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THE EFFECT OF FEMALE PARTICIPATION ON FERTILITY IN SPAIN: HOW DOES IT CHANGE AS THE BIRTH COMES CLOSER?

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Abstract

In this paper we analyze the effect of female labor force participation on fertility decisions. We focus on two issues that emerge when estimating such effect: (i) the endogeneity between fertility and participation; and (ii) the period in which participation is measured with respect to fertility. We account for the first problem by using an empirical model based on the assumption that women decide on labor force participation and childbearing in response to incentives provided by prices and incomes. The second issue is addressed exploiting the panel structure of our data (matched EPA files), which allow us to measure women labor force participation at several points in the time preceding a birth. Our results show that it is important to account for the endogeneity between participation and fertility and that women's attitude toward the labour market changes along the pregnancy.

Keywords: Fertility, female labor force participation, endogeneity.

JEL Classification: J11, J13, J21, J22

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1 Introduction

As figure 1 shows, total fertility rate has fell continuously in Spain since the mid-1970s; and women labor force participation has increased since the early 1980s. The negative correlation between fertility and female labor force participation over time has been observed in most developed countries at some specific time intervals. What is special for the case of Spain is the unparalleled decline in fertility occurred in a period of twenty years. Not even Italy –with a similar total fertility rate in the late nineties– has experienced such a huge decline in fertility over an equivalent period of time. Spain moved from 2.62 children per woman in 1977 to 1.1 children per woman in 1997. During the same time span the labor force participation rate of women aged 16-45 went from 36 to 55 per cent. Another striking feature of the Spanish case is that no developed country has ever reached such a low fertility rate; and it is unclear whether the rate will stop falling. In fact, labor force participation rate is still lower in Spain than in other European countries.

In the New Home Economics framework,[1] fertility variations are explained in terms of prices and incomes. The key variable is women's wage, which expresses the value of their time: namely, the opportunity cost of working in the home. Some empirical versions of the New Home Economics model have imposed female wage to be exogenous. To the extent that wages depend on education and experience, the model does not provide a causal explanation of fertility through the wage, taking this as a measure of women's opportunity cost.

According to Macunovich (1996), the neoclassical model of fertility misses the crucial point that female wage is endogenous in a fertility equation; and therefore has failed to provide a driving force in fertility decisions. Because the causal connections are unclear from a theoretical point of view, empirical models have hard time explaining fertility changes.

Instead of pursuing a new avenue to find the exogenous effect of female wage on fertility, this paper takes a different strand: Using individual data, we investigate the effect of labor force participation on fertility. The role of labor force participation on fertility has been largely neglected. Perhaps influenced by Mincer's assertion that "... a labor force variable

[1] The seminal works are Becker (1960), Mincer (1963), and Willis (1973). See Hotz, Klerman and Willis (1997) for a Survey. See also Easterlin (1987) for an alternative approach in explaining fertility.

[age-specific female labor force participation rate] introduced in addition to the income and price variables is redundant: it adds little or nothing to the explanation."[2] But Mincer was referring to the aggregate analysis. In a microeconomic framework we believe that whether or not the woman participates in the labor market provides valuable information about her preferences and relevant economic restrictions.

In this paper we investigate the determinants of fertility in a microeconomic framework. The focus is on female labor force participation as an endogenous variable in explaining fertility. This approach differs from studies which use time-series, where estimation of the fertility equation is complicated by problems associated with endogeneity of female wages. From a microeconomic point of view, female labor force participation appears to be an adequate variable to reflect women's opportunity costs and preferences for children. As stated by Hotz, Klerman and Willis (1997), "...women with preferences for larger numbers of children are likely to spend more time not working. Less time working implies less time to earn returns on accumulated human capital, and thus a smaller optimal investment." (p. 324). Because we do not observe preferences directly, the observed wage may be negatively correlated with fertility only as a result of women's preferences for children.

In the empirical model, labor force participation and childbearing are joint decisions taken by women in response to incentives provided by prices and incomes.[3] We do not need to investigate the "reduced-form" effects of exogenous changes in prices and incomes. The attempts to do so have been based mainly on time-series data. Using individual-level data, the question that we address is the following: once women have decided whether to participate in the labor market or not, how does this decision affect fertility behavior, taking into account the "selection bias" problem?

