ACTIVE WELFARE STATE POLICIES AND WOMEN LABOUR PARTICIPATION IN SPAIN*

XISCO OLIVER
Universitat de les Illes Balears, Palma de Mallorca (xisco.oliver@uib.es)

AMEDEO SPADARO
Paris School of Economics and Universitat de les Illes Balears, Palma de Mallorca (amedeo.spadaro@uib.es)

Preliminary and incomplete draft.

Abstract

The study shows the potential of behavioural microsimulation models as powerful tools for the *ex ante* evaluation of public policies. In particular, we focus on the effect of fiscal policies which could encourage Spanish mothers living in couples to enter in the labour market. The simulated reform consists in replacing the present in-work benefit by a benefit per children of 100 Euros per month for each child younger than 16 years old if the mother is working. The analysis is performed using the last updated version of the behavioural microsimulation model Gladhispania. To estimate labour supply reactions we follow the discrete choice approach of Aaberge et al. (1995) and van Soest (1995). The results reveal an increase in 6.45% the number of working mothers living in couples (reaching a 60% of participation) and a small reduction of the hours of work of their partners (0.11%). The total financial cost of the reform is around 2 million Euros (10% of the initial tax collection).

Keywords: microsimulation; fiscal policy; labour supply; in-work benefits;

JEL Classification: D31, H21, H23, C25, H31, J22

* Corresponding author: Xisco Oliver, Department of Economics, Universitat de les Illes Balears, Ctra. Valldemossa km. 7,5, 07122 Palma de Mallorca, Baleares, Spain.

1. Introduction

A reduction in the poverty rates and an increase in the women labour participation rate are two important policy issues currently under debate in Europe (OECD, 2006). As a consequence of this debate, recently some EU countries have introduced changes in their tax-benefit systems to move from a passive redistribution system to an active one. The aim is to redistribute income toward low income families with children and, at the same time, to encourage work. For example, in UK there exists the Working Family Tax Credit (WFTC), which is an "in-work" benefit design to encourage work among low skilled families and to redistribute income toward low income families with children (Brewer 2003). With a similar philosophy, the French government has very recently (July 2009) introduced the *Revenu de Solidarité Active*.

The increasing role played by the in-work benefits in the Anglo-Saxon welfare system and their extension to continental European countries, with positive evidence of redistributive effects and social inclusion of low skilled workers, should encourage other countries to study the feasibility of implementing such policies. In particular, these policies might be one of the pillars of redesigned welfare systems of the Southern European countries aimed at achieving specific targets in terms of social protection (Baldini et al., 2002; Boeri and Perotti, 2001; Owens, 2006).

In the mid nineties, 60% of Spanish potential female workers living in couples (married or co-habiting) did not work. This fact pushed the Spanish Government in 2003 to implement a policy to encourage work among women with children. Nowadays, around 45% of woman living in couples do not work, but still the rate is high if it is compared with other EU countries[1].

However, the potential role of an "in-work" benefit as part of a redesigned welfare system in Spain has not yet been fully analysed. Most of the Spanish reforms have been analyzed from an arithmetical perspective, without taking into account the response of the individuals. Ex ante evaluations with arithmetical microsimulation techniques can give us a first idea of the direction of the impacts[2]. A complete evaluation should include the possibility to measure in some way the efficiency impact: labour supply reactions are extremely important in the *ex ante* evaluation of this type of reforms.

The present work fills this gap. It explores the effect on employment and hours of work of a reform that broaden the generosity of the Spanish working mothers tax credit by increasing both the

[1] Bargain (2006) points out that the participation for those women in the mid nineties in France is over 75%, while Blundell et al. (2002) say that participation is around 70% in the case of UK.
[2] See Figari (2009) for an example on Southern European countries.

maximum amount of the benefit and the age of the child which entitles working mothers to perceive the benefit.

Moreover, the paper show the potential of using a behavioural microsimulation model in order to evaluate *ex ante* a tax reform, especially when these reforms affects sharply the households with higher labour supply elasticities.

In order to model labour supply reactions, we estimate the direct utility function employing the dicrete choice methodology proposed by Aaberge *et al*. (1995) and van Soest (1995) . Recently, the use of discrete models of labour supply has become very popular due to overcome several limitations of the continuous approach introduced by Hausman (1981 and 1985)[3] (Hoynes (1996), Bingley and Walker (1997), Keane and Moffit (1998) and Blundell *et al.* (2000)). This method has the advantage of capturing behavioural changes (since these are likely to occur at the corner or kink points of the labour supply function) and thereby providing researchers with an estimation of the elasticity at the extensive margin. It also permits to overcome the computational and analytical difficulties associated with utility maximization under non-linear and non-convex budget constraints, as the budget constraint is now directly modelled in the utility function; finally, it enables researchers to consider fixed costs, simultaneous participation and the intensity of work choices, as well as spouses' joint labour supply decisions.

Few attempts have been made to evaluate Spanish personal income tax (PIT) reforms, including labour supply reactions (Labeaga and Sanz, 2001, García and Suarez, 2002, Prieto and Alvarez, 2002 and Castañer *et al.*, 2004); however, all these studies base the labour supply model on the traditional continuous approach.

To our knowledge, only two studies consider a discrete labour supply to analyze a Spanish PIT reform. On the one hand, Carrasco and Ruiz-Castillo (2006) explore the implications of the 1999 reform using the collective model[4], that is, they consider a different utility function for each of the spouses. In order to recover the utility of the household, they need to assume that the preferences of singles and each of the spouses of the household are identical, indeed, they have to calibrate a “bargaining parameter” to fit household behaviour. On the other hand, Labeaga et al. (2008) analyze the 1999 PIT reform and other reforms involving a flat tax using the unitary model and estimating separate utility function for singles and couples. In the current work we opt for the last methodology.

The data we use comes from the Statistics on Income and Living Conditions (EU-SILC), which contain detailed information about sources of income and socio-economic characteristics of the

[3] See Aaberge *et al.* (1995) or van Soest (1995) for a detailed explanation of the problems that arise using the continuous approach and how the discrete approach permits to overcome them.

