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Women's wages and fertility revisited. Evidence from Norway

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Background and theory

The most influential and formally coherent theory of fertility behaviour is no doubt Beckers' New Home Economics as set out in his original work from the early 1960s (Becker, 1960, 1965). In this framework children are recognized as providing utility to parents in much the same way as other consumer goods, and besides parents' preferences the crucial determinants of childbearing are the cost of a(nother) child (the "shadow price" of children) and the family's budget constraint. The parents' market wages are important ingredients in their budget constraint, and a wage increase has two offsetting effects: The first is an income effect, which in isolation is expected to induce higher fertility due to a larger family budget. However, a wage increase also raises the value of time spent in paid work, which means that the opportunity cost of staying out of the labour market becomes higher. This raises the "shadow price" of children relative to other prices, and this has a negative substitution effect on childbearing. Since raising children is time-intensive, especially for mothers who are still the main care-givers in most societies, the substitution effect is expected to dominate the income effect for women. Thus, New Home Economics predict a negative relationship between female wages and fertility.

However, as noted by several scholars, there are considerable challenges to testing the central propositions of Becker's fertility theory (see e.g. the review by Hotz et al., 1997). Nonetheless, a number of studies have provided empirical evidence of the relationship between female wages and childbearing over the past decades, but the results are far from unanimous. Some of the divergence is clearly linked to the usage of different indicators of women's opportunity costs. Whereas many analyses adhere closely to Becker's theory and use predicted wages as indicator (e.g. Heckman and Walker, 1990; Tasiran, 1995; Merrigan and St.-Pierre, 1998; Rønsen, 2004; Rondinelli et al., 2010), others interpret the theory less strictly and use other indicators like observed annual earnings or income (e.g. Andersson, 2000; Vikat, 2004; Andersson et al., 2009; Santarelli, 2011). Yet, even analyses using very similar models, methods and indicators sometimes arrive at quite different conclusions, and the wage-fertility nexus is not always estimated to be negative as predicted by New Home Economics. The results seem quite sensitive to the wage series used to predict wages over the life-cycle, and this has been the subject of much debate (Tasiran, 2002; Walker, 2002).

In this paper we review past evidence of the impact of female wages on their childbearing behaviour and discuss possible sources of the divergent results. Moreover, we supply new evidence from Norway for the two last decades. Norway is an interesting country in this respect since Norwegian women differ from their "sisters" in many other countries by combining high fertility with high labour market participation. Today labour market participation among married and cohabiting women with children below the age of 16 is 87 percent, and the total fertility rate is 1.95. Furthermore, cohort fertility remains high and stable at almost 2.1 children also for cohorts born in the 1960s.

Our study is carried out by estimating a hazard rate model of birth transitions including the predicted wage and other variables that are known to affect fertility behaviour. In the estimation of the wage

equations and the hazard rate model we use a rich Norwegian register data set (1988-2008) with information on the dates of birth of all children over the life-cycle linked with information from the Labour Force Surveys. We plan to model the transition to first, second and third birth. As a point of departure we will estimate the various fertility transitions separately, but will also consider modelling the transitions simultaneously. Heckman's selection model is used in the estimation of the wage equations.

The paper is planned to be organized as follows. Sections 2 will review the state of art and previous empirical findings. Next, we will present the data (Section 3), the model (Section 4) and the results of our present analysis. Section 6 concludes with a brief summary and discussion.

Previous literature

Before 1990, micro evidence on the relationship between women's wages and the timing and spacing of births was scarce because of the virtual absence of individual fertility histories linked with earnings data. Later several articles with access to such data have appeared. In this section we shall briefly review these articles and summarize the evidence so far. Besides Heckman and Walker's two early articles from 1990 based on Swedish data, the review will comprise another early article from the UK (Barmby and Cigno, 1990), a study from the Netherlands (Groot and Pott-Buter, 1992), Tasiran's analyses from Sweden and the U.S. (Tasiran, 1995), a study from Canada (Merrigan and St.-Pierre, 1998), more recent studies based on Swedish and German data (Andersson, 2000; Andersson et al. 2009), previous evidence from Norway and Finland (Ronsen, 2004; Vikat 2004), and two recent studies from Italy (Rondinelli et al., 2010, Santarelli, 2011).While reviewing the evidence, we will also discuss possible reasons for the diverging results of these studies.

