here, more for some countries than for others.

Nathan Keyfitz
Leader
Population Program

Acknowledgements

I would like to thank the United Nations Economic Commission for Europe for providing the UNECE/WFS Comparative Fertility Study data file. I would particularly like to thank Alexander Riazantsev and Ioli Kimyaci of the UNECE Population Activities Unit for their assistance. I would also like to acknowledge the contribution of the late Joseph Van den Boomen, who first suggested using the UNECE/WFS data. Rudolf Wytek of the University of Vienna, provided invaluable assistance in preparing the data tapes for analysis. The expert assistance of Susan Stock in preparing the text and tables is also gratefully acknowledged. Support for this work was provided by the International Institute for Applied Systems Analysis. The views expressed are entirely those of the author.

Desired and Excess Fertility in Europe and the United States: Indirect Estimates from World Fertility Survey Data

Charles A. Calhoun

INTRODUCTION

This paper reports indirect estimates of desired and excess fertility derived from World Fertility Survey (WFS) data for married and cohabitating women in twelve European countries and the United States.[1] Previous research on WFS data from developing countries has shown that rationalization of unwanted births can produce an upward bias in average values of desired family size in cross-sectional fertility surveys.[2] While the magnitudes of desired and excess fertility are much smaller in industrialized countries, unwanted births still comprise a relatively large share of total fertility and present similar measurement problems. Estimates of desired and excess fertility are needed to inform policies aimed at eliminating the individual and societal welfare losses associated with induced abortions and unwanted or ill-timed births.[3] At the same time, programs that are

[1]The data are from the United Nations Economic Commission for Europe (UNECE) Comparative Fertility Study of World Fertility Surveys for Europe and the United States. The countries included here are: Belgium, Czechoslovakia, Denmark, Finland, France, Great Britain, Hungary, Italy, Netherlands, Norway, Poland, Spain, and the United States. The Comparative Fertility Study sample was limited to women who were currently married or in a consensual union. With the exception of Denmark and Poland, all women were in their first marriage or union. Women between the ages of 15 and 45 are represented, with some variation by country in the oldest and youngest ages. The data originated in national surveys conducted between April 1975 and December 1979. For a summary of the surveys see J. Berent, E.F. Jones, and M.K. Siddiqui, 'Basic characteristics, sample designs and questionnaires,' *Comparative Studies: ECE Analyses of WFS Surveys in Europe and USA*, No. 18, (Voorburg, Netherlands: International Statistical Institute, 1982).

[2]See T.W. Pullum, 'Adjusting stated fertility preferences for the effect of actual family size, with application to World Fertility Survey data,' pp. 129-144 in G.E. Hendershot and P.J. Placek (eds.), *Predicting Fertility: Demographic Studies of Birth Expectations*, (Lexington, Mass.: Lexington Books, 1981); and R.E. Lightbourne, 'Individual preferences and fertility behavior,' pp. 165-198 in J. Cleland and J. Hobcraft, *Reproductive Change in Developing Countries: Insights from the World Fertility Survey*, (New York: Oxford University Press, 1985).

[3]For example, see C.F Westoff, C.R. Hammerslough, and L. Paul, 'The potential impact of improvements in contraception on fertility and abortion in Western countries,' *European Journal of Population*, 3 (1987), pp. 7-32.

designed to help individual women avoid unwanted births could lead to further decline in growth rates in populations with below-replacement fertility.[4] In this case, estimates of the magnitude and frequency of desired and unwanted births may provide some indication of the long-run minimum level of fertility in developed countries.

Conceptual Framework

Although survey data on reproductive intentions have been collected for several decades, debate continues over how to conceptualize and measure the underlying demand for children.[5] The microeconomic theory of fertility advanced by Becker and Willis views the demand for children as the outcome of a process of utility maximization subject to constraints on the time and money resources of the household.[6] The main success of the microeconomic model has been to provide a common framework for discussing the results of empirical studies that explain fertility differentials as functions of household income and female earnings in developed countries.

The microeconomic model has proved to be less relevant, though no less widely applied, to the analysis of fertility in developing countries.[7] To account for the possibility that the observed number of births is the outcome of a *natural* fertility regime in which no parity-specific fertility control is exercised, Easterlin proposed a *synthesis* framework of fertility demand, biologically determined supply, and the psychic and monetary costs of fertility regulation.[8] While the synthesis model provides the means by which to simultaneously analyze both controlled and biologically constrained fertility outcomes in one system of equations, the particular definition of demand used by Easterlin has resulted in some confusion about its relation to the standard definition used by economists.

---

[4]See K. Davis, M.S. Bernstam, R. Ricardo-Campbell (eds.), *Below-Replacement Fertility in Industrial Societies: Causes, Consequences, Policies*, supplement to *Population and Development Review*, 12 (1986).

[5]For a historical review of survey questions on reproductive intentions see D. Oakley, 'The development of measures of childbearing expectations,' pp. 11-26 in G.E. Hendershot and P.J. Placek (eds.), *loc cit.* in footnote 2. The use of survey data on the desired number of births as a measure of the demand for children is discussed in G.H. McClelland, 'Family-size desires as measures of demand,' pp. 288-343 in R.A. Bulatao and R.D. Lee (eds.), *Determinants of Fertility in Developing Countries, Volume 1, Supply and Demand for Children*, (New York: Academic Press, 1983).

[6]See G.S. Becker, 'An economic analysis of fertility,' pp. 209-231 in Universities-National Bureau of Economic Research, *Demographic and Economic Change in Developed Countries* (Princeton: Princeton University Press, 1960); and R.J. Willis, 'A new approach to the economic theory of fertility behavior,' pp. 25-75 in T.W. Schultz (ed.), *Economics of the Family*, (Chicago: University of Chicago Press, 1974).

[7]See G.M. Farooq and G.B. Simmons (eds.), *Fertility in Developing Countries: An Economic Perspective on Research and Policy Issues*, (London: MacMillan Press, 1985).

[8]R.A. Easterlin, 'An economic framework for fertility analysis,' *Studies in Family Planning*, 6 (1975), pp. 54-63; and R.A. Easterlin, 'The economics and sociology of fertility: a synthesis,' in C. Tilly (ed.), *Historical Studies of Changing Fertility*, (Princeton: Princeton University Press, 1978).

Easterlin defined the demand for children as 'the number of surviving children parents would want if fertility regulation were costless.'[9] For this quantity to be theoretically consistent with demand in the standard microeconomic model, the price of contraception, as it would appear in the household budget constraint, must be zero. While the notion that the costs of fertility regulation are relevant only to those who actually regulate their fertility appears reasonable, it leads to an interpretation of the demand for children that confuses unobservable preferences with observable outcomes. In the standard theory, the demand for children and the decision to use contraception are joint decisions taken in response to the full set of relative prices, including the price of fertility regulation. In a recent paper, Montgomery has shown that even when the costs of fertility regulation are included in the budget constraint, it is still possible to estimate the underlying parameters that determine observed demand and supply, thus preserving the main contribution of Easterlin's model and the interpretation of the demand for children as the observed outcome of constrained utility maximization.[10]

The existence of unwanted births in low-fertility countries, while quantitatively different, has some conceptual similarities to the situation described above. Although parity-specific fertility control is virtually universal in industrialized countries, the observed supply of births, defined in this case by attained family size, can still exceed demand, creating the same type of measurement problems that have hindered the empirical analysis of fertility differentials in developing countries. The goal of this paper is to develop estimates of desired family size that account for effects of excess fertility and which are consistent with the standard interpretation of the demand for children outlined above.

Estimating Desired Family Size and Excess Fertility

Previous comparative analyses of family size preferences that used WFS data for Europe and the United States were based on the ultimate expected number of children, defined by the sum of the number of past live births reported at the time of the survey, and the additional number of children the respondent expected to have in the future.[11] The ultimate or total number of expected births can be greater than the desired number

---

[9]R.A. Easterlin, (1975), p.55, *ibid.*

[10]M.R. Montgomery, 'A new look at the Easterlin *synthesis* framework,' *Demography*, 24(4) (1987), pp. 481-496.

[11]J. Berent, 'Family size preferences in Europe and USA: ultimate expected number of children,' *Comparative Studies: ECE Analyses of WFS Surveys in Europe and USA*, No. 26, (Voorburg, Netherlands: International Statistical Institute, 1983).

of children because of unwanted births, and the same will be true of the answers to direct questions about desired family size when respondents are reluctant to give answers that imply that previous births were not wanted. The extent to which the ultimate expected number of births is biased as a measure of desired family size will depend on attained family size, with the result that differences in socioeconomic and demographic characteristics that are correlated with cumulative fertility will confound international comparisons. This implies the need for a bivariate approach in which children ever born and desired family size are modelled jointly and the effects of other factors are controlled in a multivariate statistical analysis.

The estimates of desired and excess fertility presented in this paper are derived from a bivariate ordered-probit censoring model for the joint distribution of children ever born (CEB) and desired family size (DFS).[12] DFS is defined as the current (survey-date) value of the total number of births a married woman would like to have when childbearing is completed. The joint distribution of cumulative and desired fertility is then estimated indirectly from data on CEB and total expected births. The censoring model accounts for the upward bias in fertility preferences derived from birth expectations data, and produces estimates of the joint distribution of CEB and DFS that can be used to determine the level of excess fertility without having to resort to sensitive questions about unwanted births. Estimation is by the method of maximum likelihood, which facilitates the calculation of statistical confidence intervals for the computed values of mean desired family size, the probability excess fertility (percent of women with at least one unwanted birth), and the mean number of unwanted births.

As with other indirect methods, the censoring model makes some specific assumptions about the relationship between birth expectations and underlying preferences for family size. The total number of births expected is assumed to represent the desired family size of women who report that they expect to have more births. Women who do not expect additional children are presumed only to have current values of DFS that are less than or equal to their observed family sizes. The approach is similar to the synthetic-cohort method of estimating the distribution of DFS in that it distinguishes between women wanting additional births and those who are assumed to have achieved, or exceed-

[12]The bivariate ordered-probit censoring model was introduced in C.A. Calhoun, 'Estimating the distribution of desired family size and excess fertility,' *Journal of Human Resources*, (forthcoming, Fall 1989). A detailed mathematical description of the model, including a discussion of parameter identification and extensions to other forms of censoring, is given in C.A. Calhoun, 'Bivariate ordered-probit models for censored data with applications in demography,' presented at the Third Annual Conference of the European Society for Population Economics, L'Université de l'UAP, Domaine de Frémigny, Bouray sur Juine, France, June 8-10, 1989.

ed, their desired family size.[13] Both approaches use the observed distribution of attained family size to help identify the underlying distribution of DFS. However, in contrast to the synthetic-cohort method, the bivariate ordered-probit censoring model estimates the joint distribution of CEB and DFS using individual-level data.

WFS Measures of Birth Expectations and Desired Family Size

Data on total expected births in the WFS surveys for Europe and the United States were not always based on the same type of question. Direct questions about total expected births were asked in Belgium, Denmark, Great Britain, the Netherlands, and Norway. In Finland, Italy, and the United States, total expected births were derived by adding the number of *additional expected births* to CEB.[14] In Poland, total expected births were given by CEB plus *additional planned births*, and in Spain, total expected births were given by CEB plus *additional intended births*. Finally, in Czechoslovakia, France, and Hungary, total expected births were derived by adding the number of *additional wanted births* to CEB. Thus, for the latter three countries the measure of total expected births is very much like a direct question on the desired number of births.

