HAVE CHILD TAX ALLOWANCES AFFECTED FAMILY SIZE? A MICRODATA STUDY FOR SPAIN (1996-2000)

Jaime Vallés-Giménez
Anabel Zárate-Marco

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Jaime Vallés-Giménez
Department of Applied Economics
Faculty of Economics. Gran Vía 2, 50005 Zaragoza, Spain.
(Tel:34-976 76 27 70, Fax:34-976 76 27 70, e-mail: jvalles@unizar.es)

*Anabel Zárate-Marco
Department of Applied Economics
School of Business Studies, C/ María de Luna. Edificio Lorenzo Normante. Campus Rio Ebro, 50018 Zaragoza, Spain.
(Tel.: 34-976 761000, ext 4982, Fax: 34-976 762740, e-mail: azarate@unizar.es)

ABSTRACT

Since the Spanish fiscal system adopted personal income tax, the amount of child allowances has been updated or modified fairly frequently. Similarly, changes have also been made in the manner that these deductions are applied, in the sense that initially the allowance was deducted from tax payable, whereas it now reduces taxable income. These changes in the child tax allowance, together with the fact that the deduction differs depending on the order of birth of each child, have led us to examine the possible relationship between the evolution of this benefit and the choices made by women of childbearing age with regard to family size. Based on pooled cross-section and time series data for Spain drawn from the European Union's Household Panel (1996-2000), we estimate a hierarchical ordered response model. Our results suggest that child tax allowances incentivize the demand for children and that the effectiveness of tax benefits could be improved by designing a strategy that would focus potential additional economic resources on the allowance for the second child.

KEY WORDS: marginal child tax saving, family size, probability

J.E.L. CLASSIFICIATION: H24, H31

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1. INTRODUCTION

The birth rate in Spain has fallen significantly in recent decades, to the point where the country is among those with the lowest fertility in Europe (see **table 1**). Moreover, birth rates in all of the member States of the European Union are below the level of demographic replacement (estimated at 2.1)[1], making it difficult to maintain the size of the population and aggravating the problems associated with ageing[2].

For these and other reasons, the majority of developed countries have established measures to stimulate the birth rate by reducing the cost of bringing up children. These policies include child income tax allowances, child benefits paid per dependent child, paid maternity leave and so on. While such measures must be justified not in terms of their effects on fertility decisions but rather of tax relief and financial support for low income families, as Pechman (1983) points out, they may be a significant factor in the decision to have children, along with other variables.

As shown in **table 1.A of the Appendix,** empirical studies carried out in the United Kingdom, the United States and Canada reveal that child benefits do in fact favorably affect the decision to have children. Preliminary studies with similar results have also been carried out in Spain[3], where child tax relief and social benefits have traditionally been provided. The two earliest studies for Spain were done at the aggregate level, and showed for the first time in this country that government aid for dependent children (in the form of child tax allowances and social benefits) had an effect on the fertility of women of child-bearing age, together with the value of women's time, the unemployment rate and the cost of housing. A more recent paper, used cross-section data to analyze the relationship between the child tax allowance in Spanish Personal Income Tax, and family size for married women, finding that the child tax allowance provided for in 1996, as well as other variables, were relevant to explaining family size.

[1] See, for example, Craig (1994).

[2] For a study of the effects of these conditions in a given area, see Alvarado and Creedy (1998).

[3] See Zárate (2001) and Vallés and Zárate (2003 and 2005).

Since these findings are in line with those obtained in the comparative literature, it would be helpful to confirm results using a micro-data sample spanning several years. Such panel data could throw light on the effects that the evolution of child tax benefits has had on family size. This is of particular interest because the amount of child allowances provided for in income tax regulations has been updated or modified fairly frequently since the tax was adopted in Spain, and even the manner in which deductions are applied has changed (initially they reduced the tax payable, but the rules have since been amended to reduce taxable income). Meanwhile, the amount of allowances often differs depending on the order in which children are born.

In this paper, we propose to use pooled cross-section and time series data to establish whether the evolution of the child income tax allowance has affected the decision to have children in Spanish households. For this purpose we have used the European Union's Household Panel for Spain, which allows us to explain family size for married women of child-bearing age who live with their husbands between 1996 and 2000.

The structure of the paper is as follows. In the second section we briefly describe the evolution of the Spanish child income tax allowance. In section three, we explain the theoretical framework and the econometric specification available for the empirical study. We then go on to describe the representative variables for the hypotheses tested in section four, as well as the data used to construct them. We present the results obtained from the econometric estimations of the model in section five, and end the paper with a section containing some final considerations.

2. THE CHILD TAX ALLOWANCE IN SPAIN

As in other developed countries, child benefits in Spain are structured via both the tax system and the Social Security system. In this paper, however, we shall focus exclusively on tax. Fiscal policy has traditionally sought to protect the family by establishing income tax benefits based on the personal and family circumstances of the taxpayer. Before undertaking our empirical evaluation of the potential impact of the Spanish child tax allowance on fertility, then, we need briefly to review the development of this benefit in income tax legislation. We shall focus particularly on the specific design of the tax allowance as applicable between 1996 and 1998 on the one hand, and between 1999 and 2000 on the other (the system for the application of deductions changed in 1999), since relevant data is available for all of these years.

We may mention, however, that certain family tax measures and exemptions were already recognized in the period that ended with the Urgent Tax Reform Measures Act, 1977 (Law 50/77), although their scope was limited by the very small number of people required to file income tax returns. This meant that few taxpayers were able to benefit from the tax relief offered, and it cannot

be said that the tax regime really addressed the matter of family expenses in general until the approval of Law 44/1978 governing personal income tax, which came into force in 1979.

In this Law, personal income tax was established as a personal and progressive tax, which addressed the reduction in spending power associated with family expenses by establishing a series of deductions from the tax liability, including a dependent child tax allowance. A series of requirements was established to qualify for the tax allowance with reference to the family relationship and age of the child, and income. These have changed over time, as reflected in the summary given in Carpio *et al.* (1999: 52).

In the years considered in this study, child tax allowances took the following form. In the period prior to the recent income tax reform (i.e. until 1998), the child tax allowance reduced the tax liability. The tax credit was applied for each unmarried child under 30 years of age living with the taxpayer and earning income lower than the minimum wage for 18-year olds[4]. Each of the first two children entitled the taxpayer to deduct € 129.22 from the tax payable in 1996, rising to € 156.26 for the third child, and € 186.31 for each child thereafter (€ 132.82, € 160.47 and € 191.12, respectively, in 1997). In 1998, the first child entitled the taxpayer to a tax credit of € 150.25, rising to € 210.35 for the second, and € 300.5 for each child thereafter [5]. In the period before the reform, then, the child allowance increased, particularly in 1998, while the exact amount taxpayers could detect depended on the order of birth of their children.

