ESTUDIOS SOBRE LA ECONOMIA ESPAÑOLA

Do child tax allowances and social benefits affect the decision to have children? An empirical study in Spain

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EEE 149

November 2002

FEDEA
Fundación de Estudios de Economía Aplicada

http://www.fedea.es/hojas/publicado.html

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October 2002

ABSTRACT

This paper presents an aggregate estimation based on time series data for Spain (1979-1999) of the effects of dependent child tax allowances and social benefits (i.e. income tax allowances for children and social security benefits for each dependent child, one-off birth payments and paid maternity leave) on the decision to have children. This is the first study of its kind to have been carried out in Spain.

The majority of these *child tax allowances and social benefits* are relevant in explaining fertility. Other key factors affecting the decision to have children are the *value of women's time* and the *rate of unemployment. Housing costs* and a measure of *changes in married couples' disposable income resulting from amendments to personal income tax regulations* also appear to have significant effects on the estimation.

KEY WORDS: Dependent child tax allowances and social benefits, Spanish personal income tax, Social Security, demand for children, cost of children.

J.E.L. CLASSIFICIATION: H24, H31, H5

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1. INTRODUCTION

Falling birth rates, contributing to a decline in organic growth and relative ageing of the population, are common to all economies, especially in the developed countries. Both of these issues will have major social and economic consequences in future years, amply justifying an analysis of the phenomenon.

The birth rate in Spain has plunged since the second half of the 1970s and is now below the replacement level (average births per woman in Spain number 1.17, while 2.1 births per woman are necessary to ensure generational replacement). Though the downward trend in fertility may now have bottomed out, as noted by Fernández (1998: 95), with women deferring birth into their thirties, the signs are not sufficient to sustain a lasting recovery, and an increase in the fertility of younger women remains a crucial factor.

As Delgado (1993: 201) points out, declining births have been accompanied by a considerable postponement of marriage (lowering the stock of married women of child-bearing age), as a result of which the age at which women have children has risen. As explained by sociologists and demographers alike, these phenomena are linked to underlying causes such as the extension of the school leaving age and the higher occupation rate of women in the labor market, which has encouraged them to defer the timing of births. Moreover, certain specific problems (e.g. unemployment, job insecurity, and high cost of domestic property) affect the integration of young people and reduce the number of marriages, with the latter not being offset by analogous cohabitation arrangements and births to unmarried women. Though they have increased in recent years, non-marital births are rare in Spain. According to data from the Spanish Statistical Institute, only 14.5% of births in 1998 took place out of wedlock (10.5% in 1992), compared to 40 and 50% of total births in France and Sweden.

Thus, we are seeing a far-reaching process of lasting adaptation to changes in the situation of women and families in society, which translates into a decline in the average number of children and a long-term shift in fertility to a later age (not to mention other phenomena such as

higher rates of divorce, abortion and voluntary infertility). This is at least assumed to be the case, although such hypotheses need to be confirmed in studies such as this.

Income tax regulations commonly provide child tax allowances, while social policies tend to establish benefits for dependent children and similar measures, and all these may implicitly affect the decision to have children. As Pechman (1983) notes, however, such measures are rationalized not as policies aimed at influencing fertility decisions but as a means of providing economic relief to low-income families. Even so, they may be a relevant factor in explaining the birth rate together with other variables such as the value of women's time and income levels.

Since Becker (1960) began the study of fertility in the field of Economics of the Family, numerous papers have tried to explain the decision to have children by examining a wide variety of demographic and socio-economic variables. It was not until Ermisch (1987), however, that child tax allowances and social benefits were included in the analysis (1), despite the fact that other scholars, such as Schultz (1969) and Cigno (1986), had already raised the theoretical possibility that public policy might affect fertility, while Aaron and Pechman (1981) had noted that tax measures had frequently been shown to have a significant impact on behaviour, even in areas where economic benefits and costs were not thought to play a major role, and it was additionally evident that the governments of numerous countries had acted as if they believed they could influence the birth rate using tax incentives (2).

Tax and social policy measures such as those described have long been used in Spain, but no empirical research has been done to relate them to fertility. This study will therefore examine aggregate data for Spain for the first time in order to establish whether tax instruments (in the form of personal income tax allowances for children) and social policy measures (dependent child benefits, one-off payments for births and paid maternity leave) in fact influenced the decision to have children in the years between 1979 and 1999 (using similar techniques, also for the first time in Spain, López Laborda and Zárate (1999) have empirically demonstrated that tax variables affected the decision to marry).

The rest of this paper is structured as follows: section 2 briefly describes the tax and social policy treatment of children in Spain between 1979 and the present. In section 3 we formulate the hypotheses to be validated, explain the construction of the variables and remark on

certain limitations in our analysis. Section 4 presents our estimations and the results obtained, which are compared with the findings from other research. The paper ends with a short section containing our concluding remarks.

2. FAMILY POLICY IN SPAIN WITH PARTICULAR REFERENCE TO TAX ALLOWANCES AND SOCIAL BENEFITS FOR CHILDREN

2.1 Income Tax Allowances for Children: Tax Benefits

Spanish tax policy has traditionally protected the family, to a greater or lesser extent, by providing income tax benefits based on the personal and family circumstances of the taxpayer.

While the taxes existing prior to 1979, the year personal income tax was first introduced in Spain, provided certain tax allowances based on family circumstances, their scope was very limited because few people were under the obligation to declare their income. Hence, the Spanish tax system cannot truly be said to have taken family circumstances into consideration in a general manner until 1979, when the current personal income tax system was implemented.

The personal income tax introduced in 1979 was structured as a synthetic, personal and progressive tax, which did take into account the reduction in disposable income caused by dependents through deductions from the final tax payable. These benefits included relief for dependent children, applicable in accordance with a series of requirements with respect to family relationships, age and income accruing to the child.

The design of the personal income tax system was changed in 1999 with the result that the tax is no longer assessed on the basis of the total income earned by taxpayers, but on the sum resulting after deductions in respect of the basic needs of the taxpayer and dependents (personal and family minimum). As a consequence, dependent children no longer give rise to a fixed deduction from the tax payable, but rather entitle the taxpayer to exemptions in the tax assessment basis. This means that the tax savings generated by children now depend on the taxpayer's marginal rate. Savings are therefore greater the higher the taxpayer's marginal rate of tax, and hence his / her taxable income (a comparison of the two methods –deductions in the tax payable and in the tax assessment basis– is to be found in Zárate (2000a)).

Child tax deductions must always be made by the parent with whom the children actually live. Thus, if a couple file individual income tax returns (until 1987 married couples were required to file joint returns, but have been able to opt for either joint or individual taxation since 1988) the deductions are made proportionally by each spouse in accordance with a cohabitation rule. Table 1 below shows the evolution of child tax allowances, as well as other tax and social benefits applicable to dependent children in Spain since 1979.

(INSERT TABLE 1)

In 1992 a tax credit was introduced for child-care expenses incurred in respect of children under three years of age. This measure took effect in the 1992 tax year and remained in force until 1998, although its application was limited (in 1996 the tax credit affected only 0.79% of taxpayers and the average amount was the lowest of all deductions from income tax payable at just Ptas. 12,071) because of the highly restrictive qualifying conditions. Among the requirements, the taxpayer had to have low net earnings, the child had to be less than three years old, and both parents had to be in paid employment outside the home.

2.2 Aid for Dependent Children in Social Policy: Social Security Benefits

During the period of Franco's dictatorship, family protection was instrumented above all through direct Social Security benefits, with two types of regular payment (a monthly allowance for housewives and a child allowance), and a further two one-off payments (received at the time of marriage and upon the birth of each child). However, Social Security funding difficulties and later the priorities of the transition to democracy, coupled with a widely held belief that family policy was a Francoist policy option, led to the erosion of allowances, which were not raised after 1971 when monthly benefits for each dependent child under 18 years of age and housewives were worth Ptas. 250 and Ptas. 375, with one-off payments fixed at Ptas. 6,000 on contracting marriage and Ptas. 3,000 at the birth of a child.

All family benefits were cut in 1985 except allowances for dependent children, while a monthly supplementary benefit of Ptas. 1,050 per dependent was established for low earners (pensioners receiving minimum benefits, those in receipt of unemployment benefits and unemployed people qualifying for healthcare assistance). In 1991 the selective conception of this

family benefit was formalised in law, albeit on a universal basis, with the award of an annual benefits of Ptas. 36,000 per dependent child to all families, whether or not affiliated to the Social Security system, but on the condition that the family's total earnings were lower than a given sum. All families with annual income above the threshold were excluded from such benefit.

Meanwhile, maternity leave was extended from 12 to 14 weeks in 1980 and again to 16 weeks in 1989 with the objective of ensuring the compatibility of work and family life. In 1995 maternity benefit was raised from 75% of the contribution basis to 100%.

3. ECONOMIC ANALYSIS OF THE DEMAND FOR CHILDREN, OBJECTIVE AND HYPHOTESES APPLIED IN THE MODEL

3.1 The Economics of Reproduction

In his pioneering work on fertility, Becker (1960: 257-258) noted that children are, on the one hand, a source of psychological wealth or satisfaction for their parents, and so may be considered consumer goods, while on the other hand they are a source of financial income, and hence may also be treated as capital goods. As Cabrillo (1996: 148) points out, however, the latter aspect has scant relevance in the developed world. Becker also made clear that neither the expenses inherent in raising children nor the income they generate are fixed. Rather, both items vary with the child's age, and children may therefore be considered from the point of view of both long-term capital goods and consumer durables. Hence, the theory of demand for consumer durables is an appropriate framework within which to analyse the demand for children.

According to the economic theory of fertility developed by Becker, each family will seek to maximise a utility function, the arguments of which are the articles produced in the home using goods and services purchased in the market and the parents' time. The articles providing the family with utility are children, C, and other goods such as health, leisure, foodstuffs and so on, which we shall combine as a single aggregate good, Z.

$$Max\ U = U\ (C, Z)$$

Maximisation of the utility function is subject to a budgetary constraint:

$$I = p_C C + \pi_z Z.$$

where I is the total family income, p_C the cost of raising and educating the children, and π_z is the cost of Z.

The solution to the problem of maximising the family's utility subject to the above restriction generates the following function for the demand for children (Willis 1973, Becker 1987):

$$D_C = D_C\,(p_C,\ \pi_z,\ I,\ v) \qquad (1)$$

where v represents other variables that may influence the demand for children, such as personal preferences and education, and where D_C may equally refer to the quantity or the quality of offspring. As Becker (1960: 259) explains, this is because a family must not only decide how many children to have, but also how much it is prepared to spend on them, or what their "quality" will be (this point refers both to material resources and time spent on children). These variables are interchangeable (Becker and Lewis 1973; Becker and Tomes 1976).

The demand for children thus depends on a series of variables that affect both the returns and the costs they generate. Hence, parents will continue to have children for as long as the benefits generated by an additional child exceed the costs incurred.