[4] See Chiappori (1988, 1992) for more details about the collective model approach.

households and each of the adult members that live in it. We focus in the sub-sample of Spanish couples because they are the main target of the simulated reform. To generate disposable incomes we use the microsimulation model GLADHISPANIA which computes the taxes and social security contributions paid by the workers under the 2007 Spanish system and each of the simulated scenarios (see Oliver and Spadaro 2004).

The layout of the rest of the paper is as follows. Section 2 describes the simulated scenarios with a brief description of the Spanish PIT and the social security contribution paid by the workers. A special emphasis is given to the simulated instruments to encourage participating in the labour market. Section 3 is devoted to the specification of the labour supply. Section 4 presents the microsimulation model and the data. In section 5, we present the results of the econometric estimation, the elasticities of the labour supply and the policy simulation. Finally, section 6 concludes.

2. Simulated scenarios

2.1. Spanish Personal Income Tax and In-Work Benefits

In 2007 the Spanish PIT has suffered several changes. Perhaps, one of the main changes has been that the taxable income has been split into two: the capital income, which is taxed at a flat rate of 18%, and the rest of the taxable income which is taxed progressively. Following the tendency of the last decade, the number of tax brackets has been reduced from 5 to 4 brackets, as well as the maximum marginal tax rate, which in 2007 was 43% (two points lower than it was in 2006). On the other hand, the minimum marginal tax rate has increase from 15% to 24%, but personal and familiar allowances have also been increased (see table 1) in order to compensate poorer families and do not increase the tax burden they support. Another important change is the way in which personal and familiar allowances are deducted. Until 2007 the allowances were subtracted from the taxable income. With the new system, the tax payer must first compute the gross tax on the whole amount of taxable income (table 2). She will then compute the tax deduction (to be subtracted to the gross tax) by applying the tax schedule (table 2) to the vital minimum to which she is entitled depending on the socio-demographic characteristics. The resulting amount cannot be negative in any case.

Since 2003, the Spanish PIT includes an in-work benefit of 100 Euros per month for working mothers with children under 3 years old. The maximum amount is bounded by the social security contributions paid by the worker and the employer. In contrast with the rest of allowances and deductions, working mother tax credit can determine a negative net PIT. The aim of the benefit is to encourage mothers with young children to enter the labour market when they are growing their children up. As pointed out in the introduction, the rate of Spanish women who are not working is relatively high when compared with other developed countries.

2.2. Proposal: increasing the in-work benefits

The reform we propose consists in relaxing some of the restrictions of the actual system and extend the in-work benefit to other mothers with children between 3 and 15 years old. In particular, the changes that we simulate are the following. First, the upper bound of the deduction, fixed by the social security contributions is suppressed. Second, we allow a deduction of 100 Euros per children (instead of per working mother) and we extend the deduction to those children between 3 and 15 years old.

Figure 1 shows the effect of the reform for a couple with two children. Basically the effect is a shift up of the budget constraint when the mother starts to work. The amount of the shift depends on the number of children in the household. The budget constraint is not completely parallel when the mother is working because under the pre-reform scenario the amount depends on the social security contributions paid by the worker.

3. Specifying a Structural Empirical Model

3.1. Discrete labour supply model

We focus on couples because they are the main target of the policy that we analyze. We assume that couples derive utility from household income, y, and from leisure, $h_i = T - l_i$, where the sub-index i indicates the gender, with T total time available and is fixed, and l_m and l_f are hours of work of the male and female respectively. Then, the utility function that they maximize is:

$$U = U(y, h_m, h_f; Z) \tag{1}$$

where Z represents household characteristics and includes common and specific characteristics of male and females. Consumers maximize utility, subject to the usual budget constraint, which is defined in terms of gross real wages, w_i, total household non-labour income, μ, and the tax system $T(l, w, \mu, Z)$. If there are no fixed costs, the budget constraint is:

$$y = w_m l_m + w_f l_f + \mu - T(l_m, l_f, w_m, w_f, \mu, Z) \tag{2}$$

where $T(l_m, l_f, w_m, w_f, \mu, Z)$ are tax payments net of benefits, which in the Spanish tax system depend on hours of work, wages, non-labour income and socio-demographic characteristics. Then, the consumer's problem takes the following form:

$$Max_h \quad \mathrm{U}(\mathrm{y}, \mathrm{h}_{\mathrm{m}}, \mathrm{h}_{\mathrm{f}}, \mathrm{Z})$$

$$\text{subject to } y \leq w_m l_m + w_f l_f + \mu - T(l_m, l_f, w_m, w_f, \mu, Z) \tag{3}$$

The solution to (3) is complex because *T(.)* is non-linear, although it is always possible to optimize for a given marginal tax rate (and to obtain a parametric Marshallian labour supply function). However, the discrete choice approach, instead of estimating the Marshallian labour supply parameters, starts by specifying utility *U(.)* and estimating its parameters. Below, we adopt the flexible quadratic utility function (as in Keane and Moffit, 1998, or Blundell *et al.*, 2000) that in the case of couples is:

$$\begin{aligned} U^*(y,h_m,h_f,Z_m,Z_f,Z) = {} & \alpha_{yy}y^2 + \alpha_{h_mh_m}h_m^2 + \alpha_{h_fh_f}h_f^2 + \alpha_{yh_m}yh_m + \\ & + \alpha_{yh_f}yh_f + \alpha_{h_hh_f}h_mh_f + \beta_y y + \beta_{h_m}h_m + \beta_{h_f}h_f + \varepsilon_{h_mh_f} \end{aligned} \tag{5}$$

The variables h_i and Z_i, $i = m, f$, are, respectively, hours and demographic characteristics of the couple member *i*, while male is represented by *m* and female by *f*. The parameters of income and hours may be linear functions of individual demographic characteristics in order to include heterogeneity in the preferences among households, and thus:

$$\begin{aligned} \beta_y &= \beta_{y0} + \beta'_y Z \\ \beta_{h_m} &= \beta_{h_m0} + \beta'_{h_m} Z_m \\ \beta_{h_f} &= \beta_{h_f0} + \beta'_{h_f} Z_f \end{aligned} \tag{6}$$

These functional forms are easily tractable and also allow a wide range of potential behavioural responses.[5]

Another important issue is the presence of fixed costs, i.e. the costs an individual must pay in order to work, such as childcare costs or travelling expenses. We assume they are dependent on observed variables, and thus $FC = Z_{fc}\beta_{fc}$. In the model we assume that fixed costs are only applied to working females. They are subtracted directly from disposable income for any choice that involves that female works. Individuals thus evaluate utility, $U = U(y - FC, h_m, h_f; Z)$, for all possible values of income (net of fixed costs). The effect of such costs for each individual (household) depends on the observables Z_{fc}, whose weights, β_{fc}, are estimated together with the remaining parameters of the utility function.