However, the income tax reform that came into effect in 1999 resulted in a major change in the philosophy of the tax. The objective of this reform was to delimit the tax on the basis of purchasing power, explicitly exempting earnings that, in the opinion of the legislator, are essential to cover basic individual and family needs. This approach also had the effect of bringing Spanish income tax into line with the model used by European partners. Consequently, the tax reform affected the manner in which the child tax allowance was applied. Thus, children no longer entitle the taxpayer to a fixed deduction from the tax liability but to a reduction in the tax base for each unmarried child aged under 25 living with the taxpayer and earning less than the minimum wage for 18-year olds in the calendar year[6]. Thus, in 1999 and 2000, each of the first two children entitled the taxpayer to an exemption of € 1,202.02, while the allowance for the third and following children was € 1,803.04[7].

[4] The minimum wage for 18 year olds was € 5.462,74 in 1996, € 5.606,36 in 1997, and € 5.725 in 1998.

[5] As a point of reference, the euro /dollar exchange rate in February 2006 was 1.1875.

[6] € 6,010.12 in 1999 and 2000.

[7] This change in the design of personal income tax brought the debate concerning the advantages of deductions from the tax liability or the tax base to the attention of the Spanish political parties and academics, in terms of both equity and efficiency, though such matters had already been raised in the literature. Thus, the proliferation of papers dealing directly or indirectly with this issue began in Spain only after the 1998 income tax reform. The principal contributions

Table 2 shows the evolution of the amount of the child allowance, although for the sake of clarity it does not include the entitlement requirements referred to above (age of the child, income, etc.). Nevertheless, we have reflected the differing amounts of the applicable allowance depending on the order of birth of each child in certain years, in view of the empirical study described below.

3. THEORETICAL FRAMEWORK FOR THE CHOICE OF FAMILY SIZE

The fertility model we use in this paper is in line with those proposed by Becker (1960), Becker and Lewis (1973) and Cigno (1986). In these models, children are included in the utility function in the same way as any conventional good. Following Georgellis and Wall (1992) and Alm and Whittington (1995), however, we shall use a simplified version that does not take into consideration the quality of children.

Thus, the choice faced by the agent is to maximize a quasi-concave utility function such as that given in equation [1], the terms of which are the articles produced by the household using the goods and services bought on the market and the parents' time, assuming a budgetary restriction. The articles providing utility are children, *C*, and other goods such as health, leisure, etc., which we combine in an aggregate class, *Z*.

$$Max\ U = U(C, Z) \qquad [1]$$

The agent (we shall henceforth consider the woman as the unit of analysis) will have one additional child if the expected utility per unit of expected cost for another baby is greater than could be obtained from any other outlay.

To illustrate the effect of the child allowance on the decision to procreate, we shall assume that all time that is not given over to paid work is spent by the woman on child-rearing, such that her earnings will represent the opportunity cost of children, rather than the cost of both leisure and offspring. We assume, then, that the total time, *T*, available to the women is divided between work and her children. If each child requires one unit of time and *L* is the time spent on paid work in the market, the time restriction will be:

$T = L + C$, where C is the total number of children. *[2]*

The budgetary restriction on the utility maximizing problem will thus be:

$$I + WL = p_C C + \pi_Z Z = p_C C + Z \qquad [3]$$

where *I* is income that is not earned from the woman's paid work (in reality this would be her husband's income and any investment income she may have) and is also spent on goods and children; *WL* is the income earned by the woman in the labour market (where *W* is her wage and *L*

to the analysis of this issue include Álvarez and Carrascal (2000), Pazos (2000), Zárate (2000), Bádenes, López Laborda and Onrubia (2001), and Álvarez and Prieto (2003).

the time worked); p_C is the cash cost of bringing up and educating the children[8]; and π_Z is the cost of *Z*, which we standardise as 1.

Taking personal income tax into account in this framework (assuming a constant marginal rate, *t*, for the sake of simplicity), the budgetary restriction would be as follows:

$$(1\text{-}t)\, I + (1\text{-}t)\, WL = p_C C + Z \qquad [4]$$

Substituting [2] in [4], we obtain:

$$(1\text{-}t)\, I + (1\text{-}t)\, W\,(T\text{-}C) = p_C C + Z \qquad [5]$$

or

$$C = \frac{(1-t)I + (1-t)WT - Z}{p_C + (1-t)W} \qquad [6]$$

where the numerator of expression [6] is total income after tax available for spending on children (i.e. total income after tax, less income spent on other goods), and the denominator is the total cost of each child, comprising the market cost of each child and the time or opportunity cost of each child after taxes.

If the income tax system recognizes the existence of family expenses through a tax credit for each child, which we shall call "ϕ", as was the case between 1996 and 1998 (the years prior to the reform), the budgetary restriction will be as follows:

$$C = \frac{(1-t)I + (1-t)WT - Z}{p_C + (1-t)W - \phi} \qquad [7]$$

If the income tax recognises the existence of family expenses through a deduction from the tax base (taking the form of a child exemption, which we shall call "δ"), as was the case in 1999 and 2000 (after the reform), the budgetary restriction will be as follows:

$$C = \frac{(1-t)I + (1-t)WT - Z}{p_C + (1-t)W - \delta t} \qquad [8]$$

Thus, the child tax allowance would potentially affect the demand for children via the denominator of equations [7] and [8], which is the cost per child. An increase in the child tax credit, ϕ, prior to the reform, or in the child tax exemption, δ, after the reform, would lower the cost of each child, thereby positively affecting the demand for offspring[9]. As can be seen in the

[8] P_C includes all expenses incurred in the purchase of goods and services for the children in the market, which is to say the cash cost of food, housing, clothing, education, etc.

[9] In the same way, variations in other monetary variables could have an effect on the decision to have children. An increase in the wages earned by the women or the opportunity cost of the woman's time, *W*, has opposite income and substitution effects on the number of children, with the result that the final effect is ambiguous, while an increase in income, *I*, would increase the number of children if they are normal goods. The number of children may affected by other variables, however, such as the woman's age, her work experience, education and so on.

denominator of equation [8], however, the reduction in the cost of children after the income tax reform (i.e. the tax saving generated by children) will depend on the tax rate, *t*, applicable to the taxpayer.

Micro-econometrics approaches the problem of the choice of family size by assigning probabilities to each of the alternatives in a finite, exhaustive and mutually exclusive set of options, from among which the agent can choose only one. For this purpose, a numerical value is assigned to establish the order of preferences. In our case, this is associated with the probability that a specific size of family will be chosen. In these models, then, what is explained is not the value taken by the regressand or endogenous variable, which is to say the size of the family (0, 1, 2 or more children), but the probability that an economic agent "i" will opt for a given number of children. This probability depends on the factors conditioning the process of choice (i.e. the set of characteristics of each alternative and the conditioning factors proper to each decider) and the probability distribution function assumed in each case.