Data

The analysis applies data that are particularly suitable for this type of study, covering a fairly long period of time, from 1988 to 2008. The main data source is the Norwegian Population Register, which contains information about the dates of birth of all children for the total population. This file is linked with information about labour force participation and working hours from the Labor Force Survey (LFS). Moreover, we have added information about education, income, country of origin and duration of residence in Norway for immigrants from various administrative registers.[1]

In the estimation of the wage equation we need to know the women's labor market status (employed, unemployed, not participating in the labor force). This information is based on answers to a broad range of questions in the LFS. Persons are asked about their attachment to the labor market during a particular week. Given that the person is employed at the time of the survey, she is asked about her actual hours of work as well as contractual working time during the survey week. Her wage rate is calculated by dividing annual wage incomes by (annual) actual hours of work. Using actual hours of work instead of contractual working time, increases the standard deviation of the predicted wage rate.

Unfortunately, we do not have very detailed information about different types of incomes for the first part of the sample period (before 1993). To obtain consistency over time, we have chosen to use a measure of non-labor income that includes salaries of the husband as well as stipulated labor incomes for self-employed husbands.

[1] This is possible owing to a system with unique personal identification numbers for every person residing in Norway.

Education is measured in years of achieved level of schooling, and experience is defined as age minus schooling minus age at school start. The age distribution of the children is considered by measuring the number of children aged 0−3 years, 4−6 years and 7−18 years, respectively.

Only females less than 60 years are included in the sample used in the estimation of the wage equation. Females in education as well as self-employed women are omitted from the sample.

Wage estimates

Heckman's selection model is used in the estimation of the wage equations. There is one equation for every year during the period 1988-2008, and the equations are estimated separately. Table 1 shows the estimation results for a selected year in the middle of the sample period, year 2000. The upper part of the table shows the primary estimation results, i.e, the results for the wage equation with log hourly wage rate as dependent variable. In the lower part of the table we show the estimation results for the selection/participation equation. The participation equation is estimated simultaneously with the wage equation.

Table 1. Estimation of the wage equation. Heckman's selection model. 2000

Parameter	Estimate	t-value
Log wage rate		
Intercept	3,86	112,1
Education/10	0,49	23,4
Experience/10	0,31	27,6
Experience/10 sqrd.	-0,05	-17,9
_Sigma	0,35	131,7
Participation		
Intercept	-0,64	-5,8
Age	0,01	4,7
Education/10	1,43	19,1
Nbr. children 0-2	-0,42	-9,8
Nbr. children 3-6	-0,23	-6,4
Nbr. children 7-18	-0,01	-0,3
Non-labor income	0,00	0,0
Non-western immigrant	-1,15	-7,2
Duration of residence, non-western immigrants	0,04	3,6
_Rho	-0,04	-0,4

Since we do not believe that there are any significant differences in the wage rates of single females and females living in partnership, we do not distinguish between these two groups in the estimation.

According to the main results in the upper part of Table 1, log hourly wage rates are an increasing function of length of education. An increase in potential experience also leads to increased wage rates, but the increase is diminishing. The results are consistent with the findings in other studies using Norwegian data, cf. Dagsvik et al. (2010).

While we are primarily interested in the estimation results for the wage equation, the results for the participation equation (lower part of Table 1) is also of interest since it is introduced to correct for possible selection bias. The specification of the decision whether or not to participate in the labour market reflects the hypothesis that a woman's preferences for leisure are determined by her age, her length of education, the number of children in different age groups, her non-labour income and two variables related to immigration from countries very different from the Norwegian society. A priori we would expect that the more children and the younger they are, the higher the woman's preferences for

leisure and the lower her labour market participation. We would also expect that women with higher education are more prone to participate in the labour market than their "sisters" with lower education. Both these hypotheses are supported by the results in the table.

Non-labour income is introduced in the model specification to consider that the option of staying outside the labour market is more available for women with high income partners than for other women. Due to constraints in the economic budget it might not be possible for single women (with or without children) to work at home with no market income. The results in Table 2 do not support this notion, but we obtain similar estimates also for other years (not shown here).

As mentioned, labor market participation among Norwegian women is high in an international perspective. Furhermore, a large fraction of employed women work in the public sector, and the wage dispersion has been relatively low. However, during the last decades immigration has increased, and a relatively large fraction of women from non-western countries do not participate in the labour market. To consider this fact, a dummy for being a non-western immigrant is introduced in the participation equation. In addition we introduce a variable for duration of residence to take into account that integration in society is a function of how long time the person has lived in Norway.

Fertility transitions

Based on the estimated wage coefficients we will proceed by predicting the potential wages of all women in our analysis sample. The predicted wage will then be included in the fertility model as a time-dependent variable, varying with education, experience and calendar time. We plan to model the transition to first, second and third birth, using a discrete hazard rate model. As a point of departure we will estimate the various fertility transitions separately, but will also consider modelling the various transitions simultaneously.