The first thing that springs to mind when the cost of children, p_C, is mentioned is the financial outlay required to raise and educate them or, to put it more generally, all expenses arising from the purchase of the requisite goods and services in the marketplace. But these are not the only costs produced by a child, and at least two other items need to be taken into account. The first of these is the physical cost of pregnancy, birth and nursing to the mother, which is very difficult to quantify in economic terms, despite its undoubted relevance in many cases, as Cabrillo (1996: 149) notes. The second is the opportunity cost of having children (this basically affects women, who tend to spend more time on child-raising).

This opportunity cost is determined by the wages the mother is obliged to forego on leaving the labor market to bear and raise the child, and by the future employment-related impacts, of giving up her post to raise an infant, on her earnings and job prospects. Hence, the opportunity cost of child-bearing and raising is higher the likelier it is that the woman will be able to find well-paid work. It will therefore be much lower for an unskilled than for a highly skilled woman.

3.2 Objective and Hypotheses Used in the Model. Variables: Description and Source.

A large part of the literature on fertility is based on static models that analyse overall demand for children throughout the parents' lives or, to put it another way, total births. These models have been queried by a number of scholars (Namboodiri 1972; Ben-Porath 1973; Hotz and Miller 1988; Cigno and Ermisch 1989, and Barmby and Cigno 1990), whose critiques note the sequential nature of reproduction decisions, as well as the fact that many families fail to complete the reproductive cycle. Nevertheless, we shall work with a static, aggregate fertility model in this paper, accepting all of its inherent limitations, in the hope that it may serve as a starting point for future research.

One of the key limitations of the model we propose is that it does not take account of the differential effect that the child tax allowances and social benefits have on fertility, depending on the existing number of children in the family. Moreover, it does not analyse the effect of these allowances and benefits by reference to distinct population sub-groups or different income levels, since the objective of the research is to estimate on aggregate whether the child benefits provided by the tax and Social Security systems influence the decision to have children. In the course of our analysis, we shall also consider certain variables that affect the benefits and costs generated by children, as well as family incomes and other variables represented by the term *v* in the above expression (1) of demand for children.

The period considered in the analysis begins in 1979, when personal income tax was first introduced in Spain, and ends in 1999, the last year for which we have all appropriate data. The variables included in our analysis are those contained in the following function:

$$\begin{aligned} \textit{Fertility} = f\,(&\textit{constant, tax and social benefits per child, income tax rate,}\\ &\textit{value of female time, male income, parents' education, cost}\\ &\textit{of housing, unemployment rate, stock of married women)} \end{aligned} \qquad (2)$$

3.2.1 Dependent variable

Various alternatives exist to measure the dependent variable. We shall use the **general fertility rate, *GFR*,** which is constructed as the number of births to woman in the range between 15 and 44 years of age, assumed here to represent the child-bearing age (according to the Spanish Statistical Institute, almost 100% of births are to mothers within this age range, while births to

mothers aged between 45 and 49 represent only 1% of the total), divided by the total number women in the age range. This measure is sensitive to changes in the age and sex of the population.

A more refined variable, which we shall use as an alternative, is the **total fertility rate** or ***TFR*.** This is defined as the sum of fertility rates for different ages, where the fertility rate at a given age *x* represents the number of births to women of age *x* divided by the total number of women in that age group. The total fertility rate is thus equal to the total number of children a woman would have if she survived the whole of her child-bearing life and her fertility were in line with the rate for each age.

The question of whether the fertility rates applied should refer to the total women in the population or only to married women is significant. We have already mentioned in the introduction to this paper that non-marital births are still rare in Spain, in such a way that variables explaining marital fertility may therefore be taken as explaining the reality of total fertility. In view of this, we shall estimate the fertility rate of Spanish women independently of their marital status. In any event, the inclusion of an explanatory variable to measure the annual stock of married women would indicate whether marital status is in fact relevant to the matter of fertility.

3.2.2 Explanatory variables

The explanatory variables we have chosen to use in our model are based on Becker's (1960) theoretical analysis of demand for children and various empirical applications explaining fertility. Table 2 contains a description of each of these variables, as well as an indication of their expected effect (i.e. positive or negative impact on the dependent variable). These will be considered in depth below. The table also refers to research using the same variables (the sources used to construct the variables are available from the authors upon request).

(INSERT TABLE 2)

***Dependent Child Tax and Social Benefits*.** As explained in section 2 of this paper, a range of tax allowances and social benefits for dependent children co-existed in each of the years comprising the period studied, although a couple would not qualify for all forms of aid, since programmes are often means tested. Because of this, we have opted to work with average individuals to determine entitlements in each year. The benefits concerned are as follows:

Tax allowances. As regards public revenue, parents have been entitled to a dependent child tax allowance since 1979, as well as the deduction of child-care expenses for infants under the age of three (Zárate (1999 and 2000b) contains a discussion of the entitlements of unmarried couples, showing that until the last personal income tax reform, such people could apply the child tax allowance -as well as the deduction of child-care cost between 1992 and 1998-, and were also able to multiply the number of family units, with the reduction in progressivity that this implied. In this work, however, we shall concentrate on the dependent child tax allowance, since the latter benefit was applicable indirectly and only in specific cases -only if the couple is unmarried, which is rare in Spain-).

- **Child tax allowances or tax savings from dependent children (TS).**

We wish to establish the tax allowances the parents could apply if they had a child in each of the years for the period of the study. The calculation of this benefit must take into account that parents can only apply the dependency allowance if they file an income tax return. Nevertheless, the income threshold below which there is no requirement to declare tax changes from year to year throughout the series. Because of this, we need to know the (average) income earned by each parent (average individual) over the whole of the period from 1979 to 1999 in order to discover whether they will benefit from the tax saving in the year of the child's birth.

To this end, we have calculated the flow of real average earnings of the couple (aged between 15 and 44) for the period of the study on the basis of a function of the evolution of income with age. Secondly, it has been necessary to distribute income between each member of the couple because the total income of the couple has been assumed to be twice the average *per capita* income. This distribution has been performed in proportion to the result of multiplying the average wage ratio (women / men) for the period from 1989 to 1999 by the relative labor force participation rate (women / men) for each year (3). Thirdly, we have assessed the obligation of the individuals to file income tax returns on the basis of the income assigned to each member of the couple and prevailing tax legislation in each year. We have then calculated the tax they would be obliged to pay in order to establish whether the couple would be able to benefit from the whole of the dependent child tax allowance to which they were entitled. This procedure means taking

account of the type of tax return the members of the couple are required to file, or that which is most favourable (individual or joint returns) if they are in a position to choose.

As a result of these procedures, we find that the average couple considered for the purposes of the analysis would be able to apply the whole of the dependent child tax allowance for all of the years comprising the period except the interim between 1991 and 1994, when they would only be able to deduct half, because the woman would be exempt from the obligation to declare income tax.

It should be noted that until 1998 the dependent child tax allowance was deducted directly from income tax payable (that is to say, took the form of tax credit), as a result of which the tax saving generated was equal to the amount of the deduction. Since 1999, however, the tax allowance is deducted from taxable income (therefore taking the form of an exemption) and, accordingly, the tax saving depends on the marginal rate for the taxpayer.

It is significant that parents would be able to enjoy the tax saving in respect of their children in all of the years that the minor is defined as a dependent by tax legislation (in accordance with a series of requirements such as age, income thresholds, etc.). In this light, the child tax allowance may be viewed as a flow of tax subsidies for births and not as a one-off payment. In our estimates, we shall therefore consider the present value of the flow of tax subsidies per child, *ts*, in real terms calculated on the basis of an appropriate discount rate (we have used real returns on electricity utility bonds).

In order to calculate this present value of tax savings (***TS***), we suppose that individuals assume that the legislation prevailing in the year t, together with the average income assigned to the parents, the CPI, and the discount rate, will remain constant over the whole period of the child's dependency:

$$TS_t = ts_t + ts_t \frac{\left(1+IPC^t\right)}{\left(1+dto_r{}^t\right)} + ts_t \frac{\left(1+IPC^t\right)^2}{\left(1+dto_r{}^t\right)^2} + \ldots + ts_t \frac{\left(1+IPC^t\right)^{ALA}}{\left(1+dto_r{}^t\right)^{ALA}} = \sum_{i=0}^{ALA} ts_t \frac{(1+IPC^t)^i}{(1+dto_r{}^t)^i}$$

where t is at the same time the year considered and the year of the child's birth, and t = 1979,... 1999; i is the child's age, and i = 0, 1, ..., ALA; and ALA is the age limit for the application of the allowance, and ALA = 24 for $t \leq 1989$ and 1999, and ALA = 29 for $1990 \leq t \leq 1998$.

Both this series and others measured in monetary units are expressed in constant pesetas for 1992 using the CPI with base year 1992 as the price deflator.

- **Child-care tax credit**

Between 1992 and 1998 a tax credit was also applicable to child-care costs incurred in respect of infants under three years of age. However, the requirements were so strict (as explained in section 2) that very few people were in fact able to apply the deduction. We shall not, therefore, include the child-care tax credit in our analysis (Whittington (1992), Quan and Van Meerbergen (1994), and Blau and Robbins (1989) do include this benefit in their research).

Social benefits. As regards public expenditure, parents have been entitled to social benefits for each dependent child, a supplementary benefit for low-income beneficiaries, a one-off payment upon birth and paid maternity leave since 1979.

- **Social Security benefit per dependent child (CB)**

Until 1990, the allowance for dependent children was awarded only to people affiliated to the Social Security system, regardless of their income. Since 1991 however, the benefit has been universalised, although, as mentioned above, it is now means tested. As a result, until 1990 all of the couples included in our analysis were entitled to receive the Social Security child benefit, since the allowance did not depend on income levels, but since 1991 they have lost the entitlement because their average income calculated on the basis explained above exceeds the means test threshold.

As with the tax allowance, child benefit, *cb*, is awarded throughout the period the child is deemed to be dependent, in this case in accordance with Social Security legislation. Consequently, this allowance too may be treated as an annual flow of social subsidies for an amount *cb*, assuming the parents' average income and the amount of the benefit remain constant, rather than as a one-off payment. We shall therefore include in our estimation the present value of the flow of social subsidies per child calculated on the basis of the same discount rate as applied to the flow of tax subsidies:

$$CB_t = cb + cb\frac{(1+IPC')}{(1+dto_r^{\,t})} + cb\frac{(1+IPC')^2}{(1+dto_r^{\,t})^2} + \ldots + cb\frac{(1+IPC')^{ALB}}{(1+dto_r^{\,t})^{ALB}} = \sum_{i=0}^{ALB} cb_t \frac{(1+IPC^{\,t})^i}{(1+dto_r^{\,t})^i}$$

where *ALB* is the age limit for entitlement to receive the benefit, and *ALB* = 17 for any *t*.

- **Supplementary benefit for low-income families**

Between 1985 and 1990, a supplementary benefit was also paid for dependent children, although only to parents on very low incomes. Specifically, the beneficiaries of the supplementary benefit were defined as pensioners receiving minimum pensions, those in receipt of unemployment benefits and unemployed people entitled to receive healthcare benefits (all with dependent children). These restrictions mean that the beneficiaries of the child supplement do not fit the profile of the average individuals in our analysis, and we shall therefore not take this benefit into consideration in our estimation.