In this regard, we understand that the problem of choice associated with decisions concerning family size can be represented using a hierarchical ordered model, as proposed by Cabrer, Sancho and Serrano (2001)[10]. Hierarchical ordered response models require that the first condition be fulfilled or met to move on to the second option. As Cabrer *et al.* (2001, pp. 173-174) explain, one example of this kind of model would be the case of a family deciding whether to have no children, or one, two, three or four. In general, this choice will imply a hierarchical response process, since one cannot have two children before first having one. Furthermore, the number of children will be determined by the socio-economic characteristics of the family. This model allows us to analyse not only the actual but also the potential demand for children (i.e. demand from people who for one reason or another have not yet had any children, but will eventually do so). Consequently, this analysis may clarify decision making with regard to family size insofar as it can explain both the number and the reasons leading couples to have children or not.

The individual will decide on a given option if the utility provided by that alternative is greater than the utility provided by the others. Thus, if we call *Yi* the number of children for an individual *i*, in this model, the probability of choosing one of the categories of Y_i is defined as follows:

$$\text{Prob}\,(Y_i = 0 / X_i, \beta, c) = F(c_1 - X_i\beta)$$

$$\text{Prob}\,(Y_i = 1 / X_i, \beta, c) = F(c_2 - X_i\beta) - F(c_1 - X_i\beta) \qquad [9]$$

[10] As explained in Wooldridge (2001) and Wooldridge (2002) decisions concerning family size can also be modelled as a case of a recount dependent variable using a *Poisson* regression. The results obtained from such models are, however,

$$\text{Prob}\,(Y_i = 2 / X_i, \beta, c) = F(c_3 - X_i\beta) - F(c_2 - X_i\beta)$$

$$\text{Prob}\,(Y_i = 3 / X_i, \beta, c) = F(c_4 - X_i\beta) - F(c_3 - X_i\beta)$$

$$\text{Prob}\,(Y_i = 4 / X_i, \beta, c) = 1 - F(c_4 - X_i\beta)$$

where F(.) is the cumulative distribution or density function of the equation selected in the specification of the model. The threshold or barrier values c_m (in our case 4) and the values of β have to be estimated jointly using the maximum likelihood technique, and the following restriction must be met: $c_1 \leq c_2 \leq c_3 \leq c_4$.

4. DATA AND VARIABLES UTILIZED IN THE ANALYSIS

4.1 Data Base

The model was estimated using data from the European Union's Household Panel for Spain. The Household Panel is based on fixed panel techniques and the data is provided in annual cycles, beginning in 1994. This design means that households and individuals can be tracked over time. Each panel survey provides information on the socio-economic situation of a series of individuals aged over 16 years and grouped by households, who are identified on the basis of their personal and family characteristics at the time the fieldwork is carried out (age, sex, marital status, qualifications, employment situation, etc.), and their earnings in the year prior to the interview. In this study, we work with data for the period from 1996 through 2000.

Within these samples, we shall focus basically on married women of child-bearing age (16-44) living with their husbands, because this is the only way, first, of working with uniform decision making units, and, secondly, of identifying the husband-father and the related socio-economic data (basically income), two aspects that we believe to be decisive in the decision to have children[11]. In addition, we use longitudinal data, that is to say, we use the same sample of women for the whole years of the study, which reduces the sample to 884 women. **Table 3** shows the distribution of the sample in each year based on the number of children.

significantly poorer. Following Greene (1999), we also considered the possibility that the specification could fit a zero-altered *Poisson* model, but the results were again poorer than those obtained from the hierarchical ordered model.

[11] The father would not be decisive in the explanation of the birth rate only in the case of women choosing to have a child without a stable partner, but this is not usual in Spain. In 1998 only 14% of births took place out of wedlock. In 1999 the percentage was 16%.

4.2. Variables

The variables used in the model were selected on the basis of the theoretical demand for children and the various empirical studies explaining the birth rate. **Table 1.A** in the **Appendix** provides a summary of the studies about the influence of child tax allowances on the birth rate. Among other matters, it reflects the explanatory variables used in these studies (key among which are child tax benefits), the variable explained and the estimation method applied[12]. Based on this analysis, the variables considered are those appearing in the following function:

Family size = f (marginal child tax saving, value of the woman's time, income, female education, male education, age of the woman at marriage, age of the woman in the year of the study, duration of the marriage, length of service of the woman to her employer at marriage) [10]

In **Table 4** we present a description of each variable as well as the expected sign (i.e. the effect we expect it to have on the dependent variable), analysed in more detail below.

The dependent variable is **family size (*FAMSIZE*)**, which represents the total number of children the couple have in the years of the study (1996 - 2000).

Marginal child tax saving (*MCHILDSAVE*) This is the key independent variable in this study. Through this variable we seek to measure the expected tax saving generated by parents for an additional child (i.e. if they have an additional child in each year of the study) expressed in relation to their income. The aim, then, is to establish the marginal child tax saving relative to family income to which a couple would be entitled if they had an additional child in the year in question.

To calculate the marginal child tax saving through 1998 it is enough to calculate the deduction from the tax liability to which the couple would be entitled if they had an additional child, and only for that additional child, and then divide this amount by the couple's income in order to express it in relative terms. In the case of the marginal child tax saving since 1999, however, we need take into account that children entitle a couple to the child exemption, which reduces the general income tax base after the deduction of the personal exemption. Consequently, the saving produced by a child since 1999 will be the result of multiplying the child tax exemption by the marginal rate of tax for each taxpayer (calculated after deducting the personal exemption

[12] Table **2.A** in the **Appendix** reflects the most significant variables used in some of the main studies seeking to explain the birth rate without considering aid for dependent children.

from income[13]). This saving may be again expressed in relative terms by dividing it by the couple's income.

Before and after the reform, we have assumed that the couple will choose to file their income tax returns under the regime (joint or individual declaration) that is most favourable depending on the number of children they already have entitling them to the tax allowance.

As explained in the preceding section, we expect the impact of this variable on family size to be positive in any event, given that the child tax allowance reduces the cost of children[14].

The **age of the female at marriage *(AGEFMARR)*** is expected to have a negative effect on family size, because the older the woman when she marries, the shorter will be the time horizon in which she can have the desired number of children.

The **age of the female *(AGEF)*** in the year of the study may also be relevant to explaining the size of the family, because older women are more likely to have more children for the simple reason that they have had more time to bear them.