For six of the countries (Belgium, Czechoslovakia, Finland, France, Netherlands, United States) it was possible to compare the indirect estimates of DFS derived from birth expectations data with those based on direct questions about desired fertility. With the exception of Czechoslovakia and France, where the near equivalence of the data on birth expectations and stated family size desires has been noted, the results of these comparisons confirm some important differences between the two measures. The indirect estimates of DFS derived from birth expectations data are lower, and the implied levels of excess fertility higher, than the corresponding estimates based on direct questions about the desired number of births.[15] The results suggest that birth expectations come closer to representing the economic demand for children in the sense of *revealed preference*; that is,

---

[13]See J.R. Udry, K.E. Bauman and C.L. Chase, 'Population growth in perfect contraceptive populations,' *Population Studies*, 27 (1972), pp. 365-372; R. Lightbourne, 'Family size desires and the birth rates they imply,' Ph.D. dissertation (Berkeley: University of California, 1977); T.W. Pullum (1981), *loc cit.* in footnote 2; G. Rodriguez and T.J. Trussell, 'A note on synthetic cohort estimates of average desired family size,' *Population Studies*, 35 (1981), pp. 321-328; and E.L. Nour, 'On the estimation of the distribution of desired family size for a synthetic cohort,' *Population Studies*, 37 (1983), pp. 315-322.

[14]Berent (1983), *loc cit.* in footnote 6, points out that the sum of past live births and of additional expected births is likely to be greater than the total number of expected births derived from a single question, since the latter would tend to exclude children who died before the survey was taken. Berent also concludes that the sum of past live births and additional wanted births is probably smaller than the sum of past live births and additional expected births for women who know that they do not control their fertility well, but will tend to be greater for women who know that they are infecund.

[15]Censoring of *DFS* by *CEB* was accounted for in both approaches.

the actual plans or intentions of individuals incorporating constraints on their choices. On the other hand, direct questions about the desired number of births might be viewed as an attempt to measure preferences or tastes for children net of constraints on personal and household resources.[16] The values of expected and desired fertility reported in the WFS surveys for Europe and the United States are both subject to censoring by CEB, so the question becomes one of which variable best represents the demand for children.[17] The view taken here is that birth expectations are a more valid indicator of the underlying demand for children than unqualified statements about desired fertility, if only because they represent what the respondents expect, as opposed to what they want.

Plan of the Paper

Because of the inherent limitations of cross-sectional data, the focus in this paper is on characterizing the distributions of DFS and excess fertility at the time of the national surveys. This forces us to set aside a number of issues relating to fertility dynamics,[18] the predictive validity of birth expectations data,[19] and the level of completed fertility in relation to expected and desired births.[20] For many women, the process by which fertility goals are formed and revised during marriage is undoubtedly sequential; desired family size at marriage will directly influence the initial rate of childbearing, producing a profile of fertility experience and subsequent changes in target fertility levels. This dynamic process cannot be fully explained or tested with cross-sectional data, but nonetheless provides

---

[16]This distinction becomes less clear when direct questions about desired family size are qualified by statements such as 'Knowing what you know now,...,' 'If life were lived over,...,' and so on. McClelland identifies the four basic types of questions used in surveys to measure desired family size: 'how many more,' 'over again,' ordering, and projective. Projective questions that ask about a generalized ideal, norm, or typical family size were rejected as having no logical link to standard microeconomic model of demand, and over-again questions were found to less valid for than how-many-more questions for respondents who already have children. G.H. McClelland (1982), *loc cit.* in footnote 5.

[17]The possibility of downward bias in the reported values of expected and desired births because of infecundity must also be considered. The countries with less than 90-percent of all women reporting that they are fecund are the United States (.72), Great Britain (.81), Denmark (.86) and Norway (.87). These figures include women who have opted for contraceptive sterilization. The majority of infecund women will be concentrated at the older ages when most women have already achieved or exceeded their desired family size. In addition, this type of rationalization is not likely to be related to attained family size, except in cases of contraceptive sterilization. Finally, the proportions infecund are small compared to the overall proportions not expecting additional births (see Table 3).

[18]K. Namboodiri, 'Some observations on the economic framework for fertility analysis,' *Population Studies*, 26 (1972), pp. 185-206; R.D. Lee, 'Aiming at a moving target: period fertility and changing reproductive goals,' *Population Studies*, 34 (1980), pp. 205-226; and V.J. Hotz and R.A. Miller, 'An empirical analysis of life cycle fertility and female labor supply,' *Econometrica*, 56 (1988), pp. 91-118.

[19]C.F. Westoff and N.B. Ryder, 'The predictive validity of reproductive intentions,' *Demography*, 14 (1977), pp. 431-453.

[20]R. Freedman, D.S. Freedman, and A.D. Thornton, 'Changes in fertility expectations and preferences between 1962 and 1977: their relation to final parity,' *Demography*, 17 (1980), pp. 365-378.

a useful guide to the specification of an appropriate empirical model. Given the availability of longitudinal or panel data, the techniques employed here could be used in addressing these other issues.

The following section on statistical method briefly outlines the bivariate ordered-probit model and discusses the proposed solution to the problem of censoring of DFS by CEB. The section on method is followed by the empirical results of applying the censoring model to data from the UNECE Comparative Fertility Study of WFS surveys for Europe and the United States. Indirect estimates of the joint distribution of CEB and DFS are presented for each country, and the predicted distributions are used to derive estimates of mean desired family size, the probability of excess fertility, and the mean number of unwanted births. Estimates of 95-percent confidence intervals for each summary measure are also reported. A comparison of the results derived from birth expectations data with those from an analysis of the responses to direct questions about desired family size is also given. This is followed by a series of multivariate analyses designed to explore the differences in desired and excess fertility for women classified by duration of marriage, age at marriage, educational attainment, employment status, work experience, and total family income. The section on empirical results is followed by some concluding remarks.

STATISTICAL METHOD

A Bivariate Ordered-Probit Model of CEB and DFS

The bivariate ordered-probit model for CEB and DFS is in the tradition of econometric models for qualitative and limited-dependent variables that employ latent (unobserved) variables as a common framework for censored and uncensored data.[21] Latent variables for cumulative fertility and desired family size are interpreted as indexes of childbearing experience and family size preferences that are directly related to the probabilities of observing particular discrete values of CEB and DFS in a cross-sectional survey. For example, in the case of cumulative fertility experience, previous decisions regarding birth timing and spacing, frequency of intercourse, contraceptive methods, and biological factors such as maternal health and fecundity, are among the factors that influence the probability of observing a specific value of CEB at the time of the survey. Differences in background factors such as education, employment status, and income imply that women

[21]For a survey of limited-dependent variable models see G.S. Maddala, *Limited-Dependent and Qualitative Variables in Econometrics*, (New York: Cambridge University Press, 1983).

will vary in the strength of their preferences for a given family size, resulting in differences in the probability of observing a given discrete value of DFS.[22]

The bivariate ordered-probit model postulates an unobserved joint normal distribution of latent cumulative fertility experience and preferences for family size that results in each individual's discrete values of CEB and DFS. The discrete probability distribution of CEB and DFS is determined by the relationship between the underlying continuous distribution and two sets of unknown threshold parameters that must also be estimated. It is assumed that discrete random variables Y_1 for CEB and Y_2 for DFS are determined by the following system of latent random variables and threshold equations:

$$Z_1^* = X_1\beta_1 + u_1 \tag{1}$$

$$Z_2^* = X_2\beta_2 + u_2 \tag{2}$$

$$Y_1 = \begin{cases} 0 & \text{if } Z_1^* \leq \mu_0 \\ 1 & \text{if } \mu_0 < Z_1^* \leq \mu_1 \\ 2 & \text{if } \mu_1 < Z_1^* \leq \mu_2 \\ \vdots & \\ C & \text{if } \mu_{C-1} < Z_1^* \end{cases} \tag{3}$$

$$Y_2 = \begin{cases} 0 & \text{if } Z_2^* \leq \delta_0 \\ 1 & \text{if } \delta_0 < Z_2^* \leq \delta_1 \\ 2 & \text{if } \delta_1 < Z_2^* \leq \delta_2 \\ \vdots & \\ D & \text{if } \delta_{D-1} < Z_2^* \ . \end{cases} \tag{4}$$

Latent variables Z_1^* and Z_2^* are the unobserved indexes of cumulative fertility experience and family size preferences that vary continuously among women in the population, with specific outcomes depending on observed characteristics of the individual woman given by X_1 and X_2, and omitted and unobserved variables represented by the random disturbances u_1 and u_2. β_1 and β_2 are column vectors of unknown regression coefficients whose elements correspond to the variables in X_1 and X_2. To complete the model, random dis-

[22]Whereas we might like to construct continuous indexes of fertility experience and family size preferences directly from the data, the information necessary to do so will not be available from the typical household survey. Even with rather detailed questions on attitudes toward family size, substantial measurement errors are likely to remain. Latent variables provide a way around these problems by allowing for the use of the observed values of CEB and DFS as discrete indicators of the underlying values of cumulative fertility experience and family size preferences. Conversely, latent variables provide a convenient mathematical bridge between discrete random variables and probabilities that are continuous functions of observed and unobserved characteristics of individual women.

turbances u_1 and u_2 are assumed to be distributed bivariate standard-normal with zero means and correlation parameter ρ.

Differences in the latent variables are translated into different discrete values of Y_1 and Y_2 depending on the location of Z_1^* and Z_2^* *vis-a-vis* the unknown threshold parameters $\mu_0, \mu_1, \mu_2, \ldots, \mu_{C-1}$ and $\delta_0, \delta_1, \delta_2, \ldots, \delta_{D-1}$. The threshold parameters determine the area of probability under the bivariate standard-normal density function associated with each outcome. Although Z_1^* and Z_2^* are assumed to be distributed bivariate standard normal, the discrete distributions of CEB and DFS can assume any shape. The fact that the threshold parameters are estimated from the data implies that skewed and multi-modal patterns of CEB and DFS are possible.[23]

The contribution to the sample likelihood function of an observation for which $CEB = Y_1$ and $DFS = Y_2$ is given by:

$$l = \int_{\mu_{Y_1-1}-X_1\beta_1}^{\mu_{Y_1}-X_1\beta_1} \int_{\delta_{Y_2-1}-X_2\beta_2}^{\delta_{Y_2}-X_2\beta_2} \varphi(a,b;\rho)\,dbda \qquad (5)$$

where $\varphi(a,b;\rho)$ is the bivariate standard normal probability density function and $\mu_{-1}=\delta_{-1}=-\infty$, $\mu_0=\delta_0=0$, and $\mu_C=\delta_D=\infty$. The likelihood function for a sample of independent observations is computed by taking the product of the individual likelihood contributions defined by (5).[24]

Censoring of DFS in Fertility Surveys

The model given by equations (1) to (4) is the structure underlying the joint distribution of CEB and DFS in the absence of censoring of DFS. As discussed in the introduction, a reluctance on the part of survey respondents to report previous births as unwanted will result in measurement error in the observed discrete values of desired family size. These errors will be systematically related to the number of children ever born, resulting in an upward bias in the average value of DFS that will be greater at longer marriage durations.[25] The same is true when using data on total expected births (TEB) as an indi-

[23]Thus, the model does not preclude the possibility that women may prefer either zero or two children to having one child, as suggested by studies of ideal family size. See J. Blake, 'Can we believe recent data on birth expectations in the United States?' *Demography*, 11 (1974), pp. 25-44.