The estimation of the model initially requires the set of labour supply alternatives for each individual to be identified. The appropriate number of intervals is evaluated by examining the histograms of hours of work of each member of the couple (see Aaberge et al., 2006, for example). Figure 2 presents the distribution of hours of work for male and female living in couples. The left part represents working hours of the males living in couples. Observing the figure we selected the three hours of work with a higher frequency. The mode is 40 hours (a standard full-time job in Spain) and agglutinates more than 40% of the workers. 15% of males do not work and around 12% work 50

[5] See Stern (1986) for a discussion of the properties of these and other functions.

hours a week. Part-time job in the case of males is virtually inexistent. In the case of the females, the picture is completely different. The mode is "not working", with a 45%. More than a fifth of the women are working full-time (between 35[6] and 40 hours). In the case of the females there is not a peak at 50 hours but it appears small peaks at 20, 25 and 30 hours (that is, part-time job). The peaks at 20, 25 and 30 hours are not very big, but we have finally decided to take into account three alternatives in the case of females: not-working, part-time job (25 hours) and full-time job (40 hours).

Having decided the choice set, we have K_i alternative values for hours for agent i ($K_m \cdot K_f$ for the household), which determine total income for the individual (household):

$$y\left[l_{m(\cdot)}, l_{f(\cdot)}\right] = w_m l_{m(\cdot)} + w_f l_{f(\cdot)} + \mu - T(l_{m(\cdot)}, l_{f(\cdot)}, w_m, w_f, \mu; Z_m, Z_f, Z) \qquad (7)$$

for all possible combinations of $l_{m(.)} \in \{l^1_{m(.)}, l^2_{m(.)}, \ldots, l^{Km}_{m(.)}\}$, and $l_{f(.)} \in \{l^1_{f(.)}, l^2_{f(.)}, \ldots, l^{Kf}_{f(.)}\}$. The variables w_m and w_f are, respectively, gross wages of the household head and the spouse. The household maximizes (4) or (5) over the set of hours of leisure $h_i \in \{h^1, h^2, ..., h^{Ki}\}$. To estimate the model we must add stochastic terms to the utility function. In what follows, we only add shocks specific to the state or hours regime for each of the possible choices, which we assume are generated by extreme value distributions.

We can write the joint probability of choosing a combination of hours $(h_{m(.)}, h_{f(.)})$ as:

$$\Pr\left[h_{m(\cdot)} = h^j_{m(\cdot)}, h_{f(\cdot)} = h^k_{f(\cdot)}, Z_m, Z_f, Z\right] = \Pr\left[U_{\{h^j_m, h^k_f\}} > U_{\{h^j_m, h^k_f\}} \forall s \neq j, t \neq k\right] =$$

$$= \frac{\exp\left[U\left(y\left[h^j_m, h^k_f\right], h^j_m, h^k_f; Z_m, Z_f, Z\right)\right]}{\sum_s \sum_t \exp\left[U\left(y\left[h^s_m, h^t_f\right], h^s_m, h^t_f; Z_m, Z_f, Z\right)\right]} \qquad (8)$$

where now $U^*(.) = U(.) + \varepsilon_{hmhf}$. Under the hypothesis of independent errors, we can write the log-likelihood function as:

$$\ln \Phi = \sum_{i=1}^{N} \sum_{k=1}^{K} d_{jk} \left[\ln \Pr(h_{h(\cdot)} = h^j_{h(\cdot)}, h_{c(\cdot)} = h^k_{c(\cdot)}; Z_h, Z_c, Z\right] \qquad (9)$$

The variables d_{jk} are (1, 0) dummies: $d_{jk} = 1$ if $[h_{m(.)} = h^j_m$ and $h_{f(.)} = h^k_f]$. As usual, all parameters in the utility functions are estimated by maximum likelihood.

3.2. Missing wages

The database offers information about the current monthly wage and the weekly hours of work, which allows us to build an hourly wage rate for individuals who are working. The distribution of wages is different between males and females, as it is shown in Figure 3. Females earn wage rates smaller than males and they are more concentrated around the mode.

[6] Some companies and especially jobs in the public administration use to have full-time contracts of 35 hours a week.

For those potential workers who are not currently participating in the labour market, we need to assign a wage rate. We adopt the common approach of estimating the wage equation separately and using estimated wages as if they were true values of unobserved wages.

The wage rate for each of the spouses in the household is written as:

$$\ln W = G'\gamma + \omega \qquad \text{where } \ln W \text{ is observed if } X'\upsilon + \varpi > 0 \qquad (10)$$

Where G and X are vectors of individual and households characteristics. G includes education, age, age squared, experience, region of residence and population density. X includes indeed dummies indicating the number of children and non-labour income. Finally, ω and ϖ are normally distributed errors that could be correlated.

To avoid problems with extreme values of the wage rates that could be explained by a mismatch between the monthly gross wage and the monthly hours of work, observations in the top 1% or below the minimum wage have been dropped.

The appendix shows the results of the estimation of the wage rate. A Heckman selection model is fitted. The inverse of the Mill’s ratio is significant in both cases, which means that there is self-selection and OLS would be biased. The coefficients have the expected signs. The wage equation shows that more educated people have higher wages, although the effect seems stronger for males (only if the female has higher education it has a positive and significant effect on the wage rate). Also, older people have a bigger wage rate, but the relation is concave, as it is indicated by the negative sign of the age squared term. Experience has the expected sign (although in the case of males is not statistically significant because it is highly correlated with age). There are regional differences across regions. Indeed, wage rates are smaller in rural areas.

The participation equation indicates a similar behaviour for the previous variables and it shows how the number of children has a negative effect on the decision of working, especially in the case of females. Finally, non-labour income has a negative effect on the decision of participation.