By ascertaining the effect of labor force participation on fertility behavior we learn something about the underline decision process that determines fertility, provided that we understand the factors that determine labor force participation. Moreover, by revealing the "true" empirical relationship between labor force participation and fertility, namely the exogenous effect of the former on the latter, we obtain a means for credible fertility prognostication.

[2] Mincer (1963).

[3] See Carrasco (1998) for the same methodology in explaining women labor force participation.

When studying fertility, it is important to take into account that the decision of having a first child is quite different from the decision to have other parity. In this paper, we focus on women's decision to have the first child. For that, we use a representative cross-section sample of childless women. By concentrating on the decision to have the first child we avoid the issue of spacing of children. Also, the decision to have the first child is particularly important because it marks the beginning of childbearing, which is highly dependent on women labor market attachment and expectations. Because most women have at least a child, this facilitates estimating the effect of women labor force participation on fertility. The reason is that the probability of a first birth in the sample and in the interval considered is mainly determined by preferences and labor market restrictions. Once labor market participation has been taken as an endogenous variable, its role in the fertility equation becomes more apparent: it indicates the reduced effect of income (either realize or expected) and prices (the cost of children). Note also that focusing on a sample of childless women simplifies the specification of the probit model for labor force participation because we do not have to take care of effect of existing children.

As it is explained in the next section, the data used in this paper allow to measure women labor force participation at several points in the time preceding the first births. We exploit this feature of the data set by estimating the model where labor force participation is measured around 12, 9, 6, 3, or 0 months earlier than the first birth takes place. This way we are able to show that the relationship between labor force participation and fertility crucially depends on how far earlier than the date of the first birth the dummy variable for participation is measured. If women's attitude toward the labor market changes along the pregnancy, it can be expected that some drop out of the labor force as the date of the birth approaches. This selection of more participant women reflects differences in incentive and restrictions faced by them in work and family.

The organization of the paper is as follows. Section 2 describes the data obtained from matched EPA files; section 3 presents the trivariate probit model applied to the joint determination of participation and fertility; section 4 contains the estimation results; and, finally, section 6 concludes.

2 Data description

The data used come from the Spanish Labor Force Survey (*Encuesta de Población Activa*, EPA). The EPA is conducted every quarter by the Spanish National Statistics Office (INE) on around 60,000 households. It is designed to be representative of the total Spanish population. One sixth of the sample is renewed quarterly; therefore, each household remains in the sample for a maximum of six consecutive quarters. We take advantage of the panel structure of the survey (EPA *enlazada*) and obtain rotating panels or cohorts from 1987:II to 1997:IV.

The data set permits us to observe new births in a given quarter, as well as mother's labor market status in each of the six quarters she is in the sample. Given this information, our purpose is to study the effect of female labor force participation on fertility and how such an effect changes as the birth comes closer. To achieve this, we exploit the possibility of measuring participation at 12, 9, 6, 3 or 0 months before the births occurs.

2.1 Sample selection and endogenous variables

Our sample includes married women aged 16 to 45 that have been observed over six consecutive quarters. To be in the data sample, a women must be childless over the six quarters or have the first birth in a given quarter.

The dependent variable, indicating fertility, is equal to 1 if the woman has a child in the sixth quarter she is observed and 0 if she remains childless. To increase the number of observations, we also consider whether or not a birth takes place in the fifth quarter, which makes us reduce to a maximum of twelve months the time interval between the two events (see Appendix for information about how we determine whether or not a new birth occurs).

To test how the effect of participation on fertility changes, we estimate the model in each of the five cases that result from when labor force participation and the other explanatory variables are measured: 4, 3, 2, 1 or 0 quarters before the birth occurs. In each case, participation is specified as a dummy variable which equals 1 if the woman is in the labor force in the period considered ($t-4$, $t-3$, $t-2$, $t-1$ or t), being t the quarter in which fertility is measured. Table 1 shows the timing of participation with respect to fertility for each period considered.

After filtering the initial sample (see Appendix) we obtain 4,141 women of which 11.49% have the first child in the sixth or in the fifth quarter they are observed (new mothers), while 88.51% are childless women.