[24]Issues of parameter identification and estimation are discussed in C.A. Calhoun, 'BIVOPROB: A computer program for maximum-likelihood estimation of bivariate ordered-probit models for censored data,' IIASA WP-89-38 (Laxenburg, Austria: International Institute for Applied Systems Analysis, June 1989).

[25]T.W. Pullum (1981), *loc cit.* in footnote 2.

cator of fertility preferences. TEB will be a truncated measure of desired family size, since outcomes corresponding to values of DFS that are less than current parity are censored. When TEB is equal to CEB we know only that the actual value of DFS is less than or equal to CEB. Accounting for this type of censoring is relatively straightforward in a model based on latent variables, and requires only a simple change to the likelihood function in equation (5).[26] The contribution to the sample likelihood function of an observation with $TEB=CEB=Y_1$ ($DFS \leq CEB$) is given by:

$$l = \int_{\mu_{Y_1-1}-X_1\beta_1}^{\mu_{Y_1}-X_1\beta_1} \int_{-\infty}^{\delta_{Y_1}-X_2\beta_2} \varphi(a,b;\rho)\,db\,da \; . \qquad (6)$$

The censoring model assigns positive probability to all possible outcomes with DFS less than or equal to CEB. When $TEB>CEB$ ($TEB=DFS=Y_2$) then the likelihood term is again given by equation (5).

EMPIRICAL RESULTS

Cross-National Estimates of Desired and Excess Fertility

Table 1 reports the results of estimating bivariate ordered-probit censoring models of CEB and DFS for twelve European countries and the United States.[27] The observed dependent variables were CEB and TEB. No explanatory variables (other than constant terms) were included when estimating the models reported in Table 1.[28] The parameter estimates in Table 1 were then used to reconstruct the underlying discrete distributions of CEB and DFS reported in Table 2. The predicted distributions were derived using the estimated parameters to compute the probability associated with each CEB-DFS combination. The marginal distributions of CEB and DFS are given in the last column and row, respectively, of each panel in Table 2.

---

[26]Numerous examples of censoring and solutions based on latent variables models can be found in the econometrics literature on limited-dependent variables. For example, see Maddala (1983), *loc cit.* in footnote 21.

[27]The program used for estimation is described in C.A. Calhoun, 'BIVOPROB: a computer program for maximum-likelihood estimation of bivariate ordered-probit models for censored data,' IIASA WP-89-38 (Laxenburg, Austria: International Institute for Applied Systems Analysis, June 1989).

[28]This maximized the numbers of cases used in estimating the overall distributions of DFS in each country, and allowed for direct comparison of the predicted values of DFS with previous estimates of family size preferences based on total expected births.

The results in Table 2 show the two-child family to be the modal value of desired family size in all thirteen countries. The three countries with the highest percentages wanting exactly two children are the Netherlands (.59), Hungary (.58), and Poland (.57), while the lowest percentages wanting two children are found for Belgium (.35), France (.40), and Norway (.41). Bi-modal distributions with concentrations at zero and two children are predicted for Belgium, Denmark, France, Hungary, Great Britain, Norway and the United States. The highest percentages of married women with zero as their desired family size are found in Great Britain (.40), Belgium (.34), and Norway (.33). The lowest percentages of married women who prefer, or would have preferred, to remain childless are found for Poland (.07), Czechoslovakia (.12), and Spain (.13). At the other end of the distribution, the largest percentages desiring four or more children are found in Spain (.09), the United States (.08), and Finland (.07). The weakest demand for large families of four or more children was found in Hungary (.01), Great Britain (.02), and Denmark (.03)

Table 3 reports the predicted and observed values of mean desired family size (DFS), the probability of excess fertility (PEF), and the mean number of unwanted births (UWB) for each country. 95-percent confidence intervals for the predicted values of DFS, PEF, and UWB are given in parentheses.[29] Sample averages are also reported for total expected births (TEB), children ever born (CEB), the proportion expecting additional births, age of the respondent, duration of marriage or consensual union, age at marriage or union, the proportion who view themselves as fecund, the proportion currently pregnant, and the year of the survey.

The differences between the observed averages for TEB and DFS and the predictions of mean DFS from the bivariate ordered-probit model show that the effects of censoring are quite large. Only Spain has a confidence interval for mean DFS that contains a value as high as 2.1, despite the fact that in every country except Hungary average TEB exceeds the level required for replacement. Great Britain is the country with the lowest estimated value of mean desired family size (1.24), and highest probability of excess fertility (.51) and average number of unwanted births (1.01), followed closely by Belgium (1.33, .48, .89) and Norway (1.53, .47, .92). The overall proportions of women expecting additional births in these countries are among the lowest observed in the 13 countries (Table 3), implying substantial adjustments in observed TEB to account for censoring of

[29]The confidence intervals are based on the asymptotic normality of the maximum-likelihood estimates. The confidence intervals for DFS are quite narrow relative to those for PEF and UWB. This is because mean DFS can be computed using only the estimated parameters from the equation for DFS, while PEF and UWB must be computed using all of the parameters of the bivariate model.

DFS. For example, approximately 75 percent of women at parity 0 in Belgium, Great Britain, and Norway expect to have additional births, but the figure drops to around 45 percent for parity-1 women, and to as low as 8 percent for parity-2 women in Great Britain. Thus, while the estimated values of DFS and excess fertility for Belgium, Great Britain, and Norway may appear low relative to cumulative and expected births, there is substantial evidence of censoring of the demand for births in the observed distributions of birth expectations for these countries.

The Netherlands are predicted to have the smallest percent of women with excess fertility (.23) and the lowest mean number of unwanted births (.33). This may be due in part to the relatively low average duration of marriage of 6.6 years for the Dutch sample, compared to averages of around 10 or 11 years for the majority of countries.[30] In the multivariate results presented below, in which duration of marriage and other factors have been controlled, the Netherlands continue to have the lowest estimated levels of excess fertility among the thirteen countries. The predicted levels of excess fertility in the Netherlands are still quite substantial, with between 13 and 32 percent of women predicted to have at least one unwanted birth, and an average number of unwanted births among all married and cohabitating women of between .12 and .54. In addition, the point estimates of PEF and UWB derived from the bivariate ordered-probit censoring model are nearly identical to the values for the Netherlands observed in the survey. Other countries in which the estimates of excess fertility are close to the observed values are France, the United States, and Denmark (PEF only). Low levels of excess fertility are also predicted for Poland, Finland, and Hungary.

Despite the wide range of point estimates for PEF and UWB, in most cases the precision of the estimates is not sufficient to state with 95-percent certainty that there is a statistically significant difference between the values for different countries. For example, while it is possible to conclude that the mean level of unwanted births is greater in Great Britain than in Finland, Hungary, the Netherlands, and Poland, and greater in Belgium and Norway than in the Netherlands, for all other countries there is some overlap of the confidence intervals for UWB. Conclusions with regard to the relative magnitudes of PEF are just as limited. On the other hand, the estimates of mean DFS are sufficiently precise as to allow one to state with 95-percent confidence that Spain has the highest and Great Britain the lowest mean DFS. In fact, differences in DFS based on pairwise comparisons are found for almost all the countries. No significant differences in mean DFS

[30]This is a result of the sampling strategy used in the Netherlands. All women married in the years 1963-73 were included irrespective of age, which resulted in an under-representation of women above the age of 35. See Berent, Jones, and Siddiqui (1982), p. 8, *loc cit.* in footnote 1.

were found between, respectively, Denmark (1.62) and Hungary (1.58), Finland (2.00) and Poland (2.00), France (1.74) and Italy (1.72), the Netherlands (1.91) and the United States (1.87), and the United States and Czechoslovakia (1.84).

Comparison With Estimates Based On Reported Values of DFS

Table 4 presents the predictions of mean DFS, PEF, and mean UWB, from bivariate ordered-probit censoring models estimated using data on children ever born and the desired number of lifetime births as reported in the surveys for Belgium, Czechoslovakia, Finland, France, the Netherlands, and the United States. The predicted values can be compared to those for the same countries that were based on total expected births (Table 3). As noted in the introduction, total expected births in Czechoslovakia and France were derived by adding additional wanted births to CEB, and the results in Tables 3 and 4 confirm the equivalence of the two measures for these countries. For the other countries the results in Table 4 indicate that using birth expectations data results in lower estimates of DFS and higher estimates of excess fertility and unwanted births. Censoring of DFS by CEB was accounted for in both cases, so the remaining differences can be attributed to reports of the number of additional wanted births being greater than additional expected births.

Given that both types of data are subject to censoring by CEB, which are to be preferred for estimating the underlying level of DFS? Measures of the desired number of births based on direct questions are viewed as inherently ambiguous because they do not take into account all the circumstances on which the respondents might base their answers. While the situation may be only marginally better with regard to birth expectations, the fact that the responses reflect what survey respondents expect, rather than desire, implies that they are likely to be a more meaningful indicators of actual fertility behavior. The results presented here suggest that birth expectations, adjusted for censoring, will be a better measure of a *revealed preference* for children than the family size goals reported in fertility surveys, simply because they are more likely to take into account the actual constraints and opportunity costs that women face in achieving their desired family size.

Multivariate Analyses of Desired and Excess Fertility

The overall distributions in Table 2 and the estimated means in Table 3 fail to account for cross-national differences in the duration of marriage or consensual union and other factors that are likely to be associated with the levels of cumulative, desired, and excess fertility. The likelihood of censoring will be positively correlated with the duration of marriage, complicating any direct comparisons of the indirect estimates of DFS across countries, and implying the need for multivariate analyses that control for the effects of socioeconomic and demographic background characteristics. Tables 5.1 to 5.5 report the results estimating multivariate versions of the bivariate ordered-probit censoring model for each country. The explanatory variables included linear and squared terms for duration of marriage and age at marriage, dummy variables for educational attainment, current employment status, and work experience, and a standardized measure of total family income.[31]

The parameter estimates in Tables 5.1 to 5.5 imply substantial variability in the effects of the explanatory variables in different countries. In order to compare the effects of specific factors, a series of conditional predictions were computed from the estimated models. The predicted effects of differences in education, employment status, work experience, and income on the expected values of DFS, PEF, and UWB are reported in Tables 6.1 to 6.3. Each table presents three sets of estimates for a 30-year old woman who married at age 25 and has been married for 5 years. The first set show the effects of differences in educational attainment, assuming that the woman is currently employed, has between 5 and 9 years of work experience, and an average level of family income. The second set of predictions show the effects of differences in educational levels for a non-employed woman with less than 2 years work experience and an average level of family income. The final set of estimates show the effect of varying income for a woman who is currently working, has between 5 and 9 years of work experience, and a higher secondary education.