- **One-off payment per birth (PB)**

Until 1985 (inclusive) a one-off payment of Ptas. 3,000 was awarded to parents, regardless of their income, upon the birth of each child. We shall include this benefit in our estimation.

- **Paid maternity leave (MML)**

Until 1980 the mother was granted 12 weeks' paid maternity leave. This was increased to 14 weeks in 1981 and again to 16 weeks in 1990. Until 1994, maternity pay was 75% of the mother's Social Security base salary, the amount having been increased to 100% in 1995.

We have included paid maternity leave (***MML***) in the estimation using a qualitative variable reflecting months' leave on full pay. The variable thus takes the value resulting from the multiplication of percentage pay by weeks' leave divided by 4.

Table 3 shows the tax and social benefits to which our average couples would be entitled in each of the years included in the study on the basis of the above explanations and their average income.

(INSERT TABLE 3)

In view of the differing nature of the allowances described, we have followed Gauthier and Hatzius (1997) in dividing benefits into two classes. Thus, on the one hand we shall examine the impact of paid maternity leave on fertility, in view of its role in reducing the opportunity cost of having children, while, on the other, we shall group the other social and tax measures in a

general class of benefits that, from now on, we will describe as benefits reducing the direct costs of children.

Each class will be considered both in the aggregate and from the point of view of their individual components. Thus, we shall analyse the effects of maternity leave on fertility in terms of months' leave on full pay (*MML*) and separately in terms of the duration of leave (*WML*) and maternity pay expressed as the percentage ordinary pay received by women on leave (*PML*). In the same way, we shall study the impact of total benefits reducing the direct cost of children (*TB*) on fertility phenomena, as well as the individual effect of each component (*TS, CB, PB*, as well as different groupings thereof (4)).

Higher pay during maternity leave (***PML***) obviously reduces the opportunity cost of raising infants, and it is therefore likely that this variable will have a positive impact on fertility. In contrast, the expected effects of the duration of leave (***WML***) are less clear cut. The longer the period of maternity leave, the more time the mother will have for post-natal recovery without forfeiting her job, but at the same time extended absence from the workplace will be more likely to result in impairment of her skills and lost opportunities for promotion and training (aside from the potential loss of earnings). These effects would clearly have an indeterminate influence on fertility. *A priori,* the joint effect of both components (***MML***) will also therefore be indeterminate, although a positive outcome may be likely in the end.

The effects of benefits that reduce the direct cost of children on fertility are likely to be positive (regardless of whether we assess the impact of individual components or combinations), since they increase the couple's income and should therefore tend to increase the size of families. Barmby and Cigno (1990) explain that an increase in benefits for the firstborn child reduces the marginal cost of child quantity, while leaving the marginal cost of child quality constant. Such an increase in benefits per child will have positive income effects on both the quantity and the quality of the children and a positive substitution effect on their number. Nevertheless, it will also produce a negative cross-substitution effect on quality (i.e. the parents will substitute quality for quantity). This being so, the effect on fertility will, in general, be positive, while the size of the impact will depend on the materiality of the benefit in relation to the cost of a child, as Whittington (1992) and Zhang, Quan and Van Meerbergen (1994: 186) make clear.

In order to obtain an idea of the quantitative materiality of benefits that reduce the direct cost of children in Spain, we may estimate the annual cost of a child on the basis of the Continuous Family Budgets Survey for 1996. According to the survey data, the cost of a first child is Ptas. 596,160 per year, which implies that child tax allowances and social benefits provide only scant relief for household finances.

***Personal Income Tax* (*IT*).** The effects of Personal Income Tax on fertility may be assessed by measuring changes in a couple's net income from year to year resulting from modifications to income tax regulations, thereby establishing the rise or fall in family income due exclusively to changes in the tax regime. The inclusion of this variable is similar to the procedure applied by other scholars (Ermisch 1987, Barmby and Cigno 1990, Whittington, Alm and Peters 1990, Whittington 1992 and Whittington 1993) in their measurements of after-tax income or wages, with the difference that we prefer to keep taxable income constant in order to isolate the effect of changes in income tax rules from variations in income itself.

We have approximated this variable using a *dummy,* which takes a value of 1 when the couple pays less tax than in the prior year on the same income, which is to say when their net income rises as a result of changes in income tax regulations. The value of the dummy in the opposite case is 0. In order to establish values for the dummy, it is necessary to calculate the optimum tax charge the couple would pay on their average income (calculated and distributed to each member of the couple on the basis we explained in our description of how the previous variable was constructed) in each year of the study under prevailing tax regulations. We then need to establish the tax the couple would have paid in each of the prior years had they earned the same income (calculated by adjusting income for each year *t* to the equivalent value in year *t-1* by applying the CPI for year *t*). The difference between the income tax charges reveals whether the couple will pay more or less tax this year than in the year before, and therefore whether the dummy takes a value of 0 or 1.

The expected effect of this variable is positive because favourable tax treatment will increase the couple's income and, therefore, they will be able to afford more children. As we shall explain later, however, the increase in disposable income may in fact be used equally to increase the quantity or the quality of children (5).

The Value of Womens' Time or Her Opportunity to Earn Income. This variable would, *a priori,* have an ambiguous effect on fertility. On the one hand, higher earnings would enable her to have more children as a result of the income effect (though in reality higher income could equally well be used to increase the quality as the quantity of offspring). On the other, children are goods that make intensive use of their mother's time. Thus, the mother forfeits the opportunity to earn additional income or undertake other activities when she has a child, producing a negative substitution effect on fertility, which may in fact be expected to outweigh the positive income effect.

In practice, it is difficult to measure the value of a woman's time or her opportunity to earn income because the wage rate refers only to working women, as Schultz (1969) points out. This is obviously not representative of the population as a whole and, consequently, cannot be representative of the opportunity cost of women's time (however, as Cain and Dooley (1976) and Cigno and Ermisch (1989) point out, one of the advantages of using aggregate data is that the average supply of female labor can be related to the observed average wage, which is not possible in the case of individual data because the wage rate is only observable for working women). Furthermore, annual earnings do not provide a good measure of that opportunity cost either, because many women work only part-time or for only part of the year. The best solution to these difficulties may be to use the rate of female participation in the labor market, or even education, as Handa (2000) does, as a proxy for this measure. As explained below, however, education may influence fertility by changing tastes (through better health and nutrition) and increasing the use of contraceptives, and it therefore captures other effects apart from those related to income. Also, the rate of female unemployment is high in Spain and therefore education may not be a good proxy for the opportunity of women to earn income. In view of these drawbacks, we shall reflect the value of women's time using the **labor force participation rate for women aged between 15 and 44 (*FLFPR).***

We shall also use the result of multiplying the average real salary of individuals aged between 15 and 44 (***AVW***) by the female occupation rate for the same age group as a proxy for the value of women's time, following Wachter (1975: 613). This provides a measure in terms of real

wages multiplied by the probability of finding a job, given that the woman is a participant in the labor market, which we shall call the **expected female wage (*EFW*)**.

Male Income. *A priori,* any growth in the man's income should have an indeterminate effect on fertility, because earnings from work would raise the cost of the husband's time, thereby increasing the cost of children. At the same time, it would generate an income effect and, since children do not appear to be less desirable goods, it is probable that rising income would induce the father to raise spending on his children, though the additional outlay may go to investment in either child quality or child quantity. Nevertheless, the income elasticity with regard to child quantity should be small compared to income elasticity with regard to child quality, as is the case with other consumer durables. Furthermore, Becker and Lewis (1973), Ermisch (1980) and Okun (see in Becker 1960) consider that income elasticity with respect to child quality may be high enough to contribute to negative income elasticity with regard to quantity, even though children are not less desirable goods in the conventional sense. As a result, the income effect on the quantitative demand for children may perfectly well be negative.

The man's income is also difficult to measure in reality, and we have thus again made use of proxies. **Average income of subjects aged between 15 and 44 (*IN),*** the **average wage of these subjects (*AVW*)** or even the **expected male wage (*EMW*)** measured, as for women, as the result of multiplying the average real wage of subjects aged between 15 and 44 by the male occupation rate for that age group, would all make good approximations.

We have also considered the possibility of using the **male higher education rate for men aged between 15 and 44 (*MHER*)** as a proxy for male incomes, although we do not believe this measure to be wholly appropriate. Although it is beyond doubt that education is closely related to an individual's income, it also has its own effects on fertility, and it would therefore be reasonable to obtain a less positive effect using this measure than the proxies described in the preceding paragraph (Alvarez 1997 and Schultz 1973).

Since the woman normally spends more time on child-raising, it is normally the case that male incomes have an impact on fertility via income effects. Hence the income variable may be expected to have a positive effect if children are a normal good, although the impact could

perfectly well be negative taking into consideration the effect on quality. At the same time, the main impact of the value of the mother's time on fertility should come through the price effect.

***Parents' Education*.** As we have already explained, the parents' education is intimately related to their earning opportunities (since it raises their human capital) and, consequently, to the opportunity cost of time given over to child-raising. Thus, the education of the parents should generate positive or negative income effects on the one hand (depending on quantitative and qualitative impacts), but negative substitution effects on the quantity and quality of children on the other.

Nevertheless, the education of the parents may have other significant effects on fertility. Specifically, Schultz (1969: 156) and Michael (1973) explain how education opens up parents' access to better (or cheaper) family planning information, thereby making smaller families a more practical proposition. Better education makes people more receptive to new ideas, and since birth control comprises an extensive range of techniques requiring varying degrees of precision in its use, it is an activity in which education may play an important role. Since education lowers the cost of information, it may reduce the relative cost of effective family planning. Moreover, as Michael (1973) and Handa (2000) explain, education may well influence fertility by changing the subjects' preferences via the utility function, and could even lead to substitution of the quantity of children for quality, insofar as it is highly likely that better educated the parents will spend more to educate their offspring.

Thus, the effect of the parents' education on fertility, though indeterminate, is very likely to be negative. Even so, it should be remembered that this variable, which we have approximated using the **higher education rate for the population aged between 15 and 44 (*HEDR*)**, also influences fertility indirectly via female and male incomes, but we have already measured the effects of incomes for each sex using the variables described above.

We shall also measure the effect of the parents' education by sex using the **male higher education rate (*MHER*)** and the **female higher education rate (*FHER*)**. Once again, the effects of these variables on fertility is ambiguous, although it seems probable that male education has a positive impact (though not as strong as male income) and female education a negative one.

***The Cost or Availability of Housing* (*CH*).** This variable may also affect the decision to have children, since access to housing suitable for use as a home is almost a prerequisite (Garrido 1993) for the couple to live as an independent family unit and raise their offspring. Accordingly, the higher house prices are, the greater the financial difficulties the couple will have meeting the cost of their children. Nevertheless, this trade-off between housing and children is sharpest for the most recent arrivals in the housing market, which is to say younger couples, who are precisely the people most likely to be considering starting a family. Additionally, rather than reducing the number of children, the most likely effect of this variable is to defer the timing of births (Ermisch 1987). For these reasons, and because the fertility of women aged between 15 and 44 has been estimated on aggregate (i.e. the measurement includes the fertility of both young and older women), the negative effects of housing on fertility are unlikely to be made apparent by the model.