4. Data and the microsimulation model

4.1. Data

The EU Statistics on Income and Living Conditions (EU-SILC) provides comparable, cross-sectional and longitudinal multidimensional data on income, poverty, social exclusion and living conditions in the EU. It is coordinated by Eurostat and conducted by the member states of the EU. We use the cross-section data coming from the Spanish sample for the year 2006. Specifically, we focus on the sub-sample of couples which are potential workers (which work or can work).

Social exclusion and housing condition information is collected at household level, and labour, education and health information is obtained for persons aged 16 and over. Income is detailed by component level and it is mainly collected at personal level, but a few components are included in the household part of SILC, which they had been redistributed among the adult members of the household. Income is provided gross and net (of withholding and social security contributions). The input data of the microsimulation model is the gross income[7].

4.2. Microsimulation model

Following the experience of Gladhispania (see Oliver and Spadaro, 2004 and 2007) we have developed a new version of the microsimulation model, simulating the Spanish tax-benefit system. In particular, it simulates the PIT and employee social security contributions for the year 2007. The last wave available when we start to construct the microsimulation model was 2006, which includes information of the sources of income of the previous year. Consequently, the data has been updated one year. The update has been carried out in two ways. On the one hand, the Spanish population has increased its population from 2006 to 2007, mainly due to a great immigration flow. This is simply taking into account calibrating the ponderation factor, which allows to move from sample values to population values, to fit the real increase of the number of households (3.3%) provided by the *Spanish Statistical National Institute*. On the other hand, the gross incomes have been updated from 2005 to 2007 using the CPI (6.4%).

In Spain there exist two types of income tax return. Joint income tax return is available for married couples or single parents and their dependent children. In any case, the individuals can opt for an individual income tax return if it is more convenient for them. The microsimulation model identifies the “fiscal unit” inside the household and selects the income tax return type (joint or individual) that minimizes the PIT of the household. Obviously, the lack of information enables to simulate certain tax allowances and tax relieves, as well as it is impossible to distinguish between the origins of the capital income.

Social security contributions are determined by a variety of factors and there exist several “social security affiliation categories” with a different regulation. The microsimulation model computes the

[7] There are other databases that could be used to construct the microsimulation model. The “Muestra de declarantes” of the Spanish Institute of Fiscal Studies offers a large sample of income tax returns filled by taxpayers. Despite the database has very precise information about income sources, tax allowances and tax relieves, it presents two inconvenient for our purposes. First, in several cases, it is not possible to completely identify the persons forming a household. This is particularly relevant for the determination of the fiscal unit, which in Spain could be the individual or the “household” depending on the particular situation. Second, the database lacks of information about employment, monthly wages and hours of work, which are essential to compute the social security contributions and estimate the labour supply.

tax base (closely related to gross salary) and the rate applicable to each individual taking into account personal circumstances.[8]

5. Results

5.1. Simulation method

With the microsimulation model the disposable incomes for each of the possible combinations of hours of work between the male and female are computed. We have considered three alternative for the male (0, 40 and 50 hours) and other three possibilities for the female (0, 25, 40), which gives a total number of nine combinations.

Using the utility function that has been defined in section 3.1 and is commented below, the predicted utility under each of the alternatives can be computed.

To generate a plausible baseline, given that predictions of the model do not perfectly fit the observed hours, we proceed as follows. Firstly, we record the discrete hours level for each individual which is closest to their observed hours level[9]. Secondly, we take random draws from an extreme value distribution for the stochastic part of the utility at each choice. These draws are accepted if they result in an optimal hours level which matches the discretized value observed in the reference scenario; if this is not the case, the draw is rejected and another one is sought, until a perfect match between observed and predicted hours is obtained. This procedure is repeated 80 times. Then, we get that the household is going to shift to each choice with a certain probability (that in some cases is zero).

5.2. Econometric Results

We obtain estimates of the parameters of the utility function (eq. 5) by optimizing (9). The sample of couples corresponds to couples with or without children (33% without children and 62% with one or two children). We select the potential active workers to estimate the function. That is, couples with spouses between 25 and 65 years old that are not retired.

We consider age, gender and number of children[10] as the observables entering vectors Z_m, Z_f and Z in equation (6), which capture differences in preferences. Table 3 present the results of the estimations. The results are consistent with economic theory. The marginal utility of income increases at a decreasing rate and is almost always positive (except in one, out of 3607 cases, where the

[8] More details about the social security contributions and their modelization can be found in Oliver and Spadaro (2004).
[9] The intervals are defined as follows. In the case of males there are three alternatives: not-working (0 hours) if hours of work are between 0 and 4, full-time worker (40 hours) if observed hours are between 5 and 44 hours and working overtime (50 hours) if he works more than 44 hours. In the case of females there are three alternatives as well: not-working (0 hours) if hours of work are between 0 and 4, part-time work (25 hours) if she works between 5 and 34 hours and full-time worker (40 hours) if observed hours are above 34.
[10] We also tried additional variables, but only retained those which had significant coefficients.

observation has been dropped from the simulations). The older the spouse, the higher is the utility of income, while children seem to have a negative effect on the utility of the income. Hours of leisure also follows a concave function. Age increase leisure preference in both cases and, in the case of females, also increases with the existence of children. In the case of males, the existence of children reduces the utility of leisure, and consequently increases the utility of hours of work. With regard to the cross terms, only the interaction between income and hours of leisure of the male seem to have a positive and significant effect. There is no evidence of substitutability or complementarity between hours of leisure of the couple.

Fixed costs also play an important role determining the preferences. As it is expected, the number of children increases the fixed cost of mothers. Living in a big city seems to reduce fixed costs, but the coefficient is not statistically different from zero.

5.3. Elasticities

In order to show the flexibility of the labour market in Spain, we compute the wage elasticities. This is done by increasing the wage rate in 10% and observing what happens to the aggregate labour supply. Since labour supply has been discretized and the increase of the wage rate is relatively small, most of the households remain in the same hours alternative after the increase of the wage (or, more precisely, they remain with a very high probability[11]).