The predictions of DFS in Table 6.1 imply much more uniformity in the values of desired family size than was exhibited by the overall distributions and summary measures in Tables 2 and 3. The main exception is Italy, which emerges as the country with the lowest levels of DFS for women participating in paid employment. The results for the three eastern European countries (Czechoslovakia, Hungary, Poland) have predicted lev-

[31]This variable was created to preserved the comparability of the results across countries; a value of zero corresponds to having the average income level observed in the national sample. There were substantial numbers of missing cases for this variable in those countries for which it was available, particularly for residents of rural regions, resulting in a bias toward towns and urban areas.

els of DFS that are quite similar to those for the United States. In most of the countries the pattern with respect to educational attainment is U-shaped, with Great Britain exhibiting the most extreme example of this pattern. In the Netherlands and Belgium the relationship of DFS to education is monotonically positive, while in Poland and the United States a negative monotonic relationship is predicted. The combined effect of employment status and work experience implied by comparing the first and second panels shows that labor force participation is negatively related to DFS in every country. However, the results are most impressive for Italy, for which a difference in DFS of more than one birth is predicted at all levels of education. France was the only country for which income was estimated to have a statistically significant effect on DFS (Table 5.5). Table 6.1 shows that numerically this effect is still relatively small; a two standard-deviation differential in total family income is associated with differential in DFS of only .34 children.

The results for PEF and UWB in Tables 6.2 and 6.3 are surprising in that they imply that excess fertility is higher for women who are less attached to the labor force, despite the fact that they also have higher levels of DFS. Again, the only exception is Italy, where the extremely low values of DFS for working women are also associated with the highest predicted levels of excess fertility. The finding that PEF and UWB are greater for non-employed women in most of the countries can be explained by the fact that excess fertility depends on the magnitude of CEB as well as that of DFS. The strong negative relationship between CEB and participation in paid employment implies that specialization in household activities is an important risk factor in the accumulation of unwanted births.

Research on unwanted fertility in the United States has shown that marriage duration is perhaps the most important factor associated with the risk of excess births.[32] The estimated effects of differences in duration of marriage and age at marriage on the predicted values of DFS, PEF, and UWB are reported in Tables 7.1 to 7.3. The estimates are for women with a higher-secondary education, currently working, with 5 to 9 years employment experience, and an average level of family income. The results in Table 7.1 indicate that Italy has the lowest level of desired family size across marriage durations 0, 5, and 10 years, and is among those countries in which the value of DFS is predicted to decline sharply with age at marriage. Marriage duration has the largest effect on mean DFS in Great Britain.[33] Finland has some of the highest values of DFS, but is also the country

[32]C.F. Westoff and N.B. Ryder, *Contraceptive Revolution*, (Princeton: Princeton University Press, 1977).

[33]The differences are so great relative to the other countries that they suggest the confounding influences of changes in fertility preferences across successive marriage cohorts that cannot be distinguished from the effects of marriage duration and age at marriage in the cross-sectional sample. The decade between 1965 and 1975 was a period of rapid decline in both period fertility rates and birth expectations. This could have

in which DFS declines the fastest with age at marriage; delaying marriage from age 20 to age 30 results in a differential in DFS of more than .8 children. Spain also has relatively high values of DFS, and while these do not change substantially with marriage duration, a negative effect of increasing age at marriage is observed.

The corresponding estimates for PEF and UWB in Tables 7.2 and 7.3 mirror those for DFS in Table 7.1. Italy emerges as the country with the highest values of PEF, primarily as a result of the uniformly low values of DFS across different levels of marriage duration. For example, women in Italy who have been married for only five years are predicted to have a probability of excess fertility of between .32 and .46, depending on age at marriage. Great Britain is next in terms of the probability of excess fertility, and the same two countries are predicted to have the highest average number of unwanted births. With the exception of Italy and Great Britain, the results exhibit much more uniformity across countries than the national estimates reported in Tables 2 and 3, indicating the importance of controlling for variation in socioeconomic and demographic background factors.

SUMMARY AND CONCLUSIONS

This paper has presented indirect estimates of desired and excess fertility for married and cohabitating women in twelve European countries and the United States. In contrast to previous indirect estimates of desired family size based on synthetic cohorts, the estimates presented here have been derived from an econometric model for censored discrete-dependent variables. A bivariate ordered-probit model of children ever born and desired family size was proposed as a solution to the problem of censoring of DFS by CEB. An important advantage of a bivariate approach is that the estimated joint distribution of CEB and DFS can be used to estimate excess fertility without having to resort to sensitive questions about unwanted births. Estimates of the overall distribution of desired and unwanted births were presented for the thirteen countries, along with the results of multivariate analyses designed to control for differences in the duration of marriage and other socioeconomic and demographic background variables known to be correlated with childbearing.

---

led to a disproportionate number of women at longer marriage durations who indicate that they do not expect to have additional births, resulting in an overestimate of the effect of marriage duration on DFS. The multivariate results in Table 5.5 show a negative coefficient for marriage duration in the DFS equation for Great Britain that is one of the largest found for any of the countries.

One of the most interesting results to emerge from the multivariate analyses was the finding that excess fertility is higher among non-employed women, even though they have higher mean levels of DFS than working women. These findings suggest that specialization in household activities may be an important factor associated with the risk of unwanted births. Previous studies have identified marriage duration as an important correlate of excess fertility, primarily as an indicator of the length of exposure to the risk of an unwanted birth. Multivariate results presented in this paper suggest that lower values of DFS at longer durations may also play a role.

Because of limitations imposed by the use of cross-sectional data, a relatively narrow definition of desired family size was adopted. DFS was defined as the current or survey-date value of the number of births a woman would like to have when childbearing is completed. While this definition leads to meaningful estimates, it forces us to abstract from past and future changes in birth expectations and family size desires. The extremely low values of DFS at longer marriage durations for Great Britain point to the need for additional research based on longitudinal and panel data, in order to determine the extent to which the indirect estimates of desired family size might be biased by changes in the age pattern of childbearing across successive marriage cohorts, as well as to better understand the dynamic process by which birth expectations change with cumulative fertility experience. Unfortunately, few panel or longitudinal surveys have recorded family size goals at regular enough intervals to allow one to sort out variations due to changing preferences and expectations in the presence of the type of measurement errors considered here.[34]

While previous studies have questioned the utility of birth expectations data for forecasting future fertility,[35] the conclusion reached here was that survey measures of expected births are preferable to unqualified questions about the desired number of births as an indicator of the demand for children. This conclusion is based on acceptance of the notion that the demand for births should represent the revealed preferences of the woman or couple, taking into account constraints on their choices.

---

[34]One study that modelled changing birth expectations and fertility is that of R. Barnes and R. Moffitt, 'A dynamic model of the expectations and fertility of childless women,' Project Report 3086-01, submitted to the National Institute for Child Health and Human Development (Washington, D.C.: The Urban Institute, 1982). The censoring problem was avoided in this study by limiting the analysis to childless women.

[35]See Westoff and Ryder (1977), *loc cit.* in footnote 19; J.F. Long and S.I. Wetrogan, 'The utility of birth expectations in population projections,' pp. 29-50 in Hendershot and Placek, *loc cit.* in footnote 2; and H. Van de Giessen, 'Birth expectations as a guide for fertility hypotheses in population projections,' paper presented at the IIASA conference on Future Changes in Population Age Structure, Sopron, Hungary, October 18-21, 1988 (Voorburg, The Netherlands: Netherlands Central Bureau of Statistics).

The estimates of desired family size and excess fertility presented in this paper show that the potential for the decline in European fertility to the low levels of the late 1980s was already present and could have been identified in the mid to late 1970s. Future research will be aimed at integrating the censoring model of desired family size into a dynamic model that can be exploited for forecasting period birth rates from birth expectations data.[36] Despite the potential shortcomings of indirect estimates of desired and excess fertility, they have the advantage that they only require data on children ever born and additional expected births. These variables are often available in national surveys whose original purposes may have had little to do with the analysis of fertility behavior.

[36]See R.D. Lee, 'Aiming at a moving target: period fertility and changing reproductive goals,' *Population Studies*, 34 (1980), pp. 205-226; and R.D. Lee, 'A model for forecasting fertility from birth expectations data,' in Hendershot and Placek (1981), *loc cit.* in footnote 2. The model presented in this paper can be used to address two shortcomings of the moving-target model as identified by Lee: First, the assumption of a single or average value of desired family size that Lee adopted for analytical convenience can be dropped and replaced by a distribution of DFS. Second, the irreversibility of fertility can be addressed by accounting for unwanted and no-longer wanted births in the model used to estimate desired family size.

Table 1
Bivariate Ordered-Probit Estimation Results
World Fertility Survey Data for Europe and USA*

Country	N	CEB Equation				DFS Equation				Correlation
		β_1	μ_1	μ_2	μ_3	β_2	δ_1	δ_2	δ_3	ρ
Belgium	3788	0.97 (39.95)	0.89 (37.69)	1.65 (58.35)	2.23 (65.90)	0.41 (7.39)	0.43 (9.95)	1.49 (26.98)	2.25 (33.83)	-0.06 (-1.93)
Czechoslovakia	2643	1.68 (41.53)	1.10 (28.04)	2.42 (53.03)	3.25 (60.09)	1.20 (8.42)	0.59 (4.50)	2.07 (14.75)	2.98 (20.49)	0.13 (3.43)
Denmark	3073	1.30 (41.72)	0.80 (28.16)	1.88 (53.22)	2.68 (62.55)	0.67 (10.06)	0.23 (5.52)	1.62 (25.69)	2.54 (33.10)	0.12 (3.15)
Finland	4430	1.18 (47.97)	0.96 (40.83)	1.91 (66.12)	2.56 (74.21)	1.06 (21.06)	0.35 (8.36)	1.55 (30.81)	2.51 (45.14)	0.27 (11.32)
France	2290	1.16 (34.42)	0.92 (28.84)	1.77 (45.95)	2.38 (52.82)	0.78 (10.10)	0.38 (5.96)	1.46 (19.51)	2.36 (28.00)	0.11 (2.73)
Great Britain	3640	0.97 (38.26)	0.66 (30.17)	1.58 (55.38)	2.22 (64.49)	0.25 (4.42)	0.19 (6.22)	1.58 (28.23)	2.22 (32.01)	-0.11 (-3.07)
Hungary	3350	1.29 (43.88)	1.14 (39.15)	2.41 (65.12)	3.16 (63.68)	0.95 (12.28)	0.53 (8.07)	2.36 (30.06)	3.22 (33.79)	0.12 (3.35)

(continued)

Table 1 (continued)
Bivariate Ordered-Probit Estimation Results
World Fertility Survey Data for Europe and USA*

Country	N	CEB Equation				DFS Equation				Correlation
		β_1	μ_1	μ_2	μ_3	β_2	δ_1	δ_2	δ_3	ρ
Italy	4200	1.47 (50.48)	1.02 (36.39)	2.08 (63.42)	2.76 (73.85)	1.13 (13.63)	0.71 (9.67)	2.13 (26.76)	2.98 (34.06)	0.30 (9.66)
Netherlands	4135	0.93 (40.64)	0.77 (37.19)	2.00 (66.83)	2.87 (63.33)	1.07 (23.35)	0.25 (7.57)	1.88 (39.91)	2.74 (50.02)	0.15 (5.94)
Norway	2740	1.25 (38.70)	0.76 (26.44)	1.77 (49.17)	2.51 (58.53)	0.43 (6.76)	0.13 (3.99)	1.25 (21.33)	2.14 (29.84)	-0.05 (-1.25)
Poland	9799	1.42 (76.96)	1.10 (60.62)	2.05 (98.16)	2.67 (112.90)	1.51 (25.90)	0.67 (12.28)	2.26 (39.00)	3.25 (52.86)	0.33 (17.92)
Spain	4236	1.78 (50.02)	0.94 (28.47)	1.94 (51.94)	2.60 (65.29)	1.14 (15.28)	0.22 (36.98)	1.66 (23.35)	2.48 (33.29)	0.46 (16.19)
United States	5471	0.89 (45.29)	0.63 (37.10)	1.36 (62.60)	1.87 (74.34)	0.93 (21.60)	0.32 (10.46)	1.64 (39.43)	2.36 (50.61)	0.18 (6.69)

* The results reported in this table are based on the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and total expected births (TEB). Asymptotic t-statistics are given in parentheses.