The **value of the woman's time** is a key variable in fertility decisions, which is intended to capture the opportunity cost of bringing up a child. In principle, this variable may be expected to exert an ambiguous influence on fertility. On the one hand, the more valuable a woman's time (because she earns a high income), the more children she will be able to afford (income effect), but in reality her higher income may be used to raise both the quantity and quality of her children. On the other hand, children are time intensive goods for the mother, and when a woman has a child she loses the opportunity to earn additional income or undertake other paid work (this opportunity is a major component of the cost of bringing up children). This produces a negative substitution effect on fertility, which is probably stronger than the income effect.

We have approximated this variable through female wages ***(WAGEF)***. In order to correct the bias resulting from the unobservability of this variable for women who do not work, we have estimated the wage for all of the women in the sample using Heckman selectivity technique by maximum likelihood. The Heckman technique has been applied in recent years in the comparative literature and, in the Spanish case, by Prieto and Álvarez (2002) or Vallés and Zárate (2005), for example. Firstly, we estimated a *probit* model for the option of working or not working. We then estimated the wage equation using ordinary least squares for those women opting to enter the labour

[13] To establish the saving produced by a second child, it would be necessary to calculate the marginal tax rate after the deduction of the personal exemption and the exemption for the first child.

[14] Whittington (1992) and Zhang, Quan and Van Meerbergen (1994: 186) argue that the size of the effect produced by this variable will depend on the size of the tax benefit in relation to the cost of a child. To gain an idea of the quantitative significance of the benefits that reduce the direct cost of children in Spain, let us note that the annual cost of bringing up a child is € 3,600/p.a. Consequently, child tax benefits hardly provide any relief for the household economy.

market, taking into account the resulting selection bias in the *probit* model. This procedure allows us to use the estimated wages to assign a wage to all women, including those who do not actually work. The sign and values of the coefficients for the variables employed are consistent with theoretical predictions and the results obtained from other empirical studies. We employed the usual variables in the literature for these estimations, consisting of the length of a woman's service to the employer, the woman's work experience, her level of education, her age, the husband's income and the number of children the couple has[15].

A priori, **income** has an indeterminate effect on fertility. As Becker (1965) notes, this is because income from work will raise the value of the agent's time, thereby increasing the cost of having children. Although earnings will also give rise to an income effect, and given that children would not appear to be inferior goods, it is likely that rising incomes will lead to higher spending on children, although this increase may be applied to raise both their number and quality. Meanwhile, the income elasticity of demand for children in quantitative terms may be small compared to elasticity with regard to quality, as is the case with other consumer durables. Moreover, Becker and Lewis (1973) and Ermisch (1980) consider that income elasticity relative to the quality of children may be high enough to cause negative income elasticity for the number of children without it being necessary for children to be an inferior good in the conventional sense. Hence, the income effect on the demand for more children may be negative.

We consider couples' after-tax income net of female earnings, ***INCCOUP,*** in order to take account of the income effect. We have excluded female earnings in order to differentiate the income effect from the price effect, which we capture through *the value of the woman's time.* An alternative measure, however, would be the after-tax income contributed by the father, ***INCMALE.***

The **woman's length of service to her employer at marriage *(WORKEXP)*** may be an important factor for the woman in the decision to have children, although the expected influence of this variable is ambiguous. If a woman has been working in a firm for only a short time, it may be risky to decide to have children due to the problems this will cause for her employer (maternity and other leave of absence, etc.), which could have some kind of employment-related comeback for the mother. In contrast, if a woman has been with a firm for some time, during which she has been able to show her professionalism and dedication to the job, she may be in a more secure position to decide to have a child. In any event, we need to take into account that the woman's work experience

[15] Some studies have suggested the possibility that the *value of women's time* may in fact be endogenous. However, we understand that the problem of endogeneity is resolved when the variable is estimated using the Heckman technique, because an estimated wage is assigned to all women, including those who are do not work in the market, as explained in the text. Meanwhile, the variables representing the level of a woman's education and her participation or otherwise in the labor markets cannot be included in the estimation of fertility because of the multicolinearity problems that would arise. This is what Whittington (1992 and 1993) does in his studies of fertility.

is directly related to her human capital, and therefore this variable may well have a negative impact on the desire to have children.

The **duration of the marriage *(TIMEMARR)*** should have a positive effect on the size of the family, because the longer a couple have been together the more likely it is that they will have children.

5. RESULTS

Having analysed the variables to be tested, we estimated the family size achieved by decision making units in which the women are married and of child-bearing age using a hierarchical ordered response model, described in section 3, and a pool of microdata. Before we go on to comment on our results, we wish to stress that they should be treated with some caution, particularly in view of our approximation to the tax variable analysed and our approximation to the value of the woman's time to correct the selection bias resulting from the unobservability of wages for women who are not in paid work.

In the first place, the results obtained (see **Table 5)** are consistent with our theoretical expectations and the empirical evidence obtained from other applied studies[16].

As the results of other empirical studies in this area show[17], the **marginal child tax saving** has a positive influence on the decision to have children because of the lower cost of children associated with the deduction.

The **age of the female at marriage** has a clearly negative effect on family size. This variable captures biological factors affecting female fertility, reflecting the fact that the later a woman marries the less time she will have to bear children, and the smaller the family is likely to be. This result is found in studies such as Cigno and Ermisch (1989) or Barmby and Cigno (1990).

Also as expected, the **age of the female** in the year of the analysis positively affects family size, because the older the woman is the more likely she is to have more children, since she has had more time to become pregnant and bear children. Similar results were obtained in applied studies such as Rosenzweig and Schultz (1985), Barmby and Cigno (1990).

[16] The descriptive statistics for the explanatory variables are provided in **Table 3.A of the Appendix**.

[17] Whittington, Alm and Peters (1990), Whittington (1992, 1993) and the other papers included in **Table 1.A. of the Appendix**. The earlier Spanish studies, Zárate (2001) and Vallés and Zárate (2003 and 2005), also give this result.

Meanwhile, the higher the **value of the woman's time**, the lower the couple's demand for children. This outcome was expected from a theoretical standpoint and has also been observed in the main empirical studies of fertility[18].

The **length of service of the woman to her employer at the time of marriage** was also found to be relevant in the model and to exert a largely negative impact on family size because the human capital acquired through paid work in a firm conditions and disincentivizes demand for children. The same result was obtained by Cigno and Ermisch (1989).

Another variable that has a significant influence on family size in the model is ***income***[19]. Nevertheless, neither the *duration of the marriage*, nor *male education,* were significant to explaining the size of families.

We also tested the impact that the inclusion of other control variables would have on the model, including couples with an immigrant member, corporate childcare subsidies, the type of the woman's employment (permanent or not), partial or full-time work, and whether the woman works in the public or private sector. However, none of these variables was found to be statistically significant, and their inclusion in the model hardly altered our results.

The ordered model provides detailed information about the effect of the child tax savings on family size, since it permits calculation of conditioned probabilities for having a given number of children given the average tax saving, as compared to a scenario in which there is no such benefit. These data are presented in **Table 6**.