Table 2 reports the fraction of women in and out of the labor force that have had the first child by number of periods (quarters) before the birth occurs. We can see that when participation is measured 12 or 9 months earlier than fertility the fraction of new mothers is almost invariant to being in or out of the labor force. However, as the birth is coming, the difference between both groups of women becomes wider. For example, among women that do not participate 6 months before fertility is defined, 15.51% have a child, while this figure fails to 10.36% for participants. The increase in the difference in fertility rates between both groups of women is more marked when participation is measured a quarter before fertility and when both variables are measured in the same quarter (from 18.61% to 9.29% and from 21.78% to 8.07%, respectively). This results from women leaving the labor force as pregnancy is confirmed and the birth becomes imminent.

Table 3 reports the labor market status of those women who have had a child. Our data set indicate that 78.57% of women who have a child were in the labor force 12 months before the birth occurs, while the number falls to 70.38% 6 months before and to 52.73% when fertility and participation are measured in the same period. The decrease in the labor force participation rates as the birth becomes closer is mainly caused by unemployed women, since employed women show to be more attached to the labor market.[4] The percentage of women out of the labor force goes from 21.43% 4 quarters before the birth happens to 47.27% in the same quarter.

2.2 Exogenous variables

The exogenous explanatory variables used in the estimation can be classified into three groups: demographic variables relating to the mother, demographic variables relating to the husband, and variables relating to household and business cycle conditions. In the Appendix we offer information on the construction of all variables.

In the first group we include age and education. Both are grouped into categories and

[4] See Alvarez (1999) for a more detailed description of this finding.

treated as dummies in the estimation. Traditionally these variables have been considered fundamental in explaining fertility behaviour of women. On one hand, the importance of age is obvious, given the biological constraints women face. On the other hand, the relevance of education is clear, since children have high time costs and more education generally increases the opportunity costs of time spent in child care[5] .

Tables 4 and 5 report the distribution of age and education by participation and fertility decisions. In panel (a) participation is measured 12 months earlier than fertility, and in panel (b) both variables are defined in the same period.

As far as the age distribution is concerned (Table 4), we can see that among those women having a child, more than 50% are between 25 and 29 years old. This table also points out that participation tends to delay the birth of the first child. The majority of participants and non participants have her first child while they are between 25 and 29 years old. However, the fraction of new mothers younger than 25 years are relatively more important among the non participants while new mothers aged 30-34 years are relatively more important among the participants. Comparing these figures with those in panel (b), we appreciate an increasing importance of women between 30 and 34 and a decreasing fraction of youngest women that have a child, both for participants and for non participants. Looking at the distribution by age, we can see that in the 25-29 group there are relatively less women with $P = 0$ and $F = 0$, while the proportion of women with $P = 1$ and $F = 1$ is higher.

Regarding the distribution by education (Table 5), the percentage of women with secondary education is the largest in the four categories considered. We observe that women with primary education are more likely not to participate while women with university education are more likely to do so. These figures agree with the hypothesis that higher education implies greater labor force participation among women. A similar conclusion can be drawn by looking at the distribution by rows: among the less educated women, 39.61% do not participate in the labor force, while this figure falls to 8.03% for women with more education. The comparison of panels (a) and (b) of Table 5 reveals that lower educated women are the most likely to leave the labor force as the first birth becomes closer.

[5]See Wolfe (1980) for posible effects of a woman's education on her family size.

We also include in the regressions husband's characteristics (age, education, labor market status and sector of employment); and household characteristics (the presence of grandparents and region of residence). In order to take into account changes in aggregate conditions, the regional unemployment rate has also been included in the participation equation.

At this point it is important to mention that this panel does not provide information on wages or income. Therefore, education is used as a proxy for these variables. The idea is that education increases the market wage rate and the potential income. In the New Home Economics framework it is usually emphasized the distinction between male and female earnings in affecting fertility. Changes in the husband´s wage are identified with income effects, while changes in the wife´s wage are associated with both income and price effects. This results from considering that children are wife´s time intensive in a production sense while husband´s time is not an important input in the production of children. Therefore, it is assumed that children do not affect the opportunity cost of the husband´s time.