Table 2
Predicted Bivariate Distributions of CEB and DFS
World Fertility Survey Data for Europe and USA

BELGIUM

CEB \ DFS	0	1	2	3	4+	Total
0	.0503	.0266	.0612	.0200	.0067	.1648
1	.0988	.0495	.1086	.0336	.0106	.3011
2	.0982	.0470	.0998	.0295	.0089	.2835
3	.0527	.0243	.0501	.0143	.0042	.1456
4+	.0401	.0176	.0351	.0095	.0027	.1050
Total	.3402	.1651	.3548	.1069	.0331	1.0000

CZECHOSLOVAKIA

CEB \ DFS	0	1	2	3	4+	Total
0	.0081	.0087	.0237	.0049	.0009	.0463
1	.0332	.0399	.1248	.0299	.0063	.2342
2	.0548	.0740	.2659	.0751	.0180	.4878
3	.0154	.0231	.0948	.0311	.0084	.1728
4+	.0042	.0069	.0321	.0120	.0037	.0589
Total	.1157	.1526	.5413	.1530	.0373	1.0000

DENMARK

CEB \ DFS	0	1	2	3	4+	Total
0	.0310	.0086	.0452	.0100	.0018	.0965
1	.0599	.0180	.1034	.0258	.0051	.2122
2	.1012	.0328	.2053	.0579	.0126	.4098
3	.0423	.0148	.1010	.0321	.0077	.1980
4+	.0153	.0058	.0429	.0154	.0041	.0835
Total	.2498	.0800	.4978	.1412	.0313	1.0000

FINLAND

CEB \ DFS	0	1	2	3	4+	Total
0	.0317	.0154	.0522	.0169	.0028	.1190
1	.0528	.0327	.1372	.0591	.0136	.2954
2	.0429	.0315	.1621	.0905	.0268	.3538
3	.0122	.0103	.0644	.0451	.0165	.1485
4+	.0043	.0044	.0323	.0285	.0137	.0833
Total	.1439	.0944	.4482	.2400	.0735	1.0000

Table 2 (continued)
Predicted Bivariate Distributions of CEB and DFS
World Fertility Survey Data for Europe and USA

FRANCE

CEB \ DFS	0	1	2	3	4+	Total
0	.0336	.0171	.0490	.0193	.0048	.1238
1	.0669	.0370	.1146	.0500	.0137	.2822
2	.0684	.0406	.1338	.0634	.0190	.3251
3	.0298	.0187	.0651	.0331	.0107	.1574
4+	.0186	.0124	.0461	.0254	.0089	.1114
Total	.2173	.1258	.4086	.1912	.0571	1.0000

GREAT BRITAIN

CEB \ DFS	0	1	2	3	4+	Total
0	.0559	.0119	.0779	.0146	.0058	.1660
1	.0795	.0157	.0953	.0160	.0059	.2124
2	.1435	.0264	.1509	.0231	.0079	.3518
3	.0727	.0124	.0668	.0095	.0030	.1644
4+	.0506	.0080	.0404	.0050	.0015	.1054
Total	.4022	.0743	.4313	.0682	.0240	1.0000

HUNGARY

CEB \ DFS	0	1	2	3	4+	Total
0	.0224	.0184	.0520	.0043	.0006	.0977
1	.0650	.0598	.1938	.0201	.0031	.3418
2	.0672	.0687	.2548	.0314	.0055	.4276
3	.0132	.0149	.0628	.0091	.0017	.1017
4+	.0034	.0042	.0197	.0032	.0007	.0312
Total	.1712	.1659	.5830	.0682	.0117	1.0000

ITALY

CEB \ DFS	0	1	2	3	4+	Total
0	.0201	.0201	.0273	.0032	.0004	.0710
1	.0470	.0643	.1196	.0203	.0034	.2546
2	.0465	.0839	.2108	.0506	.0111	.4029
3	.0125	.0282	.0944	.0304	.0086	.1741
4+	.0040	.0118	.0512	.0223	.0082	.0974
Total	.1301	.2083	.5033	.1267	.0317	1.0000

Table 2 (continued)
Predicted Bivariate Distributions of CEB and DFS
World Fertility Survey Data for Europe and USA

NETHERLANDS

CEB \ DFS	0	1	2	3	4+	Total
0	.0349	.0135	.1028	.0210	.0050	.1772
1	.0415	.0176	.1552	.0382	.0102	.2627
2	.0528	.0244	.2468	.0718	.0220	.4179
3	.0111	.0059	.0675	.0236	.0083	.1164
4+	.0019	.0011	.0145	.0059	.0024	.0258
Total	.1424	.0624	.5868	.1605	.0479	1.0000

NORWAY

CEB \ DFS	0	1	2	3	4+	Total
0	.0320	.0049	.0441	.0186	.0054	.1050
1	.0654	.0097	.0850	.0345	.0096	.2043
2	.1308	.0189	.1610	.0629	.0169	.3905
3	.0685	.0096	.0799	.0300	.0077	.1957
4+	.0382	.0052	.0421	.0152	.0038	.1045
Total	.3350	.0482	.4121	.1613	.0434	1.0000

POLAND

CEB \ DFS	0	1	2	3	4+	Total
0	.0135	.0181	.0404	.0055	.0005	.0780
1	.0276	.0526	.1732	.0373	.0054	.2961
2	.0182	.0456	.2157	.0693	.0135	.3622
3	.0046	.0138	.0901	.0398	.0101	.1583
4+	.0015	.0060	.0536	.0329	.0114	.1054
Total	.0653	.1360	.5730	.1848	.0409	1.0000

SPAIN

CEB \ DFS	0	1	2	3	4+	Total
0	.0165	.0037	.0159	.0017	.0002	.0379
1	.0423	.0140	.0895	.0162	.0028	.1649
2	.0481	.0217	.2097	.0666	.0182	.3643
3	.0145	.0084	.1204	.0603	.0238	.2273
4+	.0052	.0038	.0834	.0680	.0452	.2056
Total	.1266	.0515	.5189	.2128	.0902	1.0000

Table 2 (continued)
Predicted Bivariate Distributions of CEB and DFS
World Fertility Survey Data for Europe and USA

UNITED STATES

CEB	DFS 0	1	2	3	4+	Total
0	.0459	.0209	.0881	.0224	.0081	.1854
1	.0415	.0215	.1027	.0306	.0124	.2087
2	.0475	.0267	.1409	.0473	.0214	.2838
3	.0222	.0133	.0776	.0291	.0145	.1566
4+	.0184	.0124	.0802	.0348	.0198	.1655
Total	.1754	.0948	.4895	.1642	.0761	1.0000

Table 3
Predicted and Observed Values of Desired and Excess Fertility
World Fertility Survey Data for Europe and USA*

Predicted Values and 95-Percent Confidence Intervals

Country	B	CS	DK	SF	F	GB	H	I	NL	N	PL	E	USA
DFS	1.33	1.84	1.62	2.00	1.74	1.24	1.58	1.72	1.91	1.53	2.00	2.09	1.87
	(.03)	(.03)	(.03)	(.03)	(.04)	(.02)	(.01)	(.02)	(.03)	(.03)	(.02)	(.05)	(.03)
PEF	.48	.35	.43	.28	.39	.51	.32	.40	.23	.47	.29	.42	.37
	(.10)	(.29)	(.11)	(.12)	(.17)	(.08)	(.11)	(.15)	(.09)	(.11)	(.11)	(.15)	(.08)
UWB	.89	.52	.73	.42	.67	1.01	.47	.59	.33	.92	.40	.61	.64
	(.23)	(.73)	(.29)	(.28)	(.39)	(.19)	(.26)	(.38)	(.21)	(.29)	(.27)	(.39)	(.19)

Observed Values

Country	B	CS	DK	SF	F	GB	H	I	NL	N	PL	E	USA
DFS	2.25	2.34	n.a.	2.41	2.37	n.a.	n.a.	n.a.	2.37	n.a.	n.a.	n.a.	2.63
PEF	.36	n.a.	.41	.45	.44	.27	.22	n.a.	.24	n.a.	.12	.15	.44
UWB	.54	n.a.	.53	.64	.70	.40	.29	n.a.	.30	n.a.	.18	.23	.74
TEB	2.17	2.36	2.32	2.40	2.40	2.26	2.05	2.30	2.22	2.44	2.40	2.68	2.48
CEB	1.72	1.96	1.96	1.78	1.85	1.83	1.63	1.97	1.55	1.99	1.92	2.40	1.91
Expect More	.31	.29	.27	.43	.35	.26	.32	.25	.44	.28	.36	.22	.36
Age	32.20	32.73	32.89	32.98	31.31	32.78	29.80	33.24	28.76	32.17	31.87	35.09	30.89
Duration	10.62	11.61	10.57	10.77	9.73	11.21	9.24	11.00	6.60	10.15	10.27	11.77	10.33
Age Married	21.59	21.12	22.33	22.21	21.58	21.68	20.56	22.74	22.20	22.01	21.59	23.33	20.56
Fecund	.90	.97	.86	.91	.91	.81	.97	.92	.93	.87	.97	.90	.72
Pregnant	.05	.06	.05	.05	.07	n.a.	.07	.05	.09	.06	.04	.06	.06
Year	1975-76	1977	1975	1977	1977-78	1976	1977	1979	1975	1977-78	1977	1977	1976

* The means for the observed and predicted values of CEB, TEB, DFS, and UWB were computed using a category for 4 or more children. This results in slightly lower estimates for TEB than those reported by Berent (1983), *loc cit.* in footnote 11, who used a category for 5 or more children. 95-percent confidence intervals for the predicted values of DFS, PEF, and UWB are computed by adding and subtracting the figures in parentheses.

Table 4
Predicted Values of Desired and Excess Fertility
World Fertility Survey Data for Europe and USA*

	Predicted Values and 95-Percent Confidence Intervals					
Country	**B**	**CS**	**SF**	**F**	**NL**	**USA**
DFS	1.91	1.90	2.35	1.71	2.27	2.52
	(.03)	(.03)	(.04)	(.04)	(.04)	(.05)
PEF	.31	.32	.17	.40	.13	.22
	(.12)	(.27)	(.23)	(.17)	(.14)	(.15)
UWB	.48	.46	.22	.70	.16	.32
	(.27)	(.68)	(.50)	(.40)	(.30)	(.32)

* The results reported in this table are from the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and desired family size (DFS) as reported in the WFS surveys. 95-percent confidence intervals for the predicted values of DFS, PEF, and UWB are computed by adding and subtracting the figures in parentheses. The country codes are: Belgium (B), Czechoslovakia (CS), Finland (SF), France (F), Netherlands (NL), and United States (USA).