As shown in the upper part of **Table 6**, if we compare the probabilities of having children with and without the tax saving, it appears that the child tax saving provides a greater incentive to have two children, since the difference between the two probabilities is greater. This is also true if we compare the "cumulative" probabilities of having different numbers of children. This fact suggests that concentrating potential additional resources on deductions for the second child could be an appropriate strategy to incentivize fertility, since it provides a more effective stimulus. We may note here that the majority of couples would prefer to have two children according to the Spanish National Institute of Statistics Fertility Survey (1999), but that relatively few of them

[18] The value of the woman's time was found to be significant in studies such as Schultz (1969), Jones (1981), Shields and Tracy (1986), Ermisch (1987), Álvarez (1997).

[19] While the income variable has a positive influence on fertility in papers such as Cigno and Ermisch (1989) or Vallés y Zárate (2005), it is generally negative in others such Hotz and Miller (1988), Borg (1989), Barmby and Cigno (1990) and Whittington (1992). This is a reflection of the trade-off between the quality and the quantity of children. Our results did not change significantly when we measured income as *INCMALE* rather than *INCCOUP*.

actually do so in practice. In any event, differences in the probability of having children with and without the tax saving are so small that its effect on the demand for children is negligible. The probability of having two children when the all of the variables take average values is 0.542537, but the tax saving generated only contributes 0.029076 points out of 1, while the remainder is attributable to the remaining five variables. This may indicate that the incentive provided by the tax saving is weak compared to other considerations, probably because the tax allowance offered is so small.

Because we have used a micro-data base, we have been able to examine whether the child tax saving has different effects on fertility in different subgroups of the population. This allows us to establish the effect the child tax saving has on families with different levels of income and education, different employment conditions for the mother, age ranges, etc. To this end, we split the sample into two groups based on age in order to find out whether any of the determining factors of fertility, and especially the tax variable, exhibited a divergent pattern in the age group considered (i.e. behaviour patterns that could be masked by a joint analysis for all women of child-bearing age). In order to maintain a degree of simplicity, women of child-bearing age (16 to 44 years) were divided into those between 16 and 29 years and those between 30 and 44, and the proposed model was again estimated for each group. The econometric results obtained are shown in **Table 7**, which shows that only *income* ceases to be significant for women in the younger age range. The *marginal child tax saving* is also of less significance for younger women. These results suggest that financial considerations are not a determining factor for younger women deciding to have children, and that the woman's appraisal of her work (in terms both of the value of her time and of her experience in her firm) are more relevant to the decision, in addition to age-related variables. In any event, the results obtained for this first age band may be influenced by the fact that the age at which women enter the labor market is relatively close to the upper limit of the sample. Thus, all of the variables in the original model are found to be significant for the demand for children among women in the second age band.

Different results are also obtained if the sample is split into four groups based on family income (i.e. by income ranges), as shown in **Table 8**. The *marginal child tax saving* and *income*, on the one hand, and the *value of the woman's time,* on the other, cease to be significant variables for

low and high income couples, respectively[20], while *work experience* is always significant, positively influencing the low income range.

These results suggest that when a couple's income is very low, economic variables do not determine family size and the decision is conditioned more by the age of the woman and the value of her time. Thus, low income couples are not likely to have children in order to enjoy a small benefit in their income tax returns, especially since income, or the lack of it, is not a determining factor in their decision. Moreover, in this low income bracket, we have found that work experience has a positive influence on family size, perhaps because when incomes are low the woman has less to lose in the event of any reprisals from her employer after maternity leave. Alternatively, this may be because women in such families do not work, this being the reason for their low incomes.

When couples enjoy higher incomes, in contrast, economic variables have a greater influence on the decision to have children, and even a small tax break may encourage them or reinforce the decision to increase the size of the family. Nevertheless, the value of the woman's time loses significance in these circumstances, perhaps because her professional career is important at these income levels, and such mothers tend to return to work soon after giving birth, entrusting the care of their children to the market (e.g. kindergarten or a nurse) because they can afford to do so.

Table 8 also shows that the marginal effect of the child tax saving increases, in general, with family income, while the effects of age and the value of the woman's time declines in line with the couple's income.

6. CONCLUSIONS

Since the Spanish fiscal system adopted personal income tax, the amount of child allowances has been updated or modified fairly frequently, and changes have also been made in the manner the deductions are applied (initially the allowance was deducted from tax payable, but it now reduces taxable income due to a change in the configuration of the tax, which is no longer levied on taxpayers' earnings but on the income remaining to them after meeting basic individual and family needs). These changes in the amount and philosophy of the child tax allowance, together

[20] We have not broken down the last income quartile to avoid excessively reducing the subsamples.

with the fact that the deduction differs depending on the order of birth of each child, have led us to examine the evolution of this benefit and the number of children families demand.

To this end, we have utilised data provided by the European Union's Household Panel for Spain, which allowed us to explain family size for married women of child-bearing age who live with their husbands from 1996 through 2000, using a hierarchical ordered response model, because we believe that decisions about family size are based on a process of ranked choices (for example, a couple cannot have two children without first having one). This model also allows us to approximate not only actual but also potential demand, which is appropriate from the viewpoint of incentive policy design, because it embraces the whole population at whom the tax stimulus may eventually be aimed.

On the basis of the results obtained from the econometric estimation of the model, we may conclude, in general, that the representative variables for the hypotheses tested are relevant to explaining family size and are as expected on the basis of the behaviour patterns predicted by economic theory. Thus, the *marginal child tax saving* incentivizes demand for children, although the effect is modest, probably as a result of the low level of the aid provided. Meanwhile, the *age of the female at marriage,* the *value of the woman's time,* and the *woman's length of service to her employer at marriage* have a significantly negative effect on family size, while the *age of the female* and *income* have a positive influence on the demand for children.

The fact that the *marginal child tax saving* basically affects the likelihood of a couple's having two children suggests that an appropriate design for a tax incentive applied by way of child benefits should concentrate on raising the deductions allowed for the second child, since this would raise the effectiveness of the tax benefit. Since the Fertility Survey (1999) reveals that couples in Spain wish, on average, to have two children, but many in fact have only one, an effective design for the allowance could help to bring wants into line with realities.

When we subsequently replicated the maximum likelihood estimations for different age and income groups, we obtained evidence that the women of whatever age and income (of the couple) do react to the fiscal stimuli provided, except when incomes are very low. Even though other variables were found to be more relevant in our explanatory model for fertility in Spain, we believe that the ease and speed with which it is possible to act on tax variables compared to other alternatives such as cultural habits should encourage government to consider using this tool.

In light of the above, and as we have in fact deduced from the estimation of the econometric model, it is very likely that the most effective design would concentrate potential additional resources on tax allowances for the second child. A policy of this kind would also have the advantage of incentivizing couples to have the number of children they want.