Furthermore, high house prices will not be an obstacle to procreation for better-off couples, while they boost the wealth of owner-occupiers (De Tray (1973) in fact uses average house prices as a proxy for income). Hence, the *a priori* expected effect of this variable is, in reality, ambiguous.

In Spain, people tend to buy rather than rent housing (according to the Continuous Family Budgets Survey for 1996, 80% of housing was owner-occupied, and only 14% rented). In this light, the cost of buying a house is the relevant measure to use here. Also, it is practically impossible to buy a house without arranging finance for obvious economic reasons, and virtually all buyers in Spain take out mortgage loans. Therefore, we believe interest rates in the mortgage market provide the best measure of the accessibility of housing, rather than average house prices (for which data are in any event not available throughout the period of the study). It is, however, no simple matter to obtain a complete interest rate series that appropriately reflects the evolution of the cost of mortgage loans to house buyers since 1979. Because of this, we have used real interest rates at three months in the interbank market, since we consider this to be the complete series providing the best fit with the ideal data.

***The Unemployment Rate in the Population Aged Between 15 and 44* (*UR*).** This variable may be considered as an indicator of economic uncertainty. It is likely to have an ambiguous

impact on the fertility rate, because unemployment reduces the opportunity cost of the time spent on children and this has a positive effect on the probability of a couple's having children, though it also temporarily lowers incomes. Thus, if children are a normal good, high rates of unemployment may be expected to reduce the birth rate, or at least to defer births. This income effect probably has the more significant impact since the unemployment rate may be considered as the opposite of income from an economic standpoint.

We shall measure this variable using the **unemployment rate for the population aged between 15 and 44 (*UR*)** and the **male unemployment rate for the population aged between 15 and 44 (*MUR*)** (6). The expected effect of this variable is indeterminate, although it probably has its greatest impact on fertility through the income effect, which would indicate that the higher the rate of unemployment the fewer births.

***The Stock of Married Women* (*SMW*).** We have measured this variable as the percentage of married women aged between 15 and 44 among the total female population for the same age group, and may be a major explanatory factor for the evolution of the fertility rate in Spain. This is because marriage is the preferred route for the formation of families (Delgado 2000). Even so, wedlock can no longer be viewed as an instrument of family planning, given the much more effective and accessible methods now available, as well as the fact that the determining factors of marriage are more likely to be found in current economic and social realities, which we have already reflected in the variables described above (unemployment and job insecurity, housing difficulties, changes in the role of women that make them increasingly likely to work outside the home, etc.). Because of this, the stock of married women may not be entirely relevant to the model. If it is, however, the expected effect of the variable will in any case be positive.

The majority of empirical researchers (for example, see Simon 1969, Schultz 1969, Gregory, Campbell and Cheng 1972, De Tray 1973, Ben-Porath 1976, Haines 1977, Schultz 1978, Olsen 1980, Olsen 1983, Rosenzweig and Schultz 1983, Shields and Tracy 1986, Whittington, Alm and Peters 1990, Eldin 1994, Gohmann and Ohsfeldt 1994, Zhang, Quan and Van Meerbergen 1994, and Handa 2000) include the infant mortality rate in their models. The objective is to capture two ideas: on the one hand, if couples are concerned to create a family of a given size, the death of a child may increase the birth rate (replacement effect); on the other,

infant mortality increases the cost of producing a surviving child and therefore has a negative impact on fertility. We do not, however, believe that infant mortality is relevant to explaining fertility in Spain because it is so rare (14.27 per thousand in 1979 and 4.85 per thousand in 1998), and we have left this factor out of our analysis.

4. ESTIMATION AND RESULTS

4.1 Methodology

The results of our estimations are constrained at all times by the limited time series data available for our analysis. In reality, the existing statistics and test are efficient in an asymptotic framework, but our sample comprises only 21 observations and cannot be extended due to the nature of the subject matter. Personal income tax was introduced for the first time in Spain in 1979 and we therefore cannot go back any further in time. This constraint should be taken into account in any interpretation of the results we have obtained.

Also, we concur with Freedman (1963), Conger and Campbell (1978) and Butz and Ward (1979) in holding that the process of human reproduction must be taken into consideration. We shall therefore include a lag in the explanatory variables in our estimation of the fertility equation. Furthermore, the nine months of pregnancy should in reality be extended by the time required to conceive the child, as Michael (1973) notes, and this depends on a number of variables such as age, the frequency of intercourse, etc. so that it might be more appropriate to consider more lags. Nevertheless, we shall work with only one such factor in order not to lose degree of freedom. The objective of our estimation is thus equation 3:

$$\begin{aligned} Fertility_t = f\,(&constant,\ tax\ and\ social\ benefits\ per\ child_{t-1},\ income\ tax\ rate_{t-1},\\ &value\ of\ female\ time_{t-1},\ male\ income_{t-1},\ parents'\ education_{t-1},\ cost\\ &of\ housing_{t-1},\ unemployment\ rate_{t-1},\ stock\ of\ married\ women_{t-1}) \end{aligned} \qquad (3)$$

On the basis of an analysis of appropriate instruments (simple and partial autocorrelation functions, Dickey-Fuller, Augmented Dickey-Fuller and Phillips-Perron unit root tests, and graphs of the series), we may deduce that almost all of our variables are first order integrated series –hereinafter I(1)–. The results of the tests are available from the authors upon request. Accordingly, we need to use cointegration techniques and establish the Error Correction Mechanism (ECM) to carry out the estimation.

$$y_t = \beta x_{t-1} \quad \textit{(cointegration relationship)} \tag{4}$$

$$\Delta y_t = \lambda(y_{t-1} - \beta x_{t-2}) + \alpha \Delta x_t + v_t \quad \textit{(ECM)} \tag{5}$$

The ECM describes the variation of the dependent variable, Δy_t, around its long-term trend in terms of error correction, which is the equilibrium error in the cointegration model (4), that is $y_{t-1} - \beta x_{t-2}$, and of the variations of independent variables, Δx_t with regard to the long-term (Greene 1998). Thus, the ECM is in fact made up of two distinct parts, the first being the long-term or cointegration relationship (represented by β) indicating what is relevant in the model, and the second the dynamic short-term relationship (represented by λ and α), which is influenced by deviations in the equilibrium, where λ represents the speed of adjustment to the equilibrium, such that the greater the parameter λ the more the dependent variable will react to deviations in the long-term equilibrium of the prior period. Specifically, if the deviation is positive ($y_{t-1} - \beta x_{t-2} > 0$), the endogenous variable should decrease, which is to say that λ should be negative.

4.2 Results

In order to determine the optimum model, we first calculated an error correction model that includes a long-term equilibrium relationship between the variables I(1). This was done not only because the cointegration relationship should, in principle, obtain between variables of the same order of integration, but also because the non-linear least squares calculation methodology uses an iterative procedure that would be unlikely to converge if too many explanatory variables were introduced at the same time. Having made this initial estimation, we introduced additionally explanatory variables into the long-term dynamic –specifically, the qualitative variable ***MML***, as well as the I(0) variables, such as social benefits per child and the unemployment rate– and have further tested the inclusion of other variables in the short-term dynamic. We were also careful to ensure that the variables introduced in the long-term dynamic were not closely correlated among themselves, otherwise the model would not properly reflect the effects of each variable on fertility.

We used the TSP 4.4 program, and in all cases the appropriate specification, as reflected in the models shown in table 4, was as follows:

$$\Delta GFR_t = constant + \lambda\,[GFR_{t-1} - (a.TB_{t-2} + b.MML_{t-2} + c.FLFPR_{t-2} + d.UR_{t-2})] + e.\Delta FLFPR_{t-1} + f.\Delta MUR_{t-1}$$

The only difference between these models is the type of child benefit analysed, since the various benefits reducing the direct cost of children were not included in the analysis at the same time given that they are highly correlated.

(INSERT TABLE 4)

As shown in table 4, R^2 is high in all of these models and they reveal no auto-correlation problems (Ljung-Box statistic) or endogeneity (Wu-Hausman). Moreover, all of their variables have the effect that would be theoretically expected, although it is of course true that the *a priori* impact of some is indeterminate.

Let us first consider the long-term relationship. It is clear that the main factors determining the fertility rate are benefits that reduce the direct cost of children, maternity leave, the value of women's time and the unemployment rate.

Furthermore, benefits that reduce the direct cost of children and maternity leave are significant both taken together (i.e. measuring ***TB*** and ***MML***) and individually (***TS, CB, SB, TC*** and ***PML***). The model thus indicates that an increase in these benefits will have a favourable impact on fertility, and although the estimated coefficients for benefits that reduce the direct cost of children are very small, it should be noted that the mean is enormous in each case (these results are available from the authors upon request). Another point of interest is how rare it is for maternity leave to turn out significant in empirical tests (7), while benefits that reduce the direct cost of children have been shown to have some impact on the endogenous variable in all studies in which they were included (Ermisch (1987), Whittington, Alm and Peters (1990), Whittington (1992, 1993), etc.).

The only benefits that have no impact on fertility are payments made on the birth of a child, ***PB***, and the length of maternity leave, ***WML*** (which was only sometimes significant and then only by 20%). It is likely that the first of these benefits is not significant because the amount of such payments in Spain is trivial and almost invariable. The length of maternity leave may not be significant because of the country's high unemployment rate and general job insecurity, especially among the female population, which could make longer leave appear rather irrelevant to a woman who in any case wishes to work.

The value of women's time, measured through the ***FLFPR*** is significant in all of the models, and its impact on fertility is negative, as the theory would suggest. Thus, the more a woman's time is worth, the more expensive her children are, and she has less. We have already explained how it is likely that this variable basically captures the price effect on fertility, since it is usually the woman who devotes most time to raising the children. The income effect, on the other hand, is captured by the unemployment rate, ***UR***, which has a negative effect on fertility. In other words, unemployment or job insecurity, has a negative impact on the birth rate. The value of a woman's time has also been shown to be significant in research by Schultz (1969), Jones (11981), Shields and Tracy (1986), Ermisch (1987) and Alvarez (2997), among others. Meanwhile, Whittington, Alm and Peters (1990), Georgellis and Wall (1992) and Ahn and Mira (1998) found unemployment to be a key variable in explaining the birth rate.

Income tax, ***IT***, does not, however, explain long-term fertility, while the cost of housing, ***CH***, was revealed as a relevant factor in our models, although the levels of significance obtained were sometimes questionable. Because of this, we have opted to include the latter variable in the extended model-1, which we shall describe below (table 5). The remaining variables (***HEDR, IN*** and ***SMW***) were not included in the long-term relationship because of their high correlation with ***FLFPR***, which we consider a key variable for the explanation of fertility. In any case it seems reasonable that these variables should not appear in the model since one of the main ways in which parents' education (***HEDR***) influences family planning decisions is through their income, which is already represented by ***FLFPR*** and ***UR***. At the same time, fertility depends more on economic factors, which are already present in the model, than on whether or not a woman is married, ***SMW***.