3 The empirical model

As it has been emphasized in the previous section, the purpose of this paper is to examine the true exogenous impact of participation on fertility and see how this effect changes as the birth comes closer. For that purpose, we estimate the nexus between fertility behaviour and participation decisions at different time intervals. But, given that labor force participation is not exogenous to fertility decisions, we face an identification problem when estimating this relationship. Each woman is characterized by values of the variables (y_1, y_0, z, x). Here x is a vector of observed variables describing personal characteristics and the business cycle. The binary variable z indicates labor force participation and it is defined as $z = 0$ if the woman does not participate and $z = 1$ otherwise. For each woman there are two hypothetical fertility outcomes, y_1 and y_0. Variable y_1 indicates the outcome if the person were to participate: $y_1 = 0$ if the person would not have an additional child and $y_1 = 1$ otherwise. Similarly, y_0 indicates the outcome if the person were not to participate.

Therefore, the effect of participation on fertility for a particular woman will be given by the difference $\Pr(y_1 = 1 \mid x) - \Pr(y_0 = 1 \mid x)$. It measures how a particular woman changes fertility behaviour if her participation decision switches from $z = 0$ to $z = 1$. However, for each individual we only observe the value of y_1 or y_0, and the other value is censored. The sampling process generating the data only identifies the conditional probabilities $\Pr(y_1 = 1 \mid x, z = 1)$ and $\Pr(y_0 = 1 \mid x, z = 0)$. Therefore, in the absence of prior information, the data cannot identify the parameters of interest, $\Pr(y_1 = 1 \mid x)$ and $\Pr(y_0 = 1 \mid x)$.

Given this problem discussed, the identification of the effect of participation on fertility depends on the prior information about the process generating fertility and participation outcomes. Following Carrasco (1998), that prior information about the joint probability distribution of (y_1, y_0, z) is expressed through the formulation of a trivariate probit model. Let us consider the following model:

$$y_{it} = \begin{cases} y_{i1t} = \mathbf{1}\left(\alpha_1 x_{i(t-j)} + u_{i1(t-j)} \geq 0\right), & \text{if } z_{i(t-j)} = 1; \\ y_{i0t} = \mathbf{1}\left(\alpha_0 x_{i(t-j)} + u_{i0(t-j)} \geq 0\right), & \text{if } z_{i(t-j)} = 0, \end{cases} \tag{1}$$

and

$$z_{i(t-j)} = \mathbf{1}\left(\beta x_{i(t-j)} + \varepsilon_{i(t-j)} \geq 0\right), \quad (i = 1, ..., N;\ t = 1, ..., T;\ j = 0, ..., T-1), \tag{2}$$

where $\mathbf{1}$ is the indicator function. To simplify notation we will drop out the subscripts. We assume that u_1, u_0 and ε are normal variables, such that

$$\begin{aligned} \Pr(y_1 \mid x) &= \Phi(\alpha_1 x), \\ \Pr(y_0 \mid x) &= \Phi(\alpha_0 x), \end{aligned} \tag{3}$$

and

$$\Pr(z = 1 \mid x) = \Phi(\beta x),$$

where $\Phi(.)$ denotes the standard normal distribution function and (u_1, u_0, ε) are assumed to be jointly normally distributed with zero mean vector and covariance matrix

$$\Sigma = \begin{pmatrix} 1 & \rho_{10} & \rho_{1\varepsilon} \\ & 1 & \rho_{0\varepsilon} \\ & & 1 \end{pmatrix}. \tag{4}$$

We allow the parameter vectors in the equation explaining y_1 to differ from that in the equation explaining y_0 ($\alpha_1 \neq \alpha_0$). More restricted parametric models could be specified. In fact, in our application we impose certain parameters to have the same effect on y_1 and y_0. The contribution of unobserved variables is given by the error terms (u_1, u_0, ε). Since we estimate a cross-section model, we cannot account for panel data considerations. Therefore, we do not account neither for the possible bias due to the existence of time invariant unobserved heterogeneity nor feedback effects from dependent to explanatory variables.[6]

The estimated models differ in the assumptions they make about the covariance matrix of the disturbances. The most general one imposes no restrictions on the covariance matrix of (u_1, u_0, ε).[7] This is a switching probit model with endogenous switching. This is our preferred model, since, as it has been suggested, participation and fertility outcomes may be jointly determined by processes that we cannot observe directly. In the context of the latent-variable model previously presented, this means that the disturbances (u_1, u_0, ε) may be statistically dependent.