Finally, we would stress that our objective is to assuage the grave problem represented by Spain's very low birth rate, and our conclusions are therefore intended basically to raise the effectiveness of the child tax allowance. However, public decision makers should be aware of the possible costs in terms of equity inherent in the instrumentation of such measures when they come to evaluate possible reforms. We believe that these would be small, but their importance would depend on the intensity with which our recommendations to boost the second child allowance were applied. In any event, such effects are common to all incentive measures, and basic issues of equity can be guaranteed by applying the principle of the previously defined capacity to pay. Thus, we confine ourselves to proposing additional stimuli.

Table 1: Fertility rates by country and period*

	1988	1990	1992	1994	1996	1998	2000	2002
Belgium	1.57	1.62	1.65	1.56	1.59	1.59	1.66	1.62
Denmark	1.56	1.67	1.76	1.81	1.75	1.72	1.77	1.72
Germany (1)	1.46	1.45	1.30	1.24	1.32	1.36	1.38	1.31
Greece	1.50	1.39	1.38	1.35	1.30	1.29	1.29	1.25
Spain	1.45	1.36	1.32	1.21	1.17	1.15	1.24	1.25
France	1.81	1.78	1.73	1.66	1.72	1.75	1.88	1.89
Ireland	2.17	2.11	1.99	1.85	1.88	1.95	1.90	1.97
Italy	1.36	1.33	1.31	1.21	1.20	1.19	1.24	1.26
Luxembourg	1.51	1.61	1.64	1.72	1.76	1.68	1.76	1.63
Netherlands	1.55	1.62	1.59	1.57	1.53	1.63	1.72	1.73
Austria	1.45	1.46	1.51	1.47	1.45	1.37	1.36	1.40
Portugal	1.62	1.57	1.54	1.44	1.44	1.48	1.55	1.47
Finland	1.69	1.78	1.85	1.85	1.76	1.70	1.73	1.72
Sweden	1.96	2.13	2.09	1.88	1.60	1.50	1.54	1.65
United Kingdom	1.82	1.83	1.79	1.74	1.72	1.71	1.64	1.64
Cyprus	2.41	2.42	2.49	2.23	2.08	1.92	1.64	1.49
Czech Republic	1.94	1.89	1.72	1.44	1.18	1.16	1.14	1.17
Estonia	2.26	2.04	1.69	1.37	1.30	1.21	1.34	1.37
Hungary	1.81	1.87	1.78	1.65	1.46	1.33	1.32	1.30
Lithuania	2.02	2.03	1.94	1.57	1.49	1.46	1.39	1.24
Latvia	2.16	2.01	1.73	1.39	1.16	1.10	1.24	1.24
Malta	2.07	2.05	2.12	1.89	2.10	..	1.72	1.46
Poland	2.13	2.04	1.93	1.80	1.58	1.44	1.34	1.24
Slovenia	1.63	1.46	1.34	1.32	1.28	1.23	1.26	1.21
Slovakia	2.15	2.09	1.98	1.66	1.47	1.38	1.30	1.19

*Average number of children per woman of child-bearing age.
(1) Including the former GDR since 1991.
Source: EUROSTAT, Newcronos data base

Table 2: Evolution of Child income tax allowance* (in euros)

Year	1st child	2nd child	3rd child	4th child and over
1979	36,06	36,06	36,06	36,06
1980	48,08	48,08	48,08	48,08
1981	60,10	60,10	60,10	60,10
1982	72,12	72,12	72,12	72,12
1983	78,13	78,13	78,13	108,18
1984	84,14	84,14	84,14	114,19
1985	90,15	90,15	90,15	90,15
1986	96,16	96,16	96,16	96,16
1987	100,97	100,97	100,97	100,97
1988	105,78	105,78	105,78	105,78
1989	108,78	108,78	108,78	108,78
1990	114,19	114,19	114,19	114,19
1991	120,20	120,20	120,20	120,20
1992	120,20	120,20	120,20	120,20
1993	120,20	120,20	120,20	120,20
1994	120,20	120,20	120,20	120,20
1995	124,41	124,41	150,25	180,30
1996	129,22	129,22	156,26	186,31
1997	132,82	132,82	160,47	191,12
1998	150,25	210,35	300,5	300,5
1999	1.202,02	1.202,02	1.803,04	1.803,04
2000	1.202,02	1.202,02	1.803,04	1.803,04
2001	1.202,02	1.202,02	1.803,04	1.803,04
2002	1.202,02	1.202,02	1.803,04	1.803,04
2003	1.400	1.500	2.200	2.300
2004	1.400	1.500	2.200	2.300
2005	1.400	1.500	2.200	2.300

* Between 1979 and 1998 deductions were made from the tax liability, while they have been applied to the tax base since 1999. In any event, the allowance is applied for each dependent child as defined in prevailing tax regulations for each year.

Between 1999 and 2002 supplementary exemptions of € 300 per child aged under 3 years and € 150 per children aged between 3 and 16 existed in addition to the child exemption.

These increments for children under 16 years of age were eliminated in 2003, although an exemption of € 1,200 for care of children aged under three was included. In 2003 a maternity allowance of € 1,200 was also implemented, to which working women with children of less than three years of age were entitled.

Table 3: Distribution of the sample

Number of	Total	In 1996	In 1997	In 1998	In 1999	In 2000
Married women of child-bearing age living with husband	4420	884	884	884	884	884
childless	502	157	121	93	72	59
one child	1300	258	265	268	262	247
two children	2055	368	391	412	431	453
three children	460	83	88	91	97	101
four children	69	12	13	14	14	16
five or more children	34	6	6	6	8	8

Source: Own elaboration calculated on the basis of PHOGUE.

Table 4: Model variables and expected effects

VARIABLE	DESCRIPTION OF THE VARIABLE	EXPECTED EFFECT
DEPENDENT VARIABLE		
FAMSIZE	Number of children	
INDEPENDENT VARIABLES		
MCHILDSAVE	Tax saving to which the parents would be entitled for an additional child * 100 / family income.	+
AGEFMARR	Age of the female at marriage.	-
AGEF	Age of the female.	+
WAGEF	Estimated wage for all women in the sample based on the Heckman maximum likelihood selectivity technique.	?-
WORKEXP	Length of the woman's service to her employer at marriage (years).	?
INCCOUP	After-tax income of the couple, net of female earnings	?+
TIMEMARR	Duration of the marriage (years)	+
FLFORCE	*Dummy* taking a value of one if the female has a job and zero otherwise.	?-
FEDUC	Qualitative variable taking the value assigned to the educational level of the female in the Household Panel survey = 2, functionally illiterate and without studies = 5, primary education (initial or mid-stages of the Basic General Education cycle) = 8, 1st level of secondary education (elementary baccalaureate, 2nd stage Basic General Education and Mandatory Secondary Education) = 9, first level occupational training = 11, second level occupational training and module 3 of occupational training = 12, second level of secondary education (upper baccalaureate, preparatory university studies) = 15, short cycle university diploma and equivalent higher educational studies = 17, university degree or recognised equivalent	?-
MEDUC	Qualitative variable taking the value assigned to the educational level of the male in the Household Panel survey = 2, functionally illiterate and without studies = 5, primary education (initial or mid-stages of the Basic General Education cycle) = 8, 1st level of secondary education (elementary baccalaureate, 2nd stage Basic General Education and Mandatory Secondary Education) = 9, first level occupational training = 11, second level occupational training and module 3 of occupational training = 12, second level of secondary education (upper baccalaureate, preparatory university studies) = 15, short cycle university diploma and equivalent higher educational studies = 17, university degree or recognized equivalent	?-
INCMALE	After-tax income earned by the man	?+

Source: Own calculations.