Let us now turn our attention to the short-term dynamic. Here, the rate of adjustment is always negative and significant (supporting the cointegration relationship), which means that the birth rate responds in the short-term to changes in tax and social benefits for children, the value of women's time and the unemployment rate (when the birth rate exceeds its equilibrium relationship with respect to any of these variables, a downward adjustment takes place). The rate of adjustment is around 0.57 (depending on the tax or social benefit considered it fluctuates between 0.48 and 0.67), implying that fertility reacts fairly promptly to any deviations from the

long-term equilibrium in the preceding period. More specifically, approximately 57% of variables' deviations from the equilibrium in any given period is adjusted in the following period.

The α parameters also show the appropriate effects. Short-term, the value of women's time, ***FLFPR***, and the male unemployment rate, ***MUR***, are significant. Both variables reduce the general birth rate. The remaining variables are not significant in the short-term dynamic, with the exception of income tax, ***IT***, which, although normally capable of explaining fertility, we have nevertheless preferred to include in extended model-2, which is described below (tables 6 and 7).

We have taken account of the possible endogeneity of female participation in the labor market, since a woman who opts for a professional career and invests time and money in gaining the skills in demand in the labor market may at the same time be choosing to have fewer children. We have used the Wu-Hausman test to verify this (the instruments used were the average market wage for individuals aged between 15 and 44 (***AVW***) in order to indicate that higher market wages will encourage women to join the labour market, and the ratio of women of fertile age (***RWFA***) measured as the percentage of women aged between 15 and 44. This variable may, on the one hand, raise the rate of female participation in the labour market, since younger women are the most active. On the other hand, it may reduce participation given the difficult trade-off between work and bringing up children, which also occupies women between the ages of 15 and 44). However, we have at all times had to accept the exogeneity of this variable, probably because female activity depends more on the economic climate than on fertility concerns, given the high rate of unemployment in Spain. Furthermore, the models presented in table 4 hardly vary when the value of women's time is measured as ***EFW*** instead of ***FLFPR***.

We have also considered the possibility that ***SMW*** could be endogenous, but we have always accepted the null hypothesis of exogeneity. The instruments applied were the expected relative female/male wage (***RELW***), measured as the quotient of ***EFW*** and ***EMW***, which indicates that the higher the relative wage earned by the woman, the lower the gains from marriage, therefore, the marriage rate, and the female/male sex ratio for people aged between 15 and 44 (***SR***), which indicates that the more men there are in relative terms, the likelier it is that the percentage of married women will increase.

An alternative specification includes male income (measured as ***IN, AVW*** or ***EMW***) in the short-term dynamic instead of the value of the woman's time. This variable also has a negative effect on fertility, which implies that couples do not demand more children when the husband's income rises, but more probably spend more on those they already have or, in other words, they invest in quality (8). This result was also obtained by Georgellis and Wall (1992), Whittington (1993) and Zhang, Quan and Van Meerbergen (1994), although many other scholars such as Wachter (1975), Butz and Ward, (1979), Shield and Tracy (1986) and Ermisch (1987) obtain a positive incidence.

We have also tested the sensitivity of these models to the choice of the endogenous variable (using ***TFR*** instead of ***GFR***), obtaining exactly the same results, although maternity leave, ***MML***, was sometimes less significant for the total fertility rate (***TFR***).

In the light of the minimal variation when any of these alternative variables are used (***EFW*** instead of ***FLFPR***, ***TFR*** instead of ***GFR***, and so on), the models may be said to be consistent and robust.

These models are, however, sensitive to the structure of lags, since none is correct whether no lags or two lags are used. Nevertheless, where no lags are used, assuming perfect forecasts (i.e. assuming that the relevant value of each variable at the time the pregnancy was planned would be the same as their value at the moment of birth), the key variables of the resulting models continue to be child tax and social benefits, the value of women's time and unemployment. This reaffirms the choice of these variables. Specifically, the significant variables for the long-term dynamic are ***MML***, ***FLFPR*** and ***UR***, and for the short-term dynamic ***TB*** and ***MUR***, although the significance of the latter is only between 20% and 30%.

Extended model-1. As mentioned above, one extended specification includes, in the long-term relationship, the cost of housing, *CH*. This variable has normally been found to be fairly relevant, although sometimes with low levels of significance, as shown in table 5. However, if we take into account that the present study measures fertility for a wide range of ages, the positive sign of this variable should not be surprising. As we have already explained, the trade-off between a house and births is more likely to be made by the young, who are precisely the people planning to start a family. Furthermore, rather than reducing the number of children, the effect of

this variable seems to be to delay the timing of births. Additionally, high house prices increase the wealth of owner-occupiers. Finally, its positive effect is in line with the results obtained in the two other studies where it was used as an explanatory variable (De Tray (1973) found a positive effect using *CH* as a proxy for income, and Ermisch (1987) reached the conclusion that the relationship between fertility and the cost of housing is negative for the young but positive for older women).

(INSERT TABLE 5)

If the cost of housing, ***CH***, is included in the long-term dynamic, the marriage rate, ***SMW***, is sometimes significant in the short-term dynamic. This positive effect indicates that the larger the stock of married women the higher the birth rate.

This extended model does not reveal problems of endogeneity or autocorrelation, and the goodness of fit is also very high. Furthermore, the model does not change substantially when male income is included in the short-term dynamic (using either I***N***, ***EMW*** or ***AVW***), although it is less robust to the specification of the value of women's time, because when it is measured in terms of ***EFW*** rather than ***FLFPR,*** we find that neither the cost of housing nor the marriage rate are significant in the long- and short-term relationship, respectively.

Extended model-2. All the previous models, that is to say, those that do not take account of the long-term effect of housing (table 4) and those that do (table 5), can be further completed by including income tax, *IT*, in the short-term dynamic. This variable is always positive, implying that if personal income tax rules favour the couple, increasing their net income, they will be keener to have more children (see tables 6 and 7).

(INSERT TABLE 6)

(INSERT TABLE 7)

The properties of this new version of the extended models are also adequate, with no exogeneity or autocorrelation problems and high goodness of fit. Nevertheless, table 7 shows that when income tax, ***IT***, is included in the model, the cost of housing, ***CH***, frequently ceases to be significant. Furthermore, these new extended models are less robust than the earlier ones in the presence of alternative specifications, because income tax, ***IT***, loses significance when alternative variables are used (e.g. ***EFW*** instead of ***FLFPR*** in the long-term relationship, or ***IN, AVW, EMW*** and ***MHER*** instead of ***FLFPR*** in the short-term dynamic).

CONCLUSIONS

There is a school of thought that is in favour of pronatalist policies, with this being formed by those who believe it is the responsibility of government to promote fertility and to avoid the adverse effects of a falling birth rate and population. Its supporters hold that family policy can be effective in encouraging parents to have more children. The opposing school sees no justification for government interference in a decision that is essentially private, regardless of the consequences of the current low level of fertility, and points to the doubtful efficacy of potentially pro-birth policies.

Empirical research has been carried out in various countries in recent years, though not in Spain, with the aim of supporting and proving the claims of the pro-birth lobby. The aim of this study has therefore been to provide, for the first time in Spain, empirical evidence that aid for children provided through both the tax and the Social Security systems does in fact influence the decision to have children.

To that end, we have performed an aggregate estimation of the birth rate among women of fertile age using time series data on the basis of variables that measure, *inter alia*, the tax benefits represented by income child tax allowances, social benefits by way of allowances for dependent children and payments for births, and the benefit obtained by women from paid maternity leave. The majority of these variables have been found to be relevant in explaining the birth rate in Spain and, in fact, the only benefits we have eliminated, following an assessment of their impact in isolation, are payments for births and the length of maternity leave.

Together with child tax and social benefits, we have found that the value of women's time and the unemployment rate are key variables in the estimation of fertility, although their effect is negative, as might be expected. The cost of housing is also partially significant, having a positive impact on the birth rate, as the theory would suggest. This is also the case with the income tax variable, which measures the effect of changes in the tax regime on the individuals' net income. Such changes have a positive impact on fertility, although this is only in the short-term relationship.

The results obtained are thus consistent with theoretical hypotheses and, in general, with the findings from other empirical research. The implication of this is that the public sector should provide more generous aid for dependent children, since today's spending on such allowances may be considered as representing a kind of social investment, given the externalities produced by children. It would also be advisable for government to implement measures designed to help mothers reconcile their family and working lives, and to resolve the mismatch between children and paid employment outside the home. This could be achieved if, for example, more subsidised crèches were available, or if tax allowances were awarded to working women for domestic help and child-care.

We are, of course, aware of the limitations affecting an aggregate study such as the one undertaken here. The research we present does not, in fact, take into account the differential effect that family benefits have on fertility in function of the existing children, nor does it address the impact of benefits on fertility of different population sub-groups. Furthermore, our work contains no analysis of how the increase in the birth rate might react if the level of benefits were raised. In view of these constraints, we consider that this study should be understood as no more than an initial approach to this topic in Spain and as a starting point for future research.

The next stage will be to estimate the birth rate for different female age groups, in order to establish whether there are any independent variables that explain the fertility of younger women but not that of their elders, and *vice versa*, or indeed whether age has no effect. It would also be very useful to prepare a dynamic study of fertility in Spain using micro-data, since, as we have already explained, fertility has a sequential nature, and public aid or other variables may have differing effects on births depending on the number of children a family already has. Finally, a study by income groups could provide highly relevant conclusions and recommendations for tax policy.

This work has been financed by the Spanish Institute for Fiscal Studies.

NOTES

(1) Espenshade and Minarik (1987) estimated the impact of the 1986 tax reform in the United States on fertility, although their analysis ignored potential outcomes from changes in the cost of a child and concentrated on income effects. Other scholars, such as Cain (1977) and Ellwood & Bane (1985), have sought to analyse empirically the effects of AFDC on fertility, but such aid is atypical insofar as it is received only by families in financial need and not necessarily for the whole period in which the child is dependent. AFDC therefore differs from the type of aid considered by Ermisch (1987) in his research, as well as from the allowances and benefits that we will include in our analysis.

(2) Whittington, Alm and Peters (1990) point out that both France and Germany provide significant family tax allowances, Hungary has implemented policies including one-off payments for births and paid maternity leave, and Canada and Singapore have tried to influence the birth rate through tax incentives. China, on the other hand, introduced financial incentives for birth control.

In Spain, the Centre for Sociological Research (CIS) carried out a survey in 1999 which found that 47% of respondents had less children than they would like, the main reason being the inadequacy of social security and tax benefits for families. See Sanchis and Sanchis (2000).

(3) If only the ratio represented by relative salaries were used as the weighting, the couple's income would be distributed to each member in accordance with the average relative salaries in families where the women has a job. The effect would be to represent only the families of working women. The method we have actually used takes an average representation of the average relative proportion of salaries in the relative labor force participation rate, thereby including people who are in the labour market, but are not actually working.

We have not been able to apply the wage ratio for each year in order to calculate the annual weighting because wage data broken down by gender, and thus the ratio itself, are available only from 1989 onwards. We have therefore calculated a simple arithmetic mean of the wage ratio from 1989 to 1999, using it as the weighting.