Table 5.1
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Low Countries*

Variable	Belgium		Netherlands	
	CEB	DFS	CEB	DFS
Constant	2.7150	-1.3665	-0.5815	-0.5924
	(3.38)	(-1.41)	(-0.76)	(-0.79)
Duration of Marriage	0.2953	-0.1047	0.6007	-0.0984
	(6.60)	(-2.02)	(19.23)	(-3.01)
Duration Squared	-0.0083	0.0009	-0.0228	0.0012
	(-6.11)	(0.48)	(-10.29)	(0.49)
Age at Marriage	-0.2365	0.2862	-0.0278	0.2469
	(-3.32)	(3.22)	(-0.43)	(3.87)
Age at Marriage Squared	0.0047	-0.0062	0.0002	-0.0061
	(3.07)	(-3.28)	(0.19)	(-4.65)
Elem. Educ. Not Completed	n.a.	n.a.	n.a.	n.a.
Elementary Education	-0.0776	-0.0674	0.0295	-0.0061
	(-0.62)	(-0.16)	(0.50)	(-0.09)
Lower Second. Education				
Higher Second. Education	0.0597	0.2068	0.0984	0.0774
	(0.81)	(0.99)	(1.92)	(1.36)
Post-Second. Education	0.2897	0.5354	0.1611	0.1878
	(1.19)	(4.42)	(2.01)	(2.16)
Currently Working	-0.4608	-0.2776	-0.5887	-0.2475
	(-3.98)	(-0.57)	(-12.27)	(-4.75)
Has Worked Less Than 2 Years [a]				
Has Worked 2 To 4 Years [b]	0.0579	0.0637	-0.5623	-0.0425
	(0.33)	(0.19)	(-11.32)	(-0.78)
Has Worked 5 To 9 Years [c]	-0.2617	-0.0388	-0.7157	-0.0623
	(-1.63)	(-0.12)	(-11.27)	(-0.86)
Has Worked 10 Or More Years	-0.3676	-0.4545	n.a.	n.a.
	(-3.63)	(-2.65)		
Standardized Income	0.0319	0.0273	n.a.	n.a.
	(0.51)	(0.17)		

(continued on next page)

Table 5.1 (continued)
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Low Countries*

Variable	Belgium CEB	Belgium DFS	Netherlands CEB	Netherlands DFS
μ_1	1.2150 (6.92)		1.1945 (41.32)	
μ_2	2.2166 (8.81)		2.9073 (66.08)	
μ_3	2.9266 (10.04)		3.9849 (71.23)	
δ_1		0.7457 (8.56)		0.3069 (8.12)
δ_2		2.0697 (21.44)		2.0233 (39.73)
δ_3		2.8695 (26.34)		2.8912 (50.61)
ρ	0.4002 (10.77)		0.4140 (19.62)	
$\ln L$	-4989.80		-7243.89	
N	2682		4114	

Number Of Children	Observed Frequencies For CEB and TEB: Belgium CEB	Belgium TEB	Netherlands CEB	Netherlands TEB
0	452	116	731	141
1	833	532	1086	309
2	752	1137	1714	2448
3	374	567	475	938
4 Or More	271	330	108	278

* The results reported in this table are from the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and total expected births (TEB). Asymptotic t-statistics are given in parentheses.

[a] Indicates less than 3 years for Belgium.
[b] Indicates 3 to 4 years for Belgium.
[c] Indicates 5 or more years for the Netherlands.

Table 5.2
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Nordic Countries*

Variable	Denmark		Finland		Norway	
	CEB	DFS	CEB	DFS	CEB	DFS
Constant	3.1131	0.7466	2.7509	3.7210	2.1987	5.5286
	(4.19)	(0.62)	(3.80)	(4.10)	(1.98)	(3.12)
Duration of Marriage	0.2239	-0.1073	0.3059	0.0196	0.3928	-0.1776
	(14.81)	(-4.78)	(17.43)	(0.80)	(17.65)	(-5.37)
Duration Squared	-0.0053	0.0008	-0.0063	-0.0042	-0.0095	0.0037
	(-8.79)	(0.60)	(-9.63)	(-3.35)	(-10.47)	(1.84)
Age at Marriage	-0.2435	0.1610	-0.2335	-0.06176	-0.1906	-0.2756
	(-4.09)	(1.63)	(-3.93)	(-0.83)	(-2.00)	(-1.86)
Age at Marriage Squared	0.0050	-0.0048	0.0045	-0.0007	0.0036	0.0042
	(4.26)	(-2.40)	(3.75)	(-0.45)	(1.80)	(1.37)
Elem. Educ. Not Completed	n.a.	n.a.	-0.2337	0.3857	n.a.	n.a.
			(-0.48)	(0.57)		
Elementary Education	0.2519	0.1748	-0.0056	-0.1166	0.1670	0.3925
	(4.11)	(1.91)	(-0.90)	(-1.51)	(1.01)	(1.08)
Lower Second. Education						
Higher Second. Education	0.1267	0.1878	-0.0689	0.0923	-0.1195	0.3591
	(2.00)	(2.31)	(-1.09)	(1.27)	(-1.52)	(3.27)
Post-Second. Education	-0.0079	0.3984	0.0231	0.2310	-0.1093	0.3936
	(-0.08)	(3.67)	(0.30)	(2.63)	(-1.03)	(2.85)
Currently Working	-0.3614	-0.1652	-0.2431	-0.1656	-0.4857	-0.1350
	(-7.13)	(-2.22)	(-3.53)	(-2.13)	(-6.35)	(-1.36)
Has Worked Less Than 2 Years	n.a.	n.a.				
Has Worked 2 To 4 Years	n.a.	n.a.	-0.1065	-0.0678	-0.0708	0.1418
			(-1.39)	(-0.82)	(-0.80)	(1.26)
Has Worked 5 To 9 Years	n.a.	n.a.	-0.3830	-0.2697	-0.3553	-0.0524
			(-4.42)	(-2.62)	(-3.30)	(-0.34)
Has Worked 10 Or More Years	n.a.	n.a.	-0.8388	-0.7000	-0.7451	-0.9700
			(-8.23)	(-5.03)	(-5.45)	(-2.98)
Standardized Income	-0.0590	-0.0362	0.0218	0.0556	-0.0778	0.0506
	(-2.22)	(-0.97)	(0.83)	(1.70)	(-2.02)	(0.99)

(continued on next page)

Table 5.2 (continued)
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Nordic Countries*

Variable	Denmark CEB	Denmark DFS	Finland CEB	Finland DFS	Norway CEB	Norway DFS
μ_1	1.0963 (23.96)		1.3831 (32.19)		1.2703 (19.38)	
μ_2	2.5438 (42.68)		2.8075 (49.47)		2.8774 (32.49)	
μ_3	3.4627 (47.26)		3.7281 (54.32)		4.0520 (36.96)	
δ_1		0.5109 (5.05)		0.6054 (7.16)		0.1855 (2.91)
δ_2		2.1003 (18.86)		2.0523 (22.50)		1.6666 (16.87)
δ_3		2.9890 (24.86)		3.1754 (31.99)		2.6196 (22.56)
ρ	0.5473 (15.34)		0.5484 (21.36)		0.3136 (5.83)	
ln L	-3346.64		-4266.46		-1825.07	
N	1958		2353		1124	

Number Of Children	Observed Frequencies For CEB and TEB					
	Denmark CEB	Denmark TEB	Finland CEB	Finland TEB	Norway CEB	Norway TEB
0	199	62	322	64	155	45
1	468	185	785	282	271	91
2	826	1035	846	1124	433	568
3	328	490	284	670	201	320
4 Or More	137	186	116	213	64	100

* The results reported in this table are from the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and total expected births (TEB). Asymptotic t-statistics are given in parentheses.

Table 5.3
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Eastern European Countries*

Variable	Czechoslovakia		Hungary		Poland	
	CEB	DFS	CEB	DFS	CEB	DFS
Constant	3.7360	3.2870	1.4730	0.9933	0.7787	2.2701
	(4.04)	(3.04)	(1.62)	(0.86)	(0.80)	(2.44)
Duration of Marriage	0.2988	-0.0749	0.4047	-0.0360	0.2477	-0.0244
	(14.46)	(-2.61)	(16.85)	(-0.98)	(23.54)	(-1.85)
Duration Squared	-0.0078	0.0003	-0.0124	-0.0041	-0.0061	-0.0010
	(-11.33)	(0.30)	(-11.96)	(-2.07)	(-15.53)	(-2.13)
Age at Marriage	-0.2007	-0.0151	-0.0676	0.1291	-0.0123	0.0282
	(-2.59)	(-0.16)	(-0.85)	(1.30)	(-0.15)	(0.38)
Age at Marriage Squared	0.0032	-0.0012	0.0010	-0.0042	-0.0002	-0.0019
	(1.99)	(-0.67)	(0.56)	(-2.00)	(-0.14)	(-1.31)
Elem. Educ. Not Completed	0.8944	0.8929	0.4384	1.3091	0.6100	0.8036
	(2.60)	(1.25)	(1.70)	(3.45)	(4.92)	(4.16)
Elementary Education	0.1402	0.2145	0.2616	0.5350	0.1142	0.2884
	(1.65)	(1.56)	(1.75)	(1.82)	(2.58)	(5.20)
Lower Second. Education						
Higher Second. Education	-0.2205	0.0315	-0.2363	0.1085	-0.2060	-0.0450
	(-3.44)	(0.36)	(-3.76)	(1.27)	(-4.98)	(-0.89)
Post-Second. Education	-0.3555	-0.0089	-0.2475	0.3935	-0.2482	-0.0361
	(-3.94)	(-0.08)	(-2.38)	(3.00)	(-4.62)	(-0.54)
Currently Working	-0.4900	-0.0326	-0.7256	-0.0389	-0.2206	-0.0205
	(-6.09)	(-0.31)	(-9.69)	(-0.35)	(-4.87)	(-0.34)
Has Worked Less Than 2 Years						
Has Worked 2 To 4 Years	-0.1063	0.0448	-0.1832	-0.0167	0.1822	0.0270
	(-1.14)	(0.41)	(-1.77)	(-0.13)	(3.68)	(0.46)
Has Worked 5 To 9 Years	-0.4070	-0.0734	-0.5149	-0.2009	0.0644	-0.0929
	(-3.72)	(-0.51)	(-4.09)	(-1.13)	(1.15)	(-1.16)
Has Worked 10 Or More Years	-0.9182	-0.1901	-1.1918	-0.4034	-0.1314	-0.1192
	(-7.21)	(-1.03)	(-7.96)	(-1.77)	(-1.93)	(-1.19)
Standardized Income	0.1173	0.0240	0.1986	-0.0256	-0.0936	-0.0343
	(4.00)	(0.58)	(6.11)	(-0.56)	(-6.08)	(-1.63)

(continued on next page)

Table 5.3 (continued)
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Eastern European Countries*

Variable	Czechoslovakia CEB	Czechoslovakia DFS	Hungary CEB	Hungary DFS	Poland CEB	Poland DFS
μ_1	1.3578 (25.78)		1.6012 (29.93)		1.5954 (48.71)	
μ_2	3.0138 (47.89)		3.3435 (48.06)		3.0035 (86.42)	
μ_3	3.9876 (52.34)		4.3301 (43.18)		3.8143 (90.01)	
δ_1		0.9146 (4.50)		0.6923 (6.64)		1.0080 (11.29)
δ_2		2.6334 (12.60)		2.7301 (22.29)		2.7536 (28.76)
δ_3		3.5232 (16.54)		3.8910 (24.32)		3.7273 (35.00)
ρ	0.3186 (10.19)		0.3951 (9.10)		0.4161 (23.75)	
ln L	-3175.29		-2498.84		-9944.43	
N	1951		1722		5916	

Number Of Children	Observed Frequencies For CEB and TEB: Czechoslovakia CEB	Czechoslovakia TEB	Hungary CEB	Hungary TEB	Poland CEB	Poland TEB
0	100	10	188	40	424	55
1	492	186	650	319	2101	860
2	969	1140	733	1106	2308	3406
3	293	471	126	223	734	1167
4+	97	144	25	34	349	428

* The results reported in this table are from the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and total expected births (TEB). Asymptotic t-statistics are given in parentheses.