Table 4 shows the elasticity of at the extensive and intensive margin. An increase of a 10% of the wage rate increases participation in 2.6% and 1.8% for males and females respectively. The intensive elasticity is higher but still shows inelastic labour supply. The cross elasticity (that is, the change in the hours of work or participation when the wage of the spouse increases in a 10%) is close to zero in both cases.

However, the flexibility of the labour supply is not independent of the level of income. Table 5 shows the wage elasticity of unconditional[12] expectations of hours of work. The first column of the table gives the elasticity in the case of the spouse of the head of the household. The overall elasticity is a moderate 5% when the wage increases in 10%. But the elasticity is decreasing with income. In the first four deciles the elasticity is significantly larger than the average and it is lower in the richest deciles. Columns two and four offer the cross elasticity. The overall all cross elasticity of the male when the female wage rate increases is negative and small, which indicates a slight substitution of hours of work between the spouses. However, in the first decile the sign is positive and the value is

[11] The microsimulation model has been calibrated in order to fit the observed behaviour. This is done by adding a random error to the deterministic part of the utility function until the household maximizes the utility in the observed choice. This procedure is repeated one hundred times, and consequently, we obtain that the household react and moves to each of the alternatives with a certain probability.

[12] Following Aaberge and Flood (2008), we call unconditional elasticity when the effects on participation as well as hours supplied are accounted for.

relatively high, which shows a complementary between hours of work of the spouses for the poorer households. In the case of the cross elasticity of the females we get a positive but very small number. However in the first decile seems to be a complementarity of the hours of work of both spouses. With respect to the male wage elasticity, not surprisingly, we get smaller values than in the case of the females. The overall elasticity is 2.1% when the wage increases a 10%. Again, the elasticity is decreasing in income. The first decile is very elastic (with a change in 41% of the working hours), while the elasticity is small in the rest, and very close to zero for the richer deciles.

5.4. Policy simulation

Table 6 reports the results of the reform in terms of change in hours of work (transitions). Rows (*i*) contain the observed distribution of working hours in the baseline (2007 system), whereas columns (*j*) show the predicted distribution for the simulated scenario. Each cell a_{ij} of the matrix (for $i \neq j$) displays the percent of households changing from the observed alternative *i* to the predicted alternative *j*. The diagonal elements refer to the percent of couples whose labour supply is unchanged after the reform. In order to make the interpretation of the table easier the cells that imply starting to work for females are in bold, while the cells that imply a reduction of hours of work of the male are shadowed in light blue. Adding up (see table 7) we obtain that participation increases in 3.6 percentage points for women living in couples after the reform and the hours of work of the females increase in a 6.5%. There is a substitution effect between the hours of the men and the hours of the women. As a result of the reform, some males reduce their labour supply (0.11%) when their partner starts to work. The overall effect on hours of work is an increase of 2%.

Table 8 shows the efficiency and cost of the reform. First of all, it must be stressed that the computations correspond to sample values. The aggregate results for the whole Spanish population will be lower because we are analyzing a sample where the reform has an especial impact. The results are presented before and after the individuals change their behaviour. The efficiency can be measured by the change in the gross income. Once behaviour reactions are considered, it increases a 1% after the reform. Then, the increase of the gross income is smaller than the increase of hours of works, which indicates that the reform is more effective for low productive households where the elasticity is higher.

The cost of the reform is quite high. Without behaviour, the reform implies a decrease of the PIT of 18.1%, because the in-work benefit tax credit increases in more than a 400%, while social security contributions remain unaffected since nobody changes their labour supply. Once we take into account behaviour, more women are encouraged to work and the reduction in the PIT is even stronger, reaching a 19.5%. Besides the in-work benefits increases by 546%. On the other hand, social security contributions paid by employees increase by 1%. If social security contributions are considered as a tax, the reduction of the overall tax collection is around 10% (with or without behaviour). The results of the cost of the reform can be taken as an upper bound because social security contributions paid by the employer are not taking into account. In addition, the increase in hours of work implies an increase of the gross income and, consequently, of the consumption, which is expected to generate a growth in VAT collection.

6. Conclusions

This paper has examined the labour market impact of a hypothetical reform that increases the generosity of the Spanish working mother tax credit. At the same time, it shows the potential of the behaviour microsimulation models. Labour supply behaviour is modelled as a discrete choice among a finite set of hours alternatives.

We simulated the effect of a reform that tries to encourage mothers with young children to participate in the labour market. The reform consists in replacing the present in-work benefit by a benefit of 100 Euros per month for each child younger than 16 years if the mother is working. The results reveal an increase in 6.45% the number of working mothers living in couples (reaching a 60% of participation) and a small reduction of the hours of work of their partners (0.11%). In terms of hours of work, the results show an increase of female working hours of 6% and an overall increase in hours of work (at household level) by 2%. The total financial cost of the reform is around 2 million Euros (10% of the initial tax collection).

The analysis confirms that in-work benefits might be one of the pillars of a redefined Spanish welfare system in order to increase female occupation. However, cash transfers must be complemented by an extension of childcare provisions in order to allow women to find jobs not only more financially attractive, but also reconcilable with other caring responsibilities.

Also, it must be stressed that, in order to increase the efficiency of such a measure, it is necessary to look at the degree of flexibility of the labour market on the demand side: it could happen that the reform encourages mothers to look for a part time job that is not part of the set of alternative offered by the firms (this is often the case in the Spanish labour market). A complete analysis of this issue is left for further research.

References

Aaberge R., Colombino U. and Strom S. (1995), “Labor Supply Responses and Welfare Effects of Tax Reforms”, Scandinavian Journal of Economics 97, 635-659.

Aaberge R., Colombino U. and Vennemo, T. (2006), “Evaluating Alternative Representations of the Choice Sets in Models of Labour Supply”, IZA DP No. 1986.

Aaberge R. and Flood L. (2008) “Evaluation of an In-Work Tax Credit Reform in Sweden: Effects on Labor Supply and Welfare Participation of Single Mothers” IZA Discussion Papers 3736, Institute for the Study of Labor (IZA).

Baldini M, P Bosi and S Toso (2002), `Targeting Welfare in Italy: Old Problems and Perspectives on Reform`, Fiscal Studies, 23(1), 51-75.

Bargain O. (2006) “On Modeling Household Labor Supply With Taxation” Working Papers 2007/11, School Of Economics, University College Dublin.