(4) As shown in table 2, we have used the terms ***TS*** to refer to the tax savings obtained by the taxpayer through child tax allowances, ***CB*** for Social Security dependent child benefit, and ***PB*** for the one-off payment received on the birth of the infant. Sub-classes grouping components are referred to by the terms ***TC*** for the sum of tax savings and Social Security child benefits, ***SB*** for the sum of Social Security child benefits and the one-off payment for births, and ***TB*** for the sum of tax savings, Social Security child benefits and the one-off payment for births.

(5) Neither this study nor other empirical research in the field analyse the impact of variables on the quality of children, concentrating instead on quantity. However, quantity and quality are intimately related, making it necessary to refer continually to the quality effects of the variables. Thus, the higher a couple's income, the more they will be able to spend on each child (i.e. they will be able to bring up higher quality children). This means that an additional child will be more expensive, which may constrain demand, although this does not imply that children are less desirable goods, as we shall see later on in this paper.

(6)Ahn and Mira (1998) consider that it is better to consider the male unemployment rate, rather than the total unemployment rate, given than the former is more likely to be an exogenous variable in the decision to have children (presumably because the woman may decide to remain unemployed and collect unemployment benefit while she brings up the children, returning to work only later). Following the arguments set out in this paper, however, we do not believe this to be the case in Spain, a country in which unemployment is hardly ever a planned or deliberate situation, but rather the reverse.

(7) Hyatt and Milne (1991) found maternity leave to be significant using a variable constructed as the weighted average of the average female wage and average maternity benefits (though in fact the significant factor was the introduction of the benefit, and not the level of benefit in itself). Winegarden and Bracy (1995) found the length of maternity leave significant, but not the percentage remuneration paid. On the other hand, neither Zhang, Quan and Van Meerbergen (1994), Gauthier and Hatzius (1997) nor Phipps (2000) found maternity leave significant. Finally, Blanchet and Ekert-Jaffé (1994) do not analyse the effect of this variable separately, but rather taken together with other child benefits.

(8) Where ***IN*** is used in the short-term dynamic, however, ***MML*** is less significant.

If the man's income is approximated using ***MHER***, the resulting models are very similar, although this variable, which is positive, is not significant in the short-term dynamic, and ***MML*** is less so. This appears to confirm our intuition that this variable is not valid as a proxy for male incomes, since it captures effects other than those related to income and that are characteristic of the parents' education.

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TABLE 1: EVOLUTION OF THE MAIN TAX ALLOWANCES AND SOCIAL BENEFITS FOR DEPENDENT CHILDREN

	Income tax allowances per child (1) Ptas. / year	Child-care tax credit (2) Maximum Ptas. / year	Social Security benefit per child (3) Ptas./Year	Supplement per dependent child (4) Ptas. / month	One-off payment per birth (5) Ptas.	Maternity leave –weeks' leave (payable as a % of contribution basis) (6)-
1979	6,000	-	3,000	-	3,000	12 (75%)
1980	8,000	-	3,000	-	3,000	12 (75%)
1981	10,000	-	3,000	-	3,000	14 (75%)
1982	12,000	-	3,000	-	3,000	14 (75%)
1983	13,000; 18,000	-	3,000	-	3,000	14 (75%)
1984	14,000; 19,000	-	3,000	-	3,000	14 (75%)
1985	15,000	-	3,000	1,050	3,000	14 (75%)
1986	16,000	-	3,000	1,050	-	14 (75%)
1987	16,800	-	3,000	1,050	-	14 (75%)
1988	17,600	-	3,000	1,050	-	14 (75%)
1989	18,100	-	3,000	1,050	-	14 (75%)
1990	19,000	-	3,000	1,050	-	16 (75%)
1991	20,000	-	36,000	-	-	16 (75%)
1992	20,000	15% expense	36,000	-	-	16 (75%)
1993	20,000	15% expense	36,000	-	-	16 (75%)
1994	20,000	15% expense; max. 25,000	36,000	-	-	16 (75%)
1995	20,700; 25,000; 30,000	15% expense; max. 25,000	36,000	-	-	16 (100%)
1996	21,500; 26,000; 31,000	15% expense; max. 25,000	36,000	-	-	16 (100%)
1997	22,100; 26,700; 31,800	15% expense; max. 25,000	36,000	-	-	16 (100%)
1998	25,000; 35,000; 50,000	20% expense; max. 50,000	36,000	-	-	16 (100%)
1999	200,000; 300,000 50,000; 25,000	-	36,000	-	-	16 (100%)

(1) Between 1979 and 1998 these amounts were deducted from the tax payable. Deductions have been made in the tax assessment basis since 1999. The entitlement is applicable per dependent child as defined by the relevant tax regulations for each year. Additional tax allowances exist for disabled children.

The first of the amounts shown for 1983 and 1984 refers to each of the first three children and the second figure to each successive child. Between 1995 and 1998 the first amount is for each of the first two children, the second amount for the third child, and the last figure for each successive child. In 1999 the first amount is for each of the first two children, and the second for each successive child. The third amount shown for 1999 is the supplement for each child under three years of age, and the fourth figure is a supplement in respect of school materials for children aged between 3 and 16.

(2) Entitlement to this tax credit was initially restricted to taxpayers with net earnings of less than Ptas. 2,000,000 (Ptas. 3,000,000 in joint declarations). This ceiling was raised to Ptas. 3,000,000 (joint Ptas. 4,500,000) in 1994 and again to Ptas. 3,500,000 (joint Ptas. 5,000,000) in 1995. Other requirements included an age limit of three years for the child concerned and that both parents be employed outside the home.

(3) This benefit is payable in respect of each able, dependent child under the age of 18 (the benefit would be higher in the case of disabled children). The benefit per dependent child was increased to Ptas. 48,420 per annum with effect from January 2000.

(4) Royal Decree 2364/1985 provided for a supplement of Ptas. 1,050 per month payable to low earners for each dependent child under 18 years of age. Beneficiaries were entitled to receive payment backdated to 1 August 1985.

(5) With effect from January 2000 a one-off benefit of Ptas. 75,000 is payable upon the birth of a third child. In the case of multiple births, a further benefit is payable for an amount equal to four times the minimum wage for twins, eight times for triplets and 12 times for quadruplets or the birth of more than four children.

(6) In the case of multiple births (or adoption), a working woman is entitled to receive a special allowance for each child after the second, equal to the amount she would receive for the first child during the period of mandatory leave (6 weeks). This is a one-off, lump sum payment.

Source: Own calculations.

TABLE 2: VARIABLES USED IN THE MODEL: DESCRIPTION AND EXPECTED EFFECTS *

VARIABLE	DESCRIPTION OF THE VARIABLE	EXPECTED EFFECT
GFR	*Number of children born to mothers aged between 15 and 44 x 1000 / women between 15 and 44.*	
TFR	*Sum of fertility rates by age groups (15-19, 20-24, 25-29, 30-34, 35-39, 40-44).*	
TS	*Tax saving = Present value of annual flow of income tax savings attributable to the firstborn child.*	+
	Whittington, Alm and Peters (1990), Georgellis and Walls (1992)[a], Whittington (1992, 1993), Gohmann and Ohsfeldt (1994)[a], Zhang, Quan and Van Meerbergen (1994), Dickert-Conlin and Chandra (1999).	
CB	*Child benefit = Present value of the annual flow of social benefits per dependent child.*	+
	Ekert (1986), Barmby and Cigno (1990), Caudill and Mixon (1993)[b], Blanchet and Ekert-Jaffé (1994)[c], Schultz (1994)[b], Zhang, Quan and Van Meerbergen (1994), Gauthier and Hatzius (1997)[d], Grogger and Bronars (1997) [b], Rosezweig (1999) [b].	
PB	*One-off payment per birth.*	+
SB	*Social benefits = CB + PB*	+
TC	*Tax savings plus child benefits = TS + CB*	+
TB	*Total benefit per child = TS + CB + PB*	+
	Ermisch (1987), Hyatt and Milne (1991), Zhang, Quan and Van Meerbergen (1994), Winegarden and Bracy (1995)[e].	
WML	*Number of paid weeks' maternity leave.*	?
	Winegarden and Bracy (1995), Gauthier and Hatzius (1997).	
PML	*Percentage of the contribution basis paid to the mother during maternity leave.*	+
	Winegarden and Bracy (1995), Gauthier and Hatzius (1997), Phipps (2000) [c].	
MML	*Months' maternity leave on full pay = PML x (WML/4)*	?+
	Hyatt and Milne (1991), Blanchet and Ekert-Jaffé (1994), Zhang, Quan and Van Meerbergen (1994), Gauthier and Hatzius (1997) [c].	
IT	*Dummy taking a value of 1 if a couple pay less income tax on the same level of income in a given year than in the prior year. In the opposite case, the dummy takes a value of 0.*	+
	Ermisch (1987), Barmby and Cigno (1990), Whittington, Alm and Peters (1990), Georgellis and Walls (1992), Whittington (1992, 1993), Gohmann and Ohsfeldt (1994).	
FLFPR	*Population of female members of the labor force aged between 16 and 44 / Total female population aged between 14 and 44.*	?-
	Adelman (1963), Freedman (1963), Schultz (1969), Gregory, Campbell and Cheng (1972), Haines (1977), Anker (1978), Conger and Campbell (1978), Butz and Ward (1979), Ermisch (1979, 1980), Joseph (1980), Ward and Butz (1980), Wolfe (1980), Jones (1981), Happel, Hill and Low (1984), Winegarden (1984), Ekert (1986), Shields and Tracy (1986), Chen, Bendaraf, Hicks and Johnson (1987), Barmby and Cigno (1990), Hyatt and Milne (1991), Blanchet and Ekert-Jaffé (1994), Winegarden and Bracy (1995), Alvarez (1997), Masih and Masih (2000)[f].	
EFW	*Expected female wage = average wage of individuals aged between 15 and 44 x female occupation rate.*	?-
	Freedman (1963), Cain and Dooley (1976), Gardner (1972), Ben-Porath (1973), De Tray (1973), Rosenzweig and Evenson (1977), Butz and Ward (1979), Ermisch (1979, 1980, 1987), Fleisher and Rhodes (1979), Joseph (1980), Ward and Butz (1980), Wolfe (1980), McDonald (1983), Moffit (1984), Winegarden (1984), Ekert (1986), Hotz and Miller (1988), Sprague (1988), Cigno and Ermisch (1989), Barmby and Cigno (1990), Heckman and Walker (1990), Whittington, Alm and Peters (1990), Hyatt and Milne (1991), Georgellis and Walls (1992), Whittington (1992, 1993), Blanchet and Ekert-Jaffé (1994), Gohmann and Ohsfeldt (1994), Schultz (1994), Zhang, Quan and Van Meerbergen (1994), Gauthier and Hatzius (1997), Dickert-Conlin and Chandra (1999), Phipps (2000)[g].	
IN	*Average income of individuals aged between 15 and 44 measured in function of per capita IN at market prices.*	?
	Weintraub (1962), Adelman (1963), Schultz (1969), Gregory, Campbell and Cheng (1972), Wachter (1975), Hazledine and Moreland (1977), Conger and Campbell (1978), Olneck and Wolfe (1978), Ermisch (1980), Shields and Tracy (1986), Whittington, Alm, and Peters (1990), Georgellis and Walls (1992), Whittington (1992, 1993), Caudill and Mixon (1993), Gohmann and Ohsfeldt (1994), Zhang, Quan and Van Meerbergen (1994), Winegarden and Bracy (1995), Dickert-Conlin and Chandra (1999), Handa (2000), Masih and Masih (2000), Phipps (2000)[h].	
AVW	*Average wage earned by a individual aged between 15 and 44.*	?
EMW	*Expected male wage = average wage of individuals aged between 15 and 44 x male occupation rate.*	?
	Weintraub (1962), Freedman (1963), Schultz (1969, 1994), Ben-Porath (1973, 1975), De Tray (1973), Willis (1973), Cain and Dooley (1976), Haines (1977), Rosenzweig and Evenson (1977), Butz and Ward (1979), Ermisch (1979, 1980, 1987), Fleisher and Rhodes (1979), Cigno and Ermisch (1989), Joseph (1980), Schutjer, Stokes and Cornwell (1980), Ward and Butz (1980), Wolfe (1980), Freedman and Thornton (1982) McDonald (1983), Happel, Hill and Low (1984), Moffit (1984), Winegarden (1984), Rosenzweig and Schultz (1985), Chen, Bendaraf, Hicks and Johnson (1987), Hotz and Miller (1988), Sprague (1988), Barmby and Cigno (1990), Heckman and Walker (1990), Hyatt and Milne (1991), Alvarez (1997), Gauthier and Hatzius (1997), Ahn and Mira (1998)[i].	
HEDR	*Population aged between 15 and 44 with higher education / population aged between 15 and 44.*	?-
	Schultz (1969), Gregory, Campbell and Cheng (1972), Simon (1969), Anker (1978).	
FHER	*Number of women aged between 16 and 44 with higher education / Number of women aged between 16 and 44.*	?-
	Adelman (1963), Gardner (1972), Ben-Porath (1973, 1975, 1976), De Tray (1973), Michael (1973), Willis (1973), Cain and Dooley (1976), Chamie (1977), Rosenzweig and Evenson (1977), Conger and Campbell (1978), Joseph (1980), Schutjer, Stokes and Cornwell (1980), Wolfe (1980), Lee and Schultz (1982), Moffit (1984), Newman and McCulloch (1984), Rosenzweig and Schultz (1985), Chen, Bendaraf, Hicks and Johnson (1987), Sprague (1988), Cigno and Ermisch (1989), Barmby and Cigno (1990), Whittington, Alm and Peters (1990), Lillard and Waite (1993), Zhang, Quan and Van Meerbergen (1994), Alvarez (1997), Ahn and Mira (1998), Dickert-Conlin and Chandra (1999), Rosezweig (1999), Handa (2000), Masih and Masih (2000).	
MHER	*Number of men aged between 16 and 44 with higher education / Number of men aged between 16 and 44.*	?
	Gardner (1972), Ben-Porath (1973, 1975), De Tray (1973), Michael (1973), Rosenzweig and Evenson (1977), Olneck and Wolfe (1978), Fleisher and Rhodes (1979), Joseph (1980), Wolfe (1980), Lee and Schultz (1982), Newman and McCulloch (1984), Chen, Bendaraf, Hicks and Johnson (1987), Eldin (1994), Alvarez (1997), Ahn and Mira (1998).	
CH	*Real interbank interest rate at 3 months.*	?
	De Tray (1973)[j], Ermisch (1987).	