A model assuming that ε is statistically independent of (u_1, u_0) implies that participation is exogenous to fertility. This model imposes no restrictions on the covariance matrix of (u_1, u_0, ε). This assumption means that the unobserved factors that affect fertility and participation are unrelated. From a probabilistic point of view, the assumption implies that

$$\Pr(y_1 = 1 \mid x) = \Pr(y_1 = 1 \mid x, z), \tag{5}$$

and

$$\Pr(y_0 = 1 \mid x) = \Pr(y_0 = 1 \mid x, z). \tag{6}$$

Therefore, the sampling process is able to identify these probabilities and the parameters may be estimated by maximizing the binary probit likelihood given in (5) and (6). Equally, we estimate by maximum likelihood the system (3) with no restrictions on the covariance matrix of (u_1, u_0, ε).

[6]Carrasco (1998) presents a switching binary panel data model which accounts for time invariant unobserved heterogeneity and predetermined variables.

[7]See Alvarez (1997), Carrasco (1998) and Manski et al. (1992).

4 Estimation results

4.1 The determinants of fertility

First, we will discuss other results different from those related to the effect of women labor force participation on fertility. Table 6 presents the estimation coefficients and the t-statistics for the labor force participation equation and for the fertility equations. In the latter, results are reported for the cases in which labor force participation is considered either as an exogenous variable or as an endogenous variable. For all regressions in Table 6, the independent variables are measured four quarters (twelve months) earlier than the observed birth for women who do have a child in the sample period. Notice that the unemployment rate is omitted from the fertility equation as an identification restriction.

Results have to be interpreted taking into account that the sample is composed by married women aged 16-45 who are childless at the date in which their labor market situation is observed. Results are quite standard: Women most likely to participate are those aged 35 and over, and those who have completed a higher level of education. Moreover, women whose husbands are either employed or inactive, or are older are less likely to participate. This inverse relationship between husbands' unemployment and the labor force participation of married women reflect the well known "additional worker effect". This effect arises when a woman increases her labor force participation in order to maintain household living standard which may be reduced due to the husband's unemployment. Also, a higher rate of unemployment in the local labor market strongly reduces women's probability of participating in the labor force.

The probability of having the first child declines with age. This result does not depend much on whether labor force participation is considered exogenous or endogenous. When the dummy participation is interacted with age, the coefficients are positive and significant for the age groups 30-34 and 35-45. This result can be interpreted as indicating that participation delays the birth of the first child; probably because participating women invest relatively more in acquiring experience and human capital early in their career. This is consistent with the over-time observed pattern of having the first birth at older ages[8] . Also, younger

[8]From a theoretical point of view the optimal timing of the first birth depends on parents preferences

cohorts are increasingly postponing marriage. This is an especially important event in Spain where most of the births occurs into the marriage[9] . Postponing marriage is due, in part, to the lengthen of education which may be more important for those expecting to participate in the future. Neither woman's education nor husband's education have any effect on the probability of first parity. The interactions between educational dummies and participation are also insignificant in the fertility equations.

In our sample, a woman whose husband is either employed or inactive is more likely to have a first child than a woman with an unemployed husband. This may pick up the income effect as a husband unemployed implies a significant reduction in family income. Often, the wife has to compensate for a reduced income by entering the labor market or becoming more attached to the labor force. In fact, our results pertaining to the probit on participation point in this sense. The effect of other variables worth mentioning are that wife of service sector workers and women living in the east are less likely to have the first child in the sample interval.

4.2 Fertility models with exogenous and endogenous participation

There are many reasons that confirm the existence of an important causal connection between fertility and participation. Both childbearing and labor force participation need a great proportion of the woman's time so both activities are, to a certain point, incompatible. Woman´s childbearing responsibilities constrain her choices in the labor market. However, a good deal of the fertility literature has assumed participation to be "exogenous". We now use the trivariate probit model presented in the previous section to estimate the truly exogenous effect of participation on fertility. We can compare results from the model that treats participation as strictly exogenous with those from the model that treats this participation as endogenous. In other words, we address the bias in the fertility participation relationship caused by heterogeneity in tastes.

for children, access to the capital market and the opportunity cost of mother. See Hotz et al. (1997), pp. 318-19 and references there in.