Table 5: Results of robust econometric estimations (error and covariance) for family size (Hierarchical ordered response model, 1996-2000)

	Coefficient	z-statistic
MCHILDSAVE	0.1628632	4.33
AGEFMARR	-0.2099329	-22.37
AGEF	0.2260146	30.22
WAGEF	-0.0006724	-5.59
WORKEXP	-0.1012556	-4.40
INCCOUP	7.81E-08	3.57
LR index (Pseudo-R^2)	0.159539	
Log likelihood	-4777.833	
Restr. log likelihood	-5684.778	
LR statistic (df)	1813.89	
Probability(LR stat)	0.000	
Schwarz criterion	2.180906	
Hannan-Quinn criter.	2.171542	
Avg. log likelihood	-1.080958	
Akaike info criterion	2.16644	
LIMIT_1:C(7)	-0.3796475	
LIMIT_2:C(8)	1.871055	
LIMIT_3:C(9)	4.869978	
LIMIT_4:C(10)	6.85921	

Source: Own calculations.

Table 6: Conditioned Probabilities of having children

	If the marginal child tax saving takes the current average value (1)	If there is no tax saving (2)	Gap: (1) - (2)
Probability of having			
zero children	0.061415	0.07163	-0.010215
one child	0.321779	0.351204	-0.029425
two children	0.542537	0.513461	0.029076
three children	0.0634115	0.054476	0.0089355
four children	0.010855	0.00922	0.001635
Cumulative probability of having			
one child	0.9385825	0.928361	0.0102215
two children	0.6168035	0.577157	0.0396465
three children	0.0742665	0.063696	0.0105705
four children	0.010855	0.00922	0.001635

Source: Own calculations.

Table 7: Results of robust econometric estimations (error and covariance) by age bands*
(Hierarchical ordered response model, 1996-2000)

	16-29 years	*30-44 years*
MCHILDSAVE	0.3075806 (1,71)	0.1393937 (3.64)
AGEFMARR	-0.4273472 (-9.89)	-0.2047734 (-20.73)
AGEF	0.3937735 (8.74)	0.1833687 (20.49)
WAGEF	-0.0016972 (-3.40)	-0.0006035 (-4.73)
WORKEXP	-0.3059356 (-3.08)	-0.081924 (-3.30)
INCCOUP	4.29E-08 (0.52)	7.73E-08 (3.29)

Source: Own calculations.

* z-statistics appear in parenthesis

Table 8: Results of robust econometric estimations (error and covariance) by family income bands*

(Hierarchical ordered response model, 1996-2000)

	Less than €9,015.18	***Between €9,015.18 and €18,030.36***	***Between €18,030.36 and €27,045.54***	***Over €27,045.54***
MCHILDSAVE	0.0425409 (0.48)	0.256691 (4.12)	0.351002 (3.34)	0.3390366 (2.46)
AGEFMARR	-0.2455694 (-12.56)	-0.2272137 (-15.35)	-0.1625269 (-7.73)	-0.11680368 (-6.53)
AGEF	0.2495059 (15.43)	0.2173887 (18.55)	0.20553 (12.96)	0.2480772 (12.93)
WAGEF	-0.0015925 (-4.81)	-0.0008604 (-3.81)	-0.0003029 (-1.19)	0.0000529 (0.2)
WORKEXP	0.0767216 (2.16)	-0.1646692 (-3.16)	-0.0870029 (-2.23)	-0.1548752 (-3.89)
INCCOUP	2.89E-07 (1.63)	-4,87E-08 (-0.53)	2.96E-07 (3.73)	1.01E-07 (2.66)

Source: Own calculations.

* z-statistics appear in parenthesis

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APPENDIX

Table 1.A: Papers explaining fertility on the basis of tax variables*

	Ermisch (1987)	Whittington, Alm and Peters (1990)	Hyatt and Milne (1991)	Georgelis and Wall (1992)	Zhang, Quan and Van Meerbergen (1994)	Gohmann and Ohsfeldt (1994)
Dependent variable	Natural logarithm of the birth rate conditioned by the number of existing children	General birth rate: birth rate per 1,000 women between 15 and 44 years of age	Logarithm of the total birth rate	Nº of births * 1,000/ women between 15 and 44	Total birth rate	General birth rate Total birth rate
Independent variables	• Additional allowance for one child • After-tax male wage per hour • Female/male after-tax wage per hour • Employment rate for the cohort born in year k • Relative size of the generation of the cohort born in k • Male unemployment rate • CPI • Cost of housing • Portion of cohort k at risk of having child nº j at age a	• Personal dependent child exemption x average marginal tax rate • Income: man's wage + family capital income • Cost of time: estimated female wage net of taxes • Child mortality rate • Unemployment • Immigration rate • II GM: absence of young men (*dummy*) • Contraceptive pill (*dummy*) • Time trend • Urban population • Race Alternative variables: • Female education instead of female wages	• Child subsidies • Deduction from the tax liability for low income families • Paid maternity leave • Male income • Whether the woman works or not • Female wage	• Personal dependent child exemption x average marginal tax rate • Squared exemption • Family income net of female earnings • Female wage net of tax • Child mortality • Unemployment rate • Immigration rate • II GM • Pill (dummy) • Abortion (dummy)	• Child exemption • Child Social Security benefit • Child deduction from the tax liability (refundable) • Paid maternity leave • Male income • Female wage • Child mortality • Unemployment rate • Female immigration • II GM (measures the absence of men in the war years) • Contraceptive pill • Time trend • Female education	• Personal dependent child exemption x average marginal tax rate • Squared exemption • Family income net of female earnings • Female wage after tax • Child mortality rate • Unemployment rate • Immigration rate • II GM • Pill • Abortion • Trend
Period	1971-85	1913-1984	1948-86	1913-1984	1921-1988	1915-88
Country	United Kingdom	USA	Canada	USA	Canada	USA
Method	Two-step Engle Granger Error Correction Method	Ordinary Least Squares First order autocorrelation correction method: Yule-Walker.	-	Minimum Generalised Squares First order autocorrelation correction method: Yule-Walker	Minimum Generalised Squares Cochrane-Orcutt first order autocorrelation correction method.	-