UR	*Total unemployed population aged between 16 and 44 / Total economically active population aged between 14 and 44.* Gregory, Campbell and Cheng (1972), Sprague (1988)[k], Whittington, Alm and Peters (1990), Georgellis and Walls (1992), Gohmann and Ohsfeldt (1994), Zhang, Quan and Van Meerbergen (1994), Alvarez (1997), Gauthier and Hatzius (1997).	?-
MUR	*Unemployed male population aged between 16 and 44 / Total economically active male population aged between 14 and 44.* Rosenzweig and Schultz (1985)[l], Ermisch (1987).	?-
SMW	*Stock of married women = married women aged between 15 and 44 x 1000 / women aged between 15 and 44.* Schultz (1969), Conger and Campbell (1978), Olneck and Wolfe (1978), Winegarden (1984), Ermisch (1987), Heckman and Walker (1990), Lillard and Waite (1993), Rosezweig (1999), Dickert-Conlin and Chandra (1999), Handa (2000)[m].	+

* This table does not reflect all research on these topics.

a. Georgellis and Walls (1992) and Gohmann and Ohsfeldt (1994: 369) also take the square of the exemption for dependent children into consideration in order to calculate the variation in the increase in the fertility rate as the value of the exemption for dependent children increases. Variations are only significant in respect of firstborn children.

b. Caudill and Mixon (1993) actually apply AFDC (Aid for –low income– Families with Dependent Children), while Grogger and Bronars (1997) and Schultz (1994) also consider Food Stamp programmes. In addition, Schultz (1994) includes other aid programmes such as Medicaid. Further research estimating the impact of AFDC on fertility also exists, though it has not been included in this table.

c. Blanchet and Ekert-Jaffé (1994) investigate the combined effect of various social benefits for dependent children, including paid maternity leave. Phipps (2000) takes the percentage paid leave into account in addition to other variables such as a woman's eligibility to receive paid maternity leave.

d. Gauthier and Hatzius (1997) consider the monthly sum received in respect of children divided by the monthly wage earned by the father.

e. Ermisch (1987) and Hyatt and Milne (1991) consider the combined effect of tax exemptions and social benefits on fertility, while Zhang, Quan and Van Meerbergen (1994) analyse both combined and individual effects. Winegarden and Bracy (1995) measure the impact of a number of pro-birth measures that might be taken in a given country by applying the dependency rate (population aged over 65 / population aged between 15 and 64) as a proxy.

f. Some scholars, such as Joseph (1980) and Alvarez (1997), include variables that are in fact dummies in their models in order to take account of whether or not a women is occupied when she decides to have a child. Others, such as Freedman (1963), Wolfe (1980), and Barmby and Cigno (1990) consider the number of years a woman has been in work. Freedman (1963), Chen, Bendaraf Hicks and Johnson (1987), and Barmby and Cigno (1990) even take the woman's job status into account. Ward and Butz (1980) and Hyatt and Milne (1991) use the female occupation rate, while Anker (1978) uses the percentage of the population working in agriculture. Adelman (1963) on the other hand, applies the percentage of the female population who do not work in agriculture in order to obtain a picture of the impact of industrialisation on fertility.

g. Ermisch (1987) and Barmby and Cigno (1990) use the ratio of net (after tax) female wages / net male wages. Freedman (1963) and Joseph (1980) use female income. Butz and Ward (1979) and McDonald (1983) use precisely the logarithm of real female wages multiplied by the proportion of couples in which the woman is occupied in the labor market. Hotz and Miller (1988) apply the cost of the woman's time given over to rearing children, while Cigno and Ermisch (1989) use the woman's occupation or type of job while single and the number of years in work at the time of marriage.

h. In the absence of income data, Handa (2000) uses per capita spending. Wachter (1975), Conger and Campbell (1978) and Ermisch (1980) are in fact interested in including the intergenerational effect in order to test the Easterling hypothesis (1969, 1978). To do this, Wachter (1975) and Ermisch (1980) use relative incomes as a measure. That is, they consider current living standards in relation to expected standards constructed on the basis of real wages. Conger and Campbell (1978) use per capita income as a percentage of permanent income. Shields and Tracy (1986) and Ermisch (1987) also take intergenerational effects into consideration via a demographic variable. Winegarden and Bracy (1995) use the square of income.

i. Willis (1973), Cain and Dooley (1976), Ermisch (1980), Joseph (1980), Ward and Butz (1980), Wolfe (1980), Freedman and Thornton (1982), Hotz and Miller (1988), Heckman and Walker (1990), and Hyatt and Milne (1991) use the husband's income. Butz and Ward (1979) and McDonald (1983) use both the logarithm of real male income and the logarithm of real male income multiplied by the proportion of couples in which the woman is occupied in the labor market. Moffit (1984) applies the sum of the value of the family's assets plus the present value of the flow of male earnings. Freedman (1963) uses the man's income for the preceding year and his relative income, defined as his current income compared to what he might have expected to earn given his occupation, education and age. Chamie (1977), Haines (1977), Wolfe (1980), Chen, Bendaraf, Hicks and Johnson (1987), Alvarez (1997), and Ahn and Mira (1998) also take the husband's occupation into consideration. Weintraub (1962) and Schultz (1969) use the percentage of the population employed in the primary sector, while Schutjer, Stokes and Cornwell (1980) use the occupation rate in the manufacturing sector. Ermisch (1980) uses the percentage of men employed in agriculture to measure differences in the cost of raising a child in rural and urban environments. Alvarez (1997) uses a dummy to measure whether the father is in work or not, and Ahn and Mira (1998) also utilise the time taken in the search for a first job.

j. De Tray (1973) uses the average value of housing, but as a proxy for family income.

k. Sprague (1988) measures the probability of finding a job, in other words whether the economic situation is good or bad, using "holidays" as a proxy.

l. Rosenzweig and Schultz (1985) use the female unemployment rate.

m. Ermisch (1987) actually uses the percentage of the population at risk of having a child, while Lillard and Waite (1993) use variables that measure the length of time a woman has been married and the likelihood of divorce.

Source: Own calculations

TABLE 3: CHILD TAX ALLOWANCES AND SOCIAL BENEFITS ON THE BASIS OF THE COUPLE'S AVERAGE INCOME

	BENEFITS REDUCING THE DIRECT COSTS OF CHILDREN			BENEFITS REDUCING THE OPPORTUNITY COST OF CHILDREN. MATERNITY LEAVE	
	Tax saving	**Child benefit**	**One-off payment per birth**	**Weeks' maternity leave**	**Maternity pay**
1979	TS	CB	PB	12	75%
1980	TS	CB	PB	12	75%
1981	TS	CB	PB	14	75%
1982	TS	CB	PB	14	75%
1983	TS	CB	PB	14	75%
1984	TS	CB	PB	14	75%
1985	TS	CB	PB	14	75%
1986	TS	CB	0	14	75%
1987	TS	CB	0	14	75%
1988	TS	CB	0	14	75%
1989	TS	CB	0	14	75%
1990	TS	CB	0	16	75%
1991	TS/2	0	0	16	75%
1992	TS/2	0	0	16	75%
1993	TS/2	0	0	16	75%
1994	TS/2	0	0	16	75%
1995	TS	0	0	16	100%
1996	TS	0	0	16	100%
1997	TS	0	0	16	100%
1998	TS	0	0	16	100%
1999	TS	0	0	16	100%

Source: Own calculations on the basis of Spanish tax and Social Security legislation.