[9]See Castro Martín (1992).

4.2.1 Actual effect of participation

Table 7 presents the results from probit models that consider fertility as strictly exogenous. Columns 1 to 5 report maximum likelihood estimates from different models depending on the intervals between the quarter the explanatory variables are measured and the quarter fertility is measured. The estimated effects of participation (first row) suggest that female participation reduces the probability of having a child and that, as the date of the birth draws closer, the effect becomes stronger and more significant. To evaluate the effect of participation on the probability of having a child, we calculate the average impact for all women. For each women we have calculated:

$$E(y_i \mid x_i, z_i = 0) = \Phi\left(\widehat{\alpha}_0 x_i\right), \quad i = 1, ..., N_0,$$

and

$$E(y_j \mid x_j, z_j = 1) = \Phi\left(\widehat{\alpha}_1 x_j\right), \quad j = 1, ..., N_1,$$

where N_0 and N_1 are the number of individuals with $z = 0$ and $z = 1$ respectively.[10] Then the effect of participation on the average probability of having a child is given by

$$\widehat{\Pi} = \frac{1}{N_1} \sum_{j=1}^{N_1} \Phi\left(\widehat{\alpha}_1 x_j\right) - \frac{1}{N_0} \sum_{i=1}^{N_0} \Phi\left(\widehat{\alpha}_0 x_i\right).$$

As we can see in panel (a) of Table 9, the average effect of participation on the probability of having a child increases considerably from one year before the birth takes place to the same period the such birth occurs.

These "actual" participation effects on fertility are consistent with the casual observation typically found in the literature that any measure of female labor supply is negatively correlated with any measure of the presence of young children. In addition, we obtain that the period in which participation is measured relative to fertility is important in order to address the effect of participation on fertility: the closeness of the birth increases the negative effect of participation. However, this negative covariance could be due to an endogenous fertility effect given that, as shown before, participating women are selected along the pregnancy. Therefore, we will attempt to obtain an estimate of the effect that does not reflect variation in unobserved preferences.

[10] The standard deviations have been calculated using the Delta Method.

4.2.2 True exogenous effect of participation

Table 8 presents the results from probit models that take into account the endogeneity of fertility, measuring explanatory variables in different time periods. We obtain a positive and significant effect of participation when it is measured one year earlier than fertility. However, the effect becomes smaller and non significant up to 6 months before, turning negative as the birth approaches. We can interpret theses results as indicating that participation either has no effect on fertility or that it has a positive effect. Our estimation approach allows us to calculate the unbiased unconditional predicted probabilities

$$\widehat{y}_{0i} = E(y_{i0} \mid x_i) = \Phi\left(\widehat{\alpha}_0 x_i\right), \quad i = 1, ..., N,$$

and

$$\widehat{y}_{1i} = E(y_{i1} \mid x_i) = \Phi\left(\widehat{\alpha}_1 x_i\right), \quad i = 1, ..., N,$$

where N is the total number of individuals. Then, the average effect of participation is given by

$$\widehat{\Pi} = \frac{1}{N}\sum_{i=1}^{N}(\widehat{y}_{1i} - \widehat{y}_{0i}).$$

In terms of these probabilities, we can see from Table 9 that the average effect of participation ranges from 19.98 % to −0.29 %, depending on the period considered. That is to say, up to 9 months before having a child, participation increases significantly the average probability. However, this increase becomes less positive and even negative and non significant when participation is measured 6 and 3 months earlier than fertility and when both variables are measured in the same quarter.

These results are markedly different from the estimates obtained under strict exogeneity. The negative participation effect is substantially overestimated under the (wrong) assumption that participation does not reflect differences in preferences. The negative correlation coefficient estimated also point to the same conclusion: there is a selection bias which implies that preferences for children and for participation could be negatively correlated. The contrast between these two sets of estimates emphasizes the point that different individuals behave differently due to heterogeneous characteristics and that we need to be cautious in assuming exogeneity for participation.