Bingley P. and Walker I. (1997), “The Labour Supply, Unemployment and Participation of Lone Mothers in In-Work Transfer Programmes”, The Economic Journal, 107, 1375-90.

Blundell R., Duncan A, McCrae J. and Meghir C. (2000), “The Labour Market Impact of the Working Families-Tax Credit”, Fiscal Studies 21, 75-104.

Boeri T and R Perotti (2001), `Less Pensions, More Welfare`. Bologna: Il Mulino.

Brewer M (2003), `The New Tax Credits`, IFS Briefing Note No. 35.

Carrasco, R. and Ruiz-Castillo, J. (2006) “Microsimulation and economic rationality: an application of the collective model to evaluate tax reform in Spain”, in Microsimulation as a tool for the evaluation of public policies: methods and applications, ed. Fundación BBVA, nº 5, pp. 181-251, 2006.

Castañer, J.M., Romero, D. and Sanz, J.F. (2004), “Simulación sobre los hogares españoles de la reforma de IRPF de 2003. Efectos sobre oferta laboral, recaudación, distribución y bienestar”, XI Encuentro de Economía Pública, Barcelona, 5-6 February, 2004.

Chiappori, P.-A. (1988), “Rational household labor supply”, Econometrica, 56: 63-89.

Chiappori, P.-A. (1992), “Collective labor supply and welfare”, Journal of Political Economy, 100: 437-467.

Figari F., (2009) “Can in work benefits improve social inclusió in the southern European countries?” Euromod working paper No. EM4/09

García, J. and Suárez, M. J. (2002), “La reforma del IRPF y la oferta laboral de las mujeres casadas”, Revista de Economía Aplicada 10, 53-77.

Hausman J. (1981), “Labour Supply”, in Aaron and Pechman (eds.), How Taxes affect Economic Behaviour, Washington DC, The Brooking Institution.

Hausman J., (1985), “The Econometrics of Nonlinear Budget Sets”, Econometrica 53, 1255-1282.

Hoynes H. (1996), “Welfare Transfers in Two Parent Families: Labour Supply and Welfare Participation Under AFDC-UP”, Econometrica 64, 295- 332.

Keane M. and Moffit, R. (1998), “A Structural Model of Multiple Welfare Program Participation and Labour Supply”, International Economic Review 39, 553-589.

Labeaga, J.M. and Sanz, J.F. (2001), “Oferta de trabajo y fiscalidad en España. Hechos recientes y tendencias tras el nuevo Impuesto sobre la Renta de las Personas Físicas”, Papeles de Economía Española 87, 230-243.

Labeaga, J.M., Oliver, X., Spadaro, A. (2008) “Discrete choice models of labour supply, behavioural microsimulation and the Spanish tax reforms” Journal of Economic Inequality, Springer, vol. 6(3), pages 247-273, September.

OECD (2006), `Employment Outlook`, Paris: OECD.

Oliver X. and Spadaro, A. (2004), “Descripción técnica del modelo de microsimulación del sistema fiscal español “GLADHISPANIA” DEA Working Paper Series nº7. Universitat de les Illes Balears. http://www.uib.es/depart/deaweb/deawp/

Oliver X. and Spadaro, A. (2007), “Basic Income or Vital Minimum? A Note on the Distributive Effects of Possible Reforms of the Spanish Income Tax” in "Modelling Our Future: Population Ageing, Social Security and Taxation". Coord. Harding, A. and Gupta, A. International Symposia in Economic Theory and Econometrics. North Holland, Amsterdam.

Owens J (2006), `Fundamental Tax Reform: An International Perspective`, National Tax Journal LIX(1), 131-164.

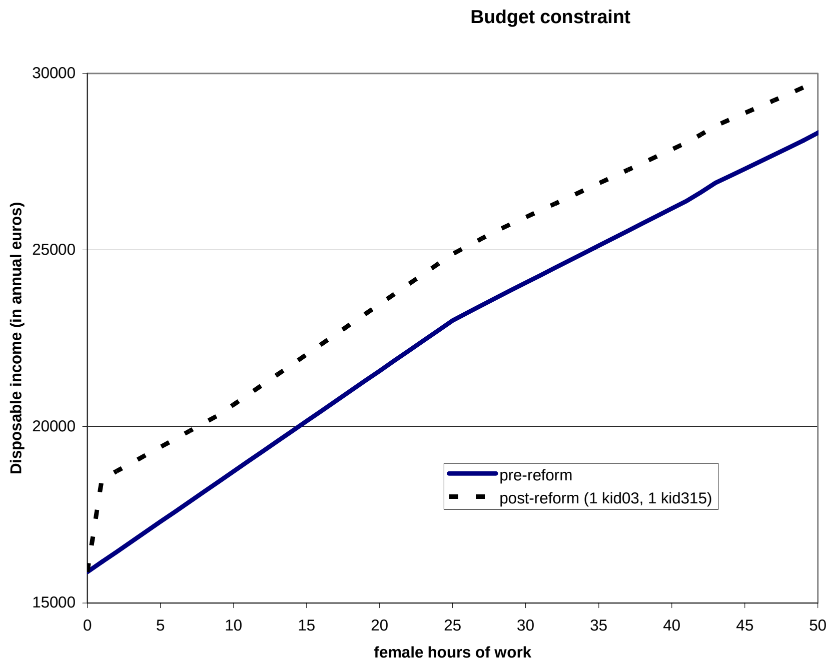
Prieto, J., and Álvarez, S. (2002), “Análisis de las ganancias de bienestar asociadas a los efectos de la reforma del IRPF sobre la oferta laboral de la familia española”, Instituto de Estudios Fiscales, DT 7.

Stern, N. (1986), “On the Specification of Labour Supply Functions”, in Blundell, R. and Walker, I. (eds.), Unemployment, Search and Labour Supply, Cambridge University Press.

Van Soest A. (1995), “Structural Models of Family Labour Supply. A Discrete Choice Approach”, Journal of Human Resources, 30, 63-88.

Tables and figures

Figure 1: Budget constraint of a couple with two children (Children ages: 2 and 4)



Note**:** the budget constraints are plotted with the following assumptions: the man is a full time worker with median male wage rate (9.42 Euros), woman wage rate is fixed as well at the median (6.33 Euros). The household is not receiving any other source of income or benefit.