TABLE 4: OPTIMUM MODELS

ΔGFR_t	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
cte	38.72**	36.66**	38.73**	51.49**	51.23**	40.34**	38.23**	40.35**	52.86**	52.65**
	Long-term	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*
MCE (λ)	-0.507**	-0.48**	-0.507**	-0.64**	-0.64**	-0.53**	-0.509**	-0.53**	-0.67**	-0.67**
TB_{t-2}	0.0000013**					0.0000013**				
TS_{t-2}		0.0000015**					0.0000014**			
TC_{t-2}			0.0000013**					0.0000013**		
CB_{t-2}				0.000011**					0.0000111**	
SB_{t-2}					0.000011**					0.000011**
MML_{t-2}	1.25^{+}	1.24^{+}	1.25^{+}	1.81*	1.805*					
PML_{-2}						6.56*	6.606*	6.57*	8.32**	8.28**
$FLFPR_{t-2}$	-0.67**	-0.66**	-0.67**	-0.76**	-0.76**	-0.68**	-0.67**	-0.68**	-0.75**	-0.74**
UR_{t-2}	-0.21*	-0.21*	-0.21*	-0.22*	-0.22*	-0.22*	-0.22*	-0.22*	-0.22**	-0.22**
	Short-term	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*
$\Delta FLFPR_{t-1}$	-0.35*	-0.34*	-0.35*	-0.41*	-0.404*	-0.35*	-0.34*	-0.35*	-0.41*	-0.407*
ΔMUR_{t-1}	-0.26**	-0.26**	-0.26**	-0.25**	-0.25**	-0.24**	-0.24**	-0.24**	-0.22**	-0.22**
R^2	0.953	0.952	0.953	0.941	0.9406	0.958	0.958	0.958	0.94	0.944
Corrected R^2	0.924	0.922	0.924	0.903	0.902	0.932	0.931	0.932	0.909	0.909
Ljung-Box										
Q (1) < χ_1 = 3.84	3.21	3.22	3.21	2.82	2.85	2.87	2.91	2.87	1.44	1.47
Q (2) < χ_2 = 5.99	4.48	4.36	4.47	3.47	3.49	5.31	5.10	5.31	3.36	3.37
Q (3) < χ_3 = 7.81	5.09	4.94	5.08	3.49	3.51	6.00	5.74	5.99	3.41	3.42
Q (4) < χ_4 = 9.48	5.37	5.12	5.36	3.62	3.65	6.91	6.44	6.90	3.93	3.96

**, *, $^{+}$, Significant at the 1%, 5%, and between the 10 and 15% levels of significance.

TABLE 5: EXTENDED MODELS-1

ΔGFR_t	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
cte	48.93**	47.16**	48.93**	58.88**	58.68**	48.11**	46.40**	48.11**	57.36**	57.25**
	Long-term	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*
MCE (λ)	-0.604**	-0.57**	-0.604**	-0.75**	-0.75**	-0.61**	-0.59**	-0.61**	-0.75**	-0.75**
TB_{t-2}	0.0000014**					0.0000014**				
TS_{t-2}		0.0000016**					0.0000015**			
TC_{t-2}			0.0000014**					0.0000014**		
CB_{t-2}				0.000014**					0.000012**	
SB_{t-2}					0.000014**					0.000012**
MML_{t-2}	1.68**	1.67**	1.68**	2.00**	1.99**					
PML_{-2}						6.76**	6.707**	6.76**	8.65**	8.59**
$FLFPR_{t-2}$	-0.81**	-0.81**	-0.81**	-0.78**	-0.77**	-0.75**	-075**	-0.75**	-0.75**	-0.74**
CH_{t-2}	0.22*	0.23*	0.22*	0.14 $^{+}$	0.14 $^{+}$	0.18*	018*	0.18*	0.09	0.09
UR_{t-2}	-0.17*	-0.18*	-0.17*	-0.17*	-0.17*	-0.17*	-017*	-0.17*	-0.19*	-0.19*
	Short-term	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*
$\Delta FLFPR_{t-1}$	-0.35**	-0.34**	-0.35**	-0.42*	-0.41*	-0.36**	-035**	-0.36**	-0.42*	-0.41*
ΔMUR_{t-1}	-0.31**	-0.31**	-0.31**	-0.27**	-0.27**	-0.27**	-027**	-0.27**	-0.22**	-0.22**
ΔSMW_{t-1}	0.21**	0.22**	0.21**			0.15*	0.17*	0.15*		
R^2	0.978	0.978	0.978	0.948	0.948	0.975	0.975	0.975	0.948	0.948
Corrected R^2	0.956	0.956	0.956	0.908	0.907	0.951	0.951	0.951	0.907	0.907
Ljung-Box										
$Q(1) < \chi_1 = 3.84$ (al 5%); 5.024 (al 2.5%)	4.04	4.31	4.03	2.45	2.50	2.98	3.23	2.97	0.93	0.97
$Q(2) < \chi_2 = 5.99$	4.21	4.45	4.21	2.62	2.65	3.69	3.83	3.69	2.17	2.16
$Q(3) < \chi_3 = 7.81$	4.25	4.46	4.25	3.12	3.18	3.69	3.83	3.69	2.49	2.50
$Q(4) < \chi_4 = 9.48$	4.29	4.49	4.28	3.19	3.26	4.17	4.24	4.17	2.89	2.93

**, *, $^{+}$, Significant at the 1%, 5%, and between the 10 and 15% levels of significance.

TABLE 6: EXTENDED MODELS-2 (without including the housing variable)

ΔGFR_t	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
cte	46.24**	43.17**	46.24**	71.92**	71.42**	47.29**	44.20**	47.30**	72.26**	71.84**
	Long-term	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*
MCE (λ)	-0.59**	-0.55**	-0.59**	-0.87**	-0.87**	-0.61**	-0.57**	-0.61**	-0.89**	-0.89**
TB_{t-2}	0.0000014**					0.0000013**				
TS_{t-2}		0.0000016**					0.0000015**			
TC_{t-2}			0.0000014**					0.0000013**		
CB_{t-2}				0.000012**					0.000012**	
SB_{t-2}					0.000012**					0.000012**
MML_{t-2}	0.802^{+}	0.79^{++}	0.803^{+}	1.29**	1.28**					
PML_{-2}						4.55*	4.63^{+}	4.56*	5.98**	5.93**
$FLFPR_{t-2}$	-0.69**	-0.68**	-0.69**	-0.79**	-0.78**	-0.701**	-0.69**	-0.702**	-0.77**	-0.77**
UR_{t-2}	-0.18**	-0.19**	-0.18**	-0.18**	-0.19**	-0.200**	-0.20**	-0.200**	-0.19**	-0.19**
	Short-term	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*
$\Delta FLFPR_{t-1}$	-0.42**	-0.407**	-0.42**	-0.54**	-0.53**	-0.41**	-0.405**	-0.42**	-0.54**	-0.52**
ΔMUR_{t-1}	-0.23**	-0.23**	-0.23**	-0.21**	-0.21**	-0.21**	-0.21**	-0.21**	-0.18**	-0.18**
IT_{t-1}	0.89**	0.85**	0.89**	1.19**	1.19**	0.86**	0.82**	0.86**	1.15**	1.15**
R^2	0.972	0.970	0.972	0.969	0.969	0.976	0.973	0.976	0.971	0.971
Corrected R^2	0.950	0.946	0.950	0.945	0.944	0.957	0.953	0.957	0.949	0.948
Ljung-Box										
Q (1) < χ_1 = 3.84	1.58	1.53	1.58	1.25	1.31	1.56	1.48	1.55	0.35	0.40
Q (2) < χ_2 = 5.99	4.06	3.77	4.06	1.96	2.00	4.51	4.17	4.51	1.32	1.34
Q (3) < χ_3 = 7.81	4.20	3.86	4.19	2.73	2.76	4.55	4.19	4.55	3.40	3.42
Q (4) < χ_4 = 9.48	5.12	4.45	5.11	2.75	2.80	6.91	5.84	6.90	3.60	3.66

**, *, $^{+}$, $^{++}$, Significant at the 1%, 5%, between the 10 and 15%, and between the 15 and 20% levels of significance.

TABLE 7: EXTENDED MODELS-2 (including the housing variable)

ΔGFR_t	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**	**Model 10**
cte	53.11**	51.001**	53.11**	73.48**	73.03**	53.009**	50.903**	53.01**	72.65**	72.28**
	Long-term	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*	*Long-term*
MCE (λ)	-0.64**	-0.61**	-0.64**	-0.908**	-0.905**	-0.65**	-0.62**	-0.65**	-0.90**	-0.90**
TB_{t-2}	0.0000013**					0.0000013**				
TS_{t-2}		0.0000015**					0.0000014**			
TC_{t-2}			0.0000013**					0.0000013**		
CB_{t-2}				0.000013**					0.000012**	
SB_{t-2}					0.000013**					0.000012**
MML_{t-2}	1.23**	1.23**	1.23**	1.41**	1.405**					
PML_{-2}						5.02**	5.009**	5.02**	6.103**	6.07**
$FLFPR_{t-2}$	-0.80**	-0.80**	-0.80**	-0.79**	-0.78**	-0.76**	-076**	-0.76**	-0.77**	-0.77**
CH_{t-2}	0.12^{+}	0.13^{+}	0.12^{+}	0.04	0.04	0.09	0.09	0.09	0.01	0.05
UR_{t-2}	-0.18**	-0.18**	-0.18**	-0.17**	-0.17**	-0.18**	-019**	-0.18**	-0.18**	-0.18**
	Short-term	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*	*Short-term*
$\Delta FLFPR_{t-1}$	-0.409**	-0.39**	-0.41**	-0.53**	-0.52**	-0.41**	-0.40**	-0.41**	-0.53**	-0.52**
ΔMUR_{t-1}	-0.27**	-0.27**	-0.27**	-0.22**	-0.22**	-0.24**	-0.24**	-0.24**	-0.18**	-0.18**
ΔSMW_{t-1}	0.18**	0.20**	0.18**			0.14*	0.15*	0.14*		
IT_{t-1}	0.64*	0.61*	0.64*	1.11**	1.104**	0.71*	0.67*	0.71*	1.13**	1.12**
R^2	0.985	0.985	0.985	0.971	0.970	0.985	0.984	0.985	0.971	0.971
Corrected R^2	0.967	0.966	0.967	0.942	0.941	0.966	0.964	0.966	0.943	0.942
Ljung-Box										
$Q(1) < \chi_1 = 3.84$ (al5%); 5.024 (al 2.5%)	4.82	4.67	4.81	2.04	2.13	4.07	3.92	4.06	0.42	0.48
$Q(2) < \chi_2 = 5.99$	4.871	4.76	4.86	2.09	2.17	4.36	4.28	4.35	1.05	1.06
$Q(3) < \chi_3 = 7.81$	5.46	5.21	5.44	3.39	3.49	5.06	4.86	5.05	3.33	3.37
$Q(4) < \chi_4 = 9.48$	7.44	6.91	7.42	3.41	3.54	9.31	8.55	9.28	3.52	3.61

**, *, $^{+}$, Significant at the 1%, 5%, and between the 10 and 15% levels of significance.