Table 5.4
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Southern European Countries*

Variable	Italy		Spain	
	CEB	DFS	CEB	DFS
Constant	3.3688	4.7450	2.1221	1.5748
	(3.51)	(4.19)	(3.90)	(2.03)
Duration of Marriage	0.3171	0.0380	0.2378	0.0015
	(13.54)	(1.21)	(18.52)	(0.08)
Duration Squared	-0.0092	-0.0037	-0.0057	-0.0010
	(-10.09)	(-2.37)	(-11.63)	(-1.19)
Age at Marriage	-0.2427	-0.2353	-0.1252	0.0290
	(-2.98)	(-2.54)	(-2.82)	(0.46)
Age at Marriage Squared	0.0042	0.0033	0.0019	-0.0015
	(2.49)	(1.76)	(2.18)	(-1.20)
Elem. Educ. Not Completed	0.7473	0.9310	0.2078	0.2444
	(6.31)	(5.80)	(3.40)	(2.82)
Elementary Education	0.3175	0.3363	-0.0155	-0.0793
	(3.69)	(2.93)	(-0.25)	(-0.95)
Lower Second. Education				
Higher Second. Education	0.0952	0.0505	0.1621	0.1298
	(0.88)	(0.37)	(2.05)	(1.21)
Post-Second. Education	0.2858	0.6059	0.1315	0.2732
	(1.29)	(2.38)	(1.07)	(1.72)
Currently Working	-0.2623	-0.4907	-0.1973	-0.1083
	(-0.68)	(-0.93)	(-3.17)	(-1.16)
Has Worked Less Than 2 Years				
Has Worked 2 To 4 Years	-0.2021	-0.2217	-0.1627	-0.0519
	(-1.74)	(-1.53)	(-2.61)	(-0.57)
Has Worked 5 To 9 Years	-0.4437	-0.8125	-0.0975	-0.0522
	(-2.59)	(-2.84)	(-1.33)	(-0.48)
Has Worked 10 Or More Years	-0.3931	-0.2917	-0.2780	-0.2843
	(-1.65)	(-0.69)	(-3.55)	(-2.21)
Standardized Income	0.0441	-0.0265	n.a.	n.a.
	(1.30)	(-0.57)		

(continued on next page)

Table 5.4 (continued)
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: Southern European Countries*

Variable	Italy CEB	Italy DFS	Spain CEB	Spain DFS
μ_1	1.5034 (17.69)		1.0559 (26.60)	
μ_2	3.0219 (30.62)		2.2923 (50.72)	
μ_3	3.8538 (37.64)		3.0758 (63.45)	
δ_1		0.5161 (2.50)		0.3242 (7.21)
δ_2		2.0509 (9.53)		1.8222 (26.61)
δ_3		2.9230 (13.15)		2.6376 (36.43)
ρ	0.6623 (16.16)		0.5760 (19.93)	
ln L	-1958.52		-7341.47	
N	1223		4162	

Number Of Children	Observed Frequencies For CEB and TEB: Italy CEB	Italy TEB	Spain CEB	Spain TEB
0	37	11	152	58
1	256	118	691	238
2	540	592	1538	1667
3	235	315	928	1196
4 Or More	155	187	853	1003

* The results reported in this table are from the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and total expected births (TEB). Asymptotic t-statistics are given in parentheses.

Table 5.5
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: France, Great Britain and USA*

Variable	France		Great Britain		USA	
	CEB	DFS	CEB	DFS	CEB	DFS
Constant	2.1642	3.6402	3.0489	0.1929	0.9049	0.7855
	(2.26)	(3.46)	(2.95)	(0.19)	(1.62)	(0.84)
Duration of Marriage	0.2944	-0.0660	0.3060	-0.0909	0.2863	-0.0566
	(17.63)	(-3.20)	(5.95)	(-2.65)	(30.11)	(-4.35)
Duration Squared	-0.0080	-0.0004	-0.0079	-0.0023	-0.0063	0.0003
	(-11.82)	(-0.33)	(-5.67)	(-1.19)	(-17.08)	(0.46)
Age at Marriage	-0.1650	-0.1267	-0.2552	0.1536	-0.0973	0.1108
	(-2.05)	(-1.48)	(-2.87)	(1.81)	(-1.97)	(1.36)
Age at Marriage Squared	0.0031	0.0013	0.0043	-0.0042	0.0021	-0.0031
	(1.87)	(0.76)	(2.30)	(-2.27)	(2.00)	(-1.84)
Elem. Educ. Not Completed	0.3601	0.2296	-0.0182	2.4917	0.4228	0.9182
	(3.63)	(1.87)	(-0.02)	(2.43)	(2.29)	(3.53)
Elementary Education	0.0539	-0.1424	0.1651	0.0881	0.0151	0.1123
	(0.64)	(-1.414)	(0.44)	(0.09)	(0.17)	(0.91)
Lower Second. Education						
Higher Second. Education	0.1211	0.2318	-0.0725	0.0394	-0.2258	-0.1636
	(1.40)	(2.32)	(-0.27)	(0.06)	(-4.59)	(-2.54)
Post-Second. Education	0.0008	0.4447	-0.0086	0.3572	-0.4180	-0.1830
	(0.00)	(3.86)	(-0.01)	(0.41)	(-7.04)	(-2.41)
Currently Working	-0.5556	-0.0260	-0.6421	-0.3323	-0.4119	-0.1812
	(-6.85)	(0.26)	(-4.61)	(-0.66)	(-12.14)	(-4.26)
Has Worked Less Than 2 Years	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Has Worked 2 To 4 Years	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Has Worked 5 To 9 Years	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Has Worked 10 Or More Years	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Standardized Income	-0.1059	-0.1742	n.a.	n.a.	-0.0892	-0.0409
	(-2.34)	(-3.25)			(-4.83)	(-1.63)

(continued on next page)

Table 5.5 (continued)
Bivariate Ordered-Probit Censoring Regressions for CEB and DFS: France, Great Britain and USA*

Variable	France CEB	France DFS	Great Britain CEB	Great Britain DFS	USA CEB	USA DFS
μ_1	1.3752 (24.94)		0.9782 (2.92)		0.9433 (35.15)	
μ_2	2.6395 (37.99)		2.2063 (4.24)		2.0801 (59.01)	
μ_3	3.4459 (43.47)		2.9846 (5.10)		2.8291 (69.28)	
δ_1		0.5839 (5.78)		0.2314 (1.91)		0.4057 (10.19)
δ_2		1.8013 (16.47)		1.8482 (9.51)		1.8078 (36.32)
δ_3		2.7326 (23.29)		2.5651 (8.88)		2.5781 (46.52)
ρ	0.4546 (12.95)		0.1917 (1.70)		0.4717 (20.71)	
ln L	-2952.49		-6048.48		-8812.12	
N	1555		3570		4668	

Number Of Children	Observed Frequencies For CEB and TEB: France CEB	France TEB	Great Britain CEB	Great Britain TEB	USA CEB	USA TEB
0	214	37	594	152	892	180
1	486	214	758	433	988	414
2	504	678	1258	1779	1344	1996
3	212	417	584	757	719	1142
4 Or More	139	209	376	449	725	936

* The results reported in this table are from the application of a bivariate ordered-probit censoring model to data on children ever born (CEB) and total expected births (TEB). Asymptotic t-statistics are given in parentheses.

Table 6.1
Cross-National Estimates of Desired Family Size
By Educational Attainment, Employment Status, and Income*

Age married = 25, Duration of marriage = 5, Standard Income = 0
Currently Working, Has Worked 5 to 9 Years

Education	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Elem. Educ. Not Completed	n.a.	2.58	n.a.	2.24	1.97	3.57	2.39	1.41	n.a.	n.a.	2.31	2.25	2.83
Elementary Education	1.66	2.08	1.92	1.82	1.61	1.55	1.92	0.89	1.62	1.77	1.95	1.95	2.08
Lower Second. Education	1.72	1.92	1.77	1.92	1.75	1.46	1.57	0.63	1.24	1.77	1.75	2.03	1.97
Higher Second. Education	1.92	1.95	1.93	2.00	1.97	1.50	1.65	0.66	1.58	1.84	1.72	2.15	1.81
Post-Second. Education	2.22	1.92	2.11	2.11	2.18	1.80	1.83	1.12	1.62	1.93	1.72	2.28	1.79

Age married = 25, Duration of marriage = 5, Standard Income = 0
Not Currently Working, Has Worked Less Than 2 Years

Education	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Elem. Educ. Not Completed	n.a.	2.66	n.a.	2.60	1.95	3.73	2.54	2.54	n.a.	n.a.	2.39	2.40	2.99
Elementary Education	1.95	2.15	2.06	2.19	1.58	1.86	2.07	2.03	1.80	2.03	2.03	2.10	2.26
Lower Second. Education	2.02	2.00	1.91	2.28	1.72	1.78	1.74	1.74	1.42	2.03	1.83	2.18	2.15
Higher Second. Education	2.21	2.02	2.07	2.36	1.95	1.81	1.81	1.78	1.77	2.10	1.80	2.30	1.99
Post-Second. Education	2.51	1.99	2.25	2.47	2.16	2.11	1.98	2.27	1.80	2.19	1.80	2.43	1.97

Age married = 25, Duration of marriage = 5, Currently Working,
Has Worked 5 To 9 Years, Higher Secondary Education

Income	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Std. Income = -1.0	1.89	1.93	1.96	1.95	2.14	n.a.	1.76	0.68	1.54	n.a.	1.74	n.a.	1.85
Std. Income = -0.5	1.90	1.94	1.95	1.98	2.06	n.a.	1.66	0.67	1.56	n.a.	1.73	n.a.	1.83
Std. Income = 0.0	1.92	1.95	1.93	2.00	1.97	n.a.	1.65	.066	1.58	n.a.	1.72	n.a.	1.81
Std. Income = 0.5	1.93	1.95	1.92	2.02	1.89	n.a.	1.64	0.65	1.61	n.a.	1.71	n.a.	1.79
Std. Income = 1.0	1.94	1.96	1.90	2.05	1.80	n.a.	1.63	0.64	1.63	n.a.	1.69	n.a.	1.77

* The country codes are: Belgium (B), Czechoslovakia (CS), Denmark (DK), Finland (SF), France (F), Great Britain (GB), Hungary (H), Italy (I), Norway (N), Netherlands (NL), Poland (PL), Spain (E), and United States (USA).