(Continued)

Table 1.A (continued): Papers explaining fertility on the basis of tax variables

	Cigno and Ermisch (1989)	Barmby and Cigno (1990)	Whittington (1992)	Whittington (1993)	Gauthier and Hatzius (1997)	Dickert-Conlin and Chandra (1999)
Dependent variable	Family size for married couples staying together 10 years Frequency of births: proportion of children born in the first ten years of marriage whose births occurred in the first 3 or 4 years	Probability of birth in year t Family size in 10 years of marriage Timing of first birth	Binary measure of births (1 if the couple has a child and 0 if not)	Binary measure of births (1 if the couple has a child and 0 if not)	Logarithm of the total fertility rate in country i and year t+1	Dummy taking a value of 1 if a birth occurs in the last week of December and 0 if it occurs in the first week of January
Independent variables	• Inverse of child benefits • Husband's lifetime earnings • Husband's earnings after taxes • Type of job before the first child: 6 dummies per classification • Generations of women born every 5 years • Age of the woman at marriage • Years of non-mandatory female education • Years' work experience before marriage • Woman's wage after taxes	• Tax benefits for the first child • Tax benefits for the second child • Husband's gross annual earnings • Woman's occupation before having children: 5 dummies for five job categories from unskilled to highly skilled • Man's/woman's wage • Age of the woman at marriage • Year of birth of the woman • Woman's work experience at marriage • Years of non-mandatory education of the woman	• Personal child exemption x marginal tax rate • Household income after taxes: man's wage + family capital income • Cost of time: female wage net of taxes (2-stage Heckman) • Child mortality rate • Unemployment • Immigration rate • IIGM: absence of young men (*dummy*) • Contraceptive pill (*dummy*) • Time trend • Urban population	• State child exemptions x estimated marginal tax rate (instrumental) • Federal child exemption * estimated marginal tax rate • Deduction from tax liability for childcare • Family income net of female earnings • Female wage estimated per Heckman technique • Woman's age	• Family benefits for 1, 2 and 3 children / average male earnings • Duration of maternity leave • Remuneration during leave • Logarithm of male wage • Logarithm of female wage • Unemployment rate • 1st order difference in the unemployment rate	• Tax saving obtained by the family if they have a child in the last week of December or the first week of January • Family income • Mother's earnings • Mother's age • Mother's 1st or 2nd child • Mother's education • Mother's marital status • Urban resident • Afro-American Supplementary variable: • Family income x tax saving on bringing birth forward
Period	1980	1954-1980	1979-1983	1982-85	1970-90	1979-93
Country	United Kingdom	United Kingdom	USA	USA	22 OECD countries	USA
Method	Ordered probit	Maximum likelihood	Conditional Logit	Conditional Logit (fixed effects)	Generalised Moments Method (GMM)	*Probit*

* These are the most relevant papers, although others could be consulted, such as Blau and Robbins (1989), Blanchet and Ekert-Jaffe (1994), and Ekert (1986). Other papers, meanwhile, consider the effects of a range of social benefits on fertility, including Entwisle and Winegarden (1984), Caudill and Mixon (1993), Winegarden and Bracy (1995), Stevans (1996), Fairlie and London (1997), Hoffman and Foster (1999), Rosenzweig (1999), Grogger and Bronars (2001), and Phipps (2000).

Source: Own calculations.

Table 2.A: Main variables utilised in papers explaining fertility without applying explanatory tax variables*

VARIABLE	PAPERS USING THE VARIABLE
Female's age	Ben-Porath (1973), Butz and Ward (1979), Joseph (1980), Ward and Butz (1980), Newman and McCulloch (1984), Rosenzweig and Schultz (1985), Schultz (1994), Álvarez (1997), Llorente *et al.* (1998), and Verdugo and Cal (2000)
Rate of female employment	Freedman (1963), Gregory, Campbell and Cheng (1972), Conger and Campbell (1978), Butz and Ward (1979), Joseph (1980), Ermisch (1980), Ward and Butz (1980), Winegarden (1984), Shields and Tracy (1986), Chen, Bendaraf, Hicks and Johnson (1987), Groot and Pott-Buter (1992), Álvarez (1997), Masih and Masih (2000), and Verdugo and Cal (2000)
Female's income	Freedman (1963) Joseph (1980), Ermisch (1980), Ward and Butz (1980), Winegarden (1984),Groot and Pott-Buter (1992), and Schultz (1994) Llorente *et al.* (1998)
Male's income	Ben-Porath (1973), Conger and Campbell (1978), Butz and Ward (1979), Gregory, Campbell and Cheng (1972), Ermisch (1980), Joseph (1980), Ward and Butz (1980), Rosenzweig and Schultz (1985), Groot and Pott-Buter (1992), Schultz (1994), Shields and Tracy (1986), Llorente *et al.* (1998), and Masih and Masih (2000)
Female's work experience	Freedman (1963), Wolfe (1980)
Female education	Ben-Porath (1973), Conger and Campbell (1978), Joseph (1980), Newman and McCulloch (1984), Rosenzweig and Schultz (1985), Groot and Pott-Buter (1992), and Álvarez (1997)
Male education	Ben-Porath (1973), Joseph (1980), Newman and McCulloch (1984), and Álvarez (1997)
Child mortality	Gregory, Campbell and Cheng (1972), Ben-Porath (1976), Shields and Tracy (1986), and Masih and Masih (2000)
Race	Gregory, Campbell and Cheng (1972), and Joseph (1980)

*Selection of key papers.
Source: Own calculations.

Table 3.A: Characteristics of the sample

	MEAN	MEDIAN	MAXIMUM	MINIMUM	STANDARD DEVIATION
FAMSIZE	1.63	2.00	4.00	0.00	0.90
MCHILDSAVE	1.01	0.98	4.75	0.00	0.74
AGEFMARR	23.34	23.00	39.00	14.00	3.69
AGEF	34.62	35.00	44.00	19.00	5.11
WAGEF (€)	7.79	7.32	14.50	0.39	317.17
FEDUC	9.02	8.00	17.00	-9.00	3.70
WORKEXP	0.43	0.00	15.00	0.00	1.48
INCCOUP (€)	13833.95	11959.68	126747.08	0.00	1509617.00
MEDUC	8.79	8.00	17.00	-9.00	3.78
TIMEMARR	11.28	11.00	29.00	0.00	5.86

Source: Own elaboration calculated on the basis of PHOGUE.

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