Figure 2: Hours of work

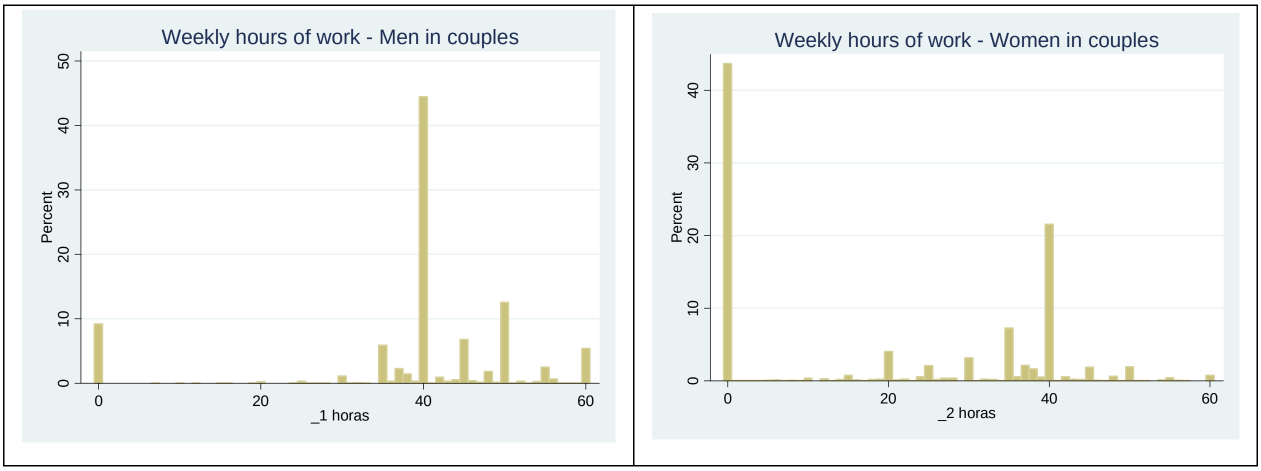


Figure 3: Kernel density estimation of wage rates

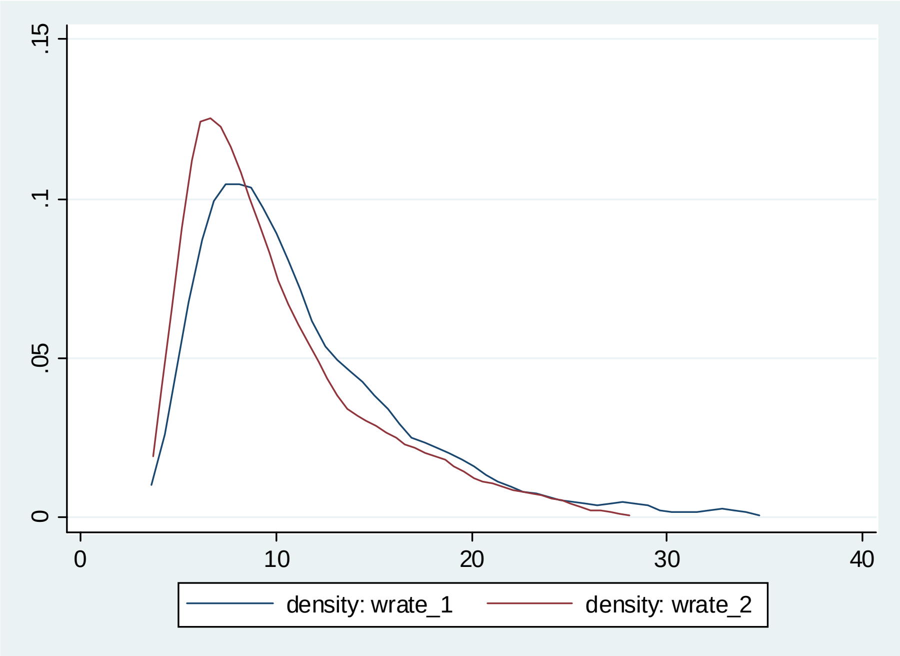


Table 1: Personal and family allowances

	2006	2007	Change
Personal allowance	3,400	5,050	49%
Age >65	800	900	13%
Increase for >75	+1,000	+1,100	10%
Children allowance:			
1st child	1,400	1,800	29%
2nd children	1,500	2,000	33%
3rd children	2,200	3,600	64%
4th children (and the followings)	2,300	4,100	78%
Increase for <3	+1,200	+1,400	17%

Table 2: Tax schedule

2006		2007	
Up to	Tax rate	Up to	Tax rate
4,162	15%	17,360	24%
14,357.52	24%	32,360	28%
26,842.32	28%	52,360	37%
46,818	37%	Over 52,360	43%
Over 46,818	45%		

Table 3: Labour Supply Parameters Estimates

Variable	Coefficient
$Income^2$	-0.283***
Hours of leisure of the $male^2$	-45.464***
Hours of leisure of the $female^2$	-83.472**
Income x Hours of leisure of the male	1.922***
Income x Hours of leisure of the female	0.929
Hours of leisure of the male x Hours of leisure of the female	-4.049
Income	1.896**
x Age of the male	0.039
x Age of the female	0.211*
x 1(Children 0-3)	-0.278
x 1(Children 3-15)	-0.391
Hours of leisure of the male	91.527***
x Age of the male	1.651***
x Age of the male square	0.841***
x 1(Children 0-3)	-0.278
x 1(Children 3-15)	-0.625***
Hours of leisure of the female	140.225**
x Age of the female	0.062
x Age of the female squared	0.968***
x 1(Children 0-3)	2.416
x 1(Children 3-15)	2.941***
Fixed costs	1.418***
x 1(big city)	-0.03
n. Children	0.116***
Number of observations	3607
Log likelihood	-6347.925

Note. The variables have been rescaled as follows: Income = disposable income in Euros/20,000; Hours of leisure = (24x7 – weekly hours of work)/160; Age = (age in years – 40)/10. * parameter significant at 10%, ** parameter significant at 5%, *** parameter significant at 1%
Average wage elasticities are computed by increasing the gross wage rate by 10%.