Table 6.2
Cross-National Estimates of Probability of Excess Fertility
By Educational Attainment, Employment Status, and Income

Age married = 25, Duration of marriage = 5, Standard Income = 0
Currently Working, Has Worked 5 to 9 Years

Education	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Elem. Educ. Not Completed	n.a.	8.90	n.a.	0.84	12.26	0.13	1.45	25.06	n.a.	n.a.	9.42	9.48	4.45
Elementary Education	7.58	8.36	8.39	4.70	15.57	16.01	5.72	36.25	18.49	4.78	9.14	11.98	9.49
Lower Second. Education	7.69	9.83	8.48	3.63	11.66	14.95	11.27	38.12	26.15	4.53	12.11	10.66	9.83
Higher Second. Education	5.98	7.03	8.58	2.57	9.08	13.17	7.16	39.68	15.31	4.49	9.86	10.85	10.18
Post-Second. Education	4.98	6.29	8.67	2.14	5.08	9.33	4.00	25.23	14.73	3.92	9.16	7.91	10.53

Age married = 25, Duration of marriage = 5, Standard Income = 0
Not Currently Working, Has Worked Less Than 2 Years

Education	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Elem. Educ. Not Completed	n.a.	25.20	n.a.	0.87	23.50	0.27	9.62	5.22	n.a.	n.a.	10.47	11.50	10.90
Elementary Education	13.78	21.52	5.90	4.87	28.04	20.04	18.40	9.79	25.53	12.29	9.73	14.04	10.91
Lower Second. Education	14.02	23.33	10.92	3.77	22.26	19.01	25.54	12.74	35.63	11.81	12.62	12.60	13.98
Higher Second. Education	11.47	17.83	12.59	2.67	18.26	16.95	17.86	13.00	22.14	11.51	10.18	12.98	15.06
Post-Second. Education	10.23	16.14	13.38	2.24	11.35	12.11	11.85	5.07	21.32	10.26	9.47	9.64	13.05

Age married = 25, Duration of marriage = 5, Currently Working,
Has Worked 5 To 9 Years, Higher Secondary Education

Income	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Std. Income = -1.0	5.94	6.26	12.54	2.84	7.55	n.a.	5.32	37.19	17.52	n.a.	10.59	n.a.	6.83
Std. Income = -0.5	5.96	6.63	4.44	2.70	8.28	n.a.	6.19	38.43	16.39	n.a.	10.22	n.a.	7.76
Std. Income = 0.0	5.98	7.03	8.58	2.57	9.08	n.a.	7.16	39.68	15.31	n.a.	9.86	n.a.	10.18
Std. Income = 0.5	6.00	7.45	10.06	2.45	9.91	n.a.	8.22	40.93	14.27	n.a.	9.51	n.a.	1.79
Std. Income = 1.0	6.01	7.88	10.59	2.33	10.78	n.a.	9.40	42.20	13.28	n.a.	9.17	n.a.	9.35

The country codes are: Belgium (B), Czechoslovakia (CS), Denmark (DK), Finland (SF), France (F), Great Britain (GB), Hungary (H), Italy (I), Norway (N), Netherlands (NL), Poland (PL), Spain (E), and United States (USA).

Table 6.3
Cross-National Estimates of Unwanted Births
By Educational Attainment, Employment Status, and Income*

Age married = 25, Duration of marriage = 5, Standard Income = 0
Currently Working, Has Worked 5 to 9 Years

Education	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Elem. Educ. Not Completed	n.a.	0.10	n.a.	0.01	0.14	0.00	0.02	0.28	n.a.	n.a.	0.11	0.11	0.05
Elementary Education	0.08	0.09	0.12	0.05	0.18	0.21	0.06	0.40	0.23	0.05	0.10	0.14	0.11
Lower Second. Education	0.07	0.11	0.11	0.04	0.13	0.19	0.12	0.41	0.32	0.05	0.13	0.12	0.13
Higher Second. Education	0.07	0.08	0.10	0.03	0.10	0.17	0.08	0.43	0.18	0.05	0.11	0.13	0.12
Post-Second. Education	0.06	0.07	0.05	0.02	0.06	0.12	0.04	0.27	0.17	0.04	0.10	0.09	0.09

Age married = 25, Duration of marriage = 5, Standard Income = 0
Not Currently Working, Has Worked Less Than 2 Years

Education	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Elem. Educ. Not Completed	n.a.	0.30	n.a.	0.01	0.29	0.00	0.11	0.06	n.a.	n.a.	0.12	0.13	0.08
Elementary Education	0.16	0.26	0.15	0.05	0.35	0.28	0.21	0.11	0.36	0.15	0.11	0.17	0.16
Lower Second. Education	0.17	0.28	0.14	0.04	0.27	0.26	0.31	0.14	0.51	0.14	0.14	0.15	0.19
Higher Second. Education	0.14	0.21	0.12	0.03	0.22	0.23	0.21	0.14	0.30	0.14	0.11	0.15	0.17
Post-Second. Education	0.12	0.19	0.06	0.02	0.13	0.16	0.13	0.05	0.29	0.12	0.10	0.11	0.13

Age married = 25, Duration of marriage = 5, Currently Working,
Has Worked 5 To 9 Years, Higher Secondary Education

Income	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Std. Income = -1.0	0.07	0.07	0.10	0.03	0.08	n.a.	0.06	0.40	0.21	n.a.	0.12	n.a.	0.13
Std. Income = -0.5	0.07	0.07	0.10	0.03	0.09	n.a.	0.07	0.42	0.20	n.a.	0.11	n.a.	0.12
Std. Income = 0.0	0.07	0.08	0.10	0.03	0.10	n.a.	0.08	0.43	0.19	n.a.	0.11	n.a.	0.12
Std. Income = 0.5	0.07	0.08	0.09	0.03	0.11	n.a.	0.09	0.45	0.17	n.a.	0.10	n.a.	0.12
Std. Income = 1.0	0.07	0.09	0.09	0.02	0.12	n.a.	0.10	0.47	0.16	n.a.	0.10	n.a.	0.11

* The country codes are: Belgium (B), Czechoslovakia (CS), Denmark (DK), Finland (SF), France (F), Great Britain (GB), Hungary (H), Italy (I), Norway (N), Netherlands (NL), Poland (PL), Spain (E), and United States (USA).

Table 7.1
Cross-National Estimates of Desired Family Size by Duration of Marriage and Age at Marriage*

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
Duration = 0													
20	2.34	2.47	2.59	2.39	2.62	2.15	2.01	0.92	2.73	2.34	2.02	2.34	2.22
25	2.38	2.21	2.36	2.00	2.30	1.98	1.83	0.59	2.34	2.23	1.82	2.16	2.08
30	2.14	1.91	1.93	1.57	2.04	1.62	1.50	0.43	2.13	1.85	1.55	1.92	1.78
Duration = 5													
20	1.88	2.20	2.16	2.38	2.30	1.67	1.84	1.01	2.00	1.96	1.92	2.32	1.96
25	1.92	1.95	1.93	2.00	1.97	1.50	1.65	0.66	1.58	1.84	1.72	2.15	1.81
30	1.67	1.64	1.49	1.57	1.71	1.14	1.29	0.49	1.37	1.45	1.44	1.90	1.51
Duration = 10													
20	1.45	1.95	1.75	2.21	1.95	1.08	1.51	0.93	1.41	1.61	1.78	2.26	1.71
25	1.49	1.69	1.52	1.82	1.62	0.92	1.30	0.60	1.00	1.49	1.58	2.08	1.56
30	1.26	1.38	1.07	1.38	1.36	0.61	0.91	0.44	0.80	1.10	1.30	1.83	1.26
Duration = 15													
20	1.09	1.71	1.37	1.85	1.58	0.49	0.98	0.72	1.00	1.31	1.61	2.15	1.47
25	1.12	1.44	1.13	1.44	1.26	0.38	0.76	0.43	0.64	1.19	1.40	1.97	1.32
30	0.90	1.12	0.71	1.01	1.01	0.21	0.44	0.30	0.48	0.81	1.11	1.72	1.03

* The predicted values of mean desired family size (DFS) are for women with a higher secondary education, currently employed in market work, with 5 to 9 years of work experience, and an average level of total family income (standard income = 0).

Table 7.2
Cross-National Estimates of Probability of Excess Fertility by Duration of Marriage and Age at Marriage*

Duration = 0

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	0.17	0.22	0.16	0.03	0.22	0.88	0.09	5.24	0.09	0.00	0.73	1.34	0.27
25	0.11	0.33	0.30	0.09	0.46	0.67	0.15	6.08	0.20	0.00	1.22	1.46	0.40
30	0.29	0.76	1.85	0.51	1.00	1.13	0.48	7.65	0.38	0.00	2.34	2.34	1.08

Duration = 5

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	8.01	5.61	5.89	0.98	5.64	14.55	4.69	32.44	8.87	3.80	7.15	10.47	8.10
25	5.95	7.03	8.58	2.57	9.08	13.17	7.16	39.68	15.31	4.49	9.86	10.85	10.18
30	10.72	11.90	23.67	8.68	14.81	18.44	15.04	46.15	21.17	9.02	15.24	14.81	18.08

Duration = 10

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	39.10	26.91	32.52	10.32	28.32	52.19	29.88	63.63	44.13	27.40	26.07	32.42	37.46
25	33.33	29.96	39.44	18.42	36.71	49.82	37.38	72.25	57.52	30.38	31.29	32.52	42.25
30	45.30	40.36	64.38	37.74	48.02	58.56	54.81	78.40	66.27	45.03	40.47	38.97	56.42

Duration = 15

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	67.46	52.30	64.87	42.60	56.61	83.84	66.72	84.16	75.42	42.84	49.07	54.92	68.22
25	61.75	55.41	71.25	55.88	65.25	81.76	73.85	88.93	84.11	46.25	54.88	54.97	72.41
30	72.83	66.00	88.18	76.50	75.13	85.88	85.84	91.97	89.02	61.31	64.06	61.45	82.86

* The predicted values of the probability of excess fertility (PEF) are for women with a higher secondary education, currently employed in market work, with 5 to 9 years of work experience, and an average level of total family income (standard income = 0).

Table 7.3
Cross-National Estimates of Unwanted Births by Duration of Marriage and Age at Marriage*

Duration = 0

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.05	0.00	0.00	0.01	0.01	0.00
25	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.01	0.02	0.00
30	0.00	0.01	0.02	0.01	0.01	0.01	0.00	0.08	0.00	0.00	0.02	0.02	0.01

Duration = 5

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	0.09	0.06	0.06	0.01	0.06	0.19	0.05	0.36	0.11	0.04	0.08	0.12	0.09
25	0.07	0.08	0.10	0.03	0.10	0.17	0.08	0.43	0.18	0.05	0.11	0.13	0.12
30	0.12	0.13	0.28	0.09	0.17	0.23	0.16	0.51	0.26	0.10	0.17	0.17	0.22

Duration = 10

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	0.53	0.33	0.41	0.11	0.36	0.86	0.37	0.84	0.68	0.36	0.31	0.41	0.52
25	0.44	0.37	0.51	0.21	0.48	0.78	0.47	0.96	0.91	0.41	0.38	0.42	0.60
30	0.63	0.52	0.95	0.46	0.66	0.93	0.72	1.06	1.09	0.63	0.50	0.52	0.87

Duration = 15

Age Married	B	CS	DK	SF	F	GB	H	I	N	NL	PL	E	USA
20	1.10	0.73	0.97	0.55	0.85	1.75	0.98	1.32	1.43	0.61	0.66	0.78	1.15
25	0.96	0.78	1.11	0.77	1.02	1.59	1.12	1.40	1.67	0.66	0.75	0.79	1.26
30	1.23	0.98	1.62	1.20	1.25	1.67	1.37	1.48	1.85	0.92	0.91	0.93	1.60

* The predicted values of the mean number of unwanted births (UWB) are for women with a higher secondary education, currently employed in market work, with 5 to 9 years of work experience, and an average level of total family income (standard income = 0).