Regarding the effect of the rest of covariates, basically only the effect of education changes across estimates. We can see that when participation is measured 12 and 9 months earlier than fertility, less educated women have higher probability of having a child. However, once the pregnant becomes "obvious" there are not significant effects of education. This is unsurprising given that less educated women are more prone to become inactive as the birth approaches, due to their weaker attachment to the labor force. Therefore, from 6 months earlier to the same period in which fertility is measured, mainly more educated women are in the labor force, so there is no significant effect of education.

5 Conclusions

In this paper we have analyzed the effect of female labor force participation on fertility. Using a trivariate probit model, we have drawn two main conclusions: (i) It is important to account for the endogeneity between fertility and participation. The importance of taking into account the endogeneity of labor market variables in order to estimate a fertility equation has been previously pointed out in the literature. In this paper we have found that the estimates that treat participation as exogenous are upward biased. We have offered a measure of this bias in terms of the estimated coefficients and the estimated probabilities. (ii) The effect of participation on fertility varies considerably depending on the time interval between the quarters in which the variables are measured. Although the existing literature has paid more attention to (i), we have shown that this issue is also important when assessing the effect of labor force participation on fertility.

To sum up, our empirical results support the hypotheses that fertility interacts with labor supply decisions in ways that are not easy to account for. Our results suggest that the relationship between labor force participation and fertility could be characterized according to how far earlier the first variable is measured with respect to the second. One could think that when participation is measured much earlier than fertility, it becomes "less endogenous" and "more exogenous". However, we have shown that in both cases, we have to be very cautious about our exogeneity assumptions.

APPENDIX: Sample selection and explanatory variables

Sample selection

The initial sample included 82,495 married women of 16 to 45 years of age observed over six consecutive quarters. Since we are interested in the occurrence of the first birth, we select those women who haven't had a child over the observed period (childless women) and those who have had her first child in the fifth or the sixth period (new mothers). After this filtering the final sample consists of 4,141 women. Given this sample, our dependent variable (indicator of fertility) is equal to 1 for the new mothers and 0 for childless women.

In order to determine whether a first birth has happened or not, we use information about the number and age of children in the household. Therefore, if the number of children is zero over all the observation period, the woman is considered as a childless woman. On the other hand, if the number of children is zero until the fourth period and one in the fifth, being the age of this child zero in that period, the woman is classified as a new mother. A new mother case also happens when the number of children is zero until the fifth period and one in the sixth, being the age of this child zero in that period.

Explanatory variables

All the explanatory variables included in the analysis have been constructed from de Spanish Labor Force Surveys (Encuesta de Poblacion Activa). Most of them are dummies that reflect the characteristics of the woman, her husband as well as other household and business cycle conditions. The variables we have considered are the following:

Woman's characteristics

Age: It is grouped into four categories: 16 to 24 years old, 25 to 29 years old, 30 to 34 years old and 35 to 45 years old.

Education: We consider the following categories: Primary education (it includes illiterate and no schooling). Secondary education and University education.

Husband's characteristics

Age: It is included as a continuous variable.

Education: We consider the same categories than in the case of the woman: Primary.

Secondary and University education.

Labor market situation: We consider the following three categories: Employed, Unemployed and Out of the labor force.

Economic Sector: Grouped into three categories: Farming, Industry and Construction and Service.

Household and business cycle conditions

Grandparent: This is an indicator variable that takes the value 1 if there is a person living in the household which relation with the woman is mother, father, mother-in-law or father-in-law.

Region: We consider the following geographical areas: South, Center, East and North. Each one contains the following regions:

- South: Andalucia, Canarias, Extremadura and Murcia.
- Center: Castilla-Leon, Castilla-La Mancha and Madrid.
- East: Aragon, Baleares, Cataluña and Valencia.
- North: Asturias, Cantabria, Galicia, Navarra, Pais Vasco and La Rioja.

Time period: Since the data runs over the period 1987:II to 1997:IV, we have included a indicator variable that takes the value 1 if the observation pertains to the period 1992:I to 1997:IV.

Regional Unemployment Rate: This variable is defined as the unemployment rate for each region and each period.

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