Table 4: Elasticities at the intensive at extensive margin. Responses in percentage points of an increase of 10% (elasticities)

	Change in	Increase in female wage rate	Increase in male wage rate
Females	**Participation**	**2.6**	0.24
	Working hours	**5.1**	0.23
Males	**Participation**	-0.34	**1.76**
	Working hours	-0.42	**2.12**

Note: elasticities are computed using averaged simulated transitions

Table 5: Elasticity of unconditional expectation of hours of work in percentage points

Pre-reform gross income deciles	Increase in 10% of the female wage rate		Increase in 10% of the male wage rate	
	Females	Males (cross elasticity)	Males	Females (cross elasticity)
1	43.846	5.312	41.383	12.069
2	51.727	-0.727	1.976	-2.790
3	37.508	-0.741	1.088	0.391
4	10.728	-0.716	0.814	-0.845
5	4.366	-0.561	0.797	-0.297
6	2.153	-0.724	0.253	-0.141
7	2.153	-0.487	0.253	0.026
8	1.379	-0.634	0.337	-0.106
9	0.989	-0.652	0.194	0.049
10	0.743	-0.817	0.245	-0.037
total	**5.060**	**-0.425**	**2.123**	**0.234**

Note: elasticities are computed as the average increase in hours of as a result of a 1% increase of the wage rate. Deciles are computed taking into account the household gross income in the baseline (or the pre-reform scenario).

Table 6: Transitions

Post-reform

Pre-reform	**0_0**	**0_25**	**0_40**	**40_0**	**40_25**	**40_40**	**50_0**	**50_25**	**50_40**	Total
0_0	4.67	**0.01**	**0.02**	0	**0.06**	**0.13**	0	**0.04**	**0.07**	4.99
0_25	0	0.86	0	0	0	0	0	0	0	0.86
0_40	0	0	3.13	0	0	0	0	0	0	3.13
40_0	0	**0.03**	**0.09**	21.23	**0.39**	**0.73**	0	**0.24**	**0.43**	23.13
40_25	0	0	0.01	0	9.17	0	0	0	0	9.18
40_40	0	0.01	0.03	0	0.03	25.21	0	0	0	25.29
50_0	0	**0.03**	**0.08**	0	**0.28**	**0.54**	14.15	**0.17**	**0.31**	15.56
50_25	0	0	0.01	0	0.01	0	0	4.87	0	4.88
50_40	0	0.01	0.03	0	0.02	0.04	0	0.01	12.87	12.98
Total	**4.67**	**0.94**	**3.42**	**21.23**	**9.95**	**26.64**	**14.15**	**5.32**	**13.68**	**100**

Table 7: Labour supply

	Pre-reform	Post-reform	Change
Participation			
Male	91.02	90.97	-0.05%
Female	56.32	59.96	6.45%
Hours			
Male	3974.8	3970.2	-0.11%
Female	2029.1	2154.9	6.20%

Table 8: Cost and efficiency of the reform

	Pre-reform	Post-reform			
		without response	Change	with response	Change
Cost					
Income Tax	10,650,859	8,721,694	-18.11%	8,574,936	-19.49%
Income Tax (excluding in-work benefit)	11,058,094	11,058,094	0.00%	11,207,391	1.35%
In-work mother benefit	407,235	2,336,400	473.72%	2,632,455	546.42%
Social security contributions	7,742,663	7,742,663	0.00%	7,825,826	1.07%
Tax collection	18,393,522	16,464,357	-10.49%	16,400,762	-10.83%
Efficiency					
Gross Income (in millions)	109.76	109.76	0.00%	110.86	1.00%

Note: Data of the simulated couples in annual Euros.

Appendix

Table A1: Estimation of wage rates

	ln W		Selection eq.	
	Male	**Female**	**Male**	**Female**
Experience	0.001	0.022***	0.017***	0.065***
Age	0.049***	0.036***	0.113***	0.128***
Age^2	-0.000***	-0.000***	-0.002***	-0.002***
Education				
Primary	0.209**	-0.166	0.163	-0.143
Secondary	0.287***	-0.141	0.352*	0.035
Secondary +	0.432***	0.144	0.547***	0.433*
Other (after Secondary)	0.386***	0.157	0.789***	0.443
College	0.707***	0.587***	1.116***	0.980***
Region				
Principado de Asturias	0.105**	-0.085	-0.265*	-0.22
Cantabria	0.142**	0.078	0.188	0.063
País Vasco	0.202***	0.058	0.136	0.142
Comunidad Foral de Navarra	0.229***	0.046	0.083	-0.095
La Rioja	0.067	-0.134**	0.17	0.113
Aragón	0.133***	0.042	0.422***	0.317**
Comunidad de Madrid	0.130***	0.049	0.465***	0.211
Castilla y León	0.074*	-0.074	0.104	0.052
Castilla-La Mancha	0.126***	0.108*	0.136	0.219
Extremadura	0.005	0.084	0.111	0.242
Cataluña	0.178***	0.036	0.208*	0.259**
Comunidad Valenciana	0.033	-0.065	0.04	-0.054
Illes Balears	0.137***	0.045	0.373**	0.369**
Andalucía	0.03	-0.008	-0.033	-0.097
Región de Murcia	0.139***	0.062	0.284**	0.274*
Ciudad Autónoma de Ceuta	0.176**	0.212**	-0.053	-0.139
Ciudad Autónoma de Melilla	0.223***	0.191*	0.376	0.244
Canarias	0.014	0.001	-0.009	0.029
Agglomeration				
Urban	-0.026	-0.045		
Rural	-0.094***	-0.111***	-0.132**	-0.190***
Constant	0.477**	0.739***	-0.363***	-0.291***
Children				
dummy 1			0.009	-0.306***
dummy 2			-0.065	-0.379***
dummy >2			-0.248**	-0.585***
Non-labour income			-0.336***	-0.060***
Mills				
lambda	0.146***	0.367***		
Chi^2	1075.098	543.82		
N	3916	3916		

Note: Reference values are: “not answering” in Education level, “Galicia” in Region, “Big city” in Agglomeration and “No children” in Children. * p<.1; ** p<.05; *** p<.01