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WOMEN AT WORK: THE IMPACT OF WELFARE AND FISCAL POLICIES IN A DYNAMIC LABOR SUPPLY MODEL

by Maria Rosaria Marino*, Marzia Romanelli** and Martino Tasso**

Abstract

We build and estimate a structural dynamic life-cycle model of household labor supply, fertility, and consumption behavior. The model features several sources of heterogeneity in household members' characteristics and it incorporates most of the fiscal rules that affect household net income. The parameters of the model are estimated using Italian longitudinal data for the period 2004-12 in order to investigate the causes of the relatively low labor supply by married women in this country. The model matches many characteristics of the data quite well. We use the estimated model to simulate a few counterfactual fiscal and welfare policies: some of them are effective in decreasing poverty rates while increasing labor supply.

JEL Classification: J22, H24, H31.
Keywords: household labor supply, savings and fertility choices, fiscal policies.

Contents

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1 Introduction[1]

Welfare and taxation policies can heavily influence most decisions of economic agents. In this paper, we focus on the effects of these policies on the employment decisions of married women, a group which is usually found by the literature to react relatively more to changes of the tax-and-benefit system. Indeed, while singles tend to supply their labor relatively inelastically, second-earners in couples typically do not. First of all, they can obviously rely on an alternative source of income. Second, the presence of kids can increase the *costs* (monetary and psychological) of being employed. Lastly, in many advanced economies, the design of labor earning taxation introduces rather high disincentives for them to participate to the labor market (see for example Meghir and Phillips (2010) and Saez et al. (2012)).

Over time, extensive research has been devoted to explaining household labor supply and consumption decisions. A specific stream of the literature has focused specifically on female labor supply within a dynamic framework. Eckstein and Wolpin (1989), Sheran (2007), and Eckstein and Lifshitz (2011) are among the main contributions. However, also because of the associated high computational costs, a full specification of taxes and welfare benefits in estimated dynamic models is relatively rare. In this respect, the papers by Haan and Prowse (2010) on joint retirement decisions of German workers, by Keane and Wolpin (2010) on the effects of the Earned Income Tax Credit (EITC) in the United States on labor supply, by Blundell et al. (2013) on the labor supply of English women, and by Chan (2013) on welfare reform are particularly relevant exceptions.

We believe that the Italian case is particularly interesting.[2] According to Eurostat, in 2014 the employment rate for women aged between 25 and 54 (57.6%) was between 5

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[2] Clearly, other scholars have investigated the characteristics of the Italian labor market for women. For example, Olivetti and Petrongolo (2008) conduct a cross-country study on the origins of gender wage gaps; Del Boca (2002) investigates on the role of the availability of childcare services.

and 21 percentage points lower than the figures registered in the other large European countries (United Kingdom, Germany, France, Spain) and, on average, in the EU. This low average degree of labor market attachment by women mainly reflects the behavior of those living in a couple with children. A few studies have investigated the role of the Italian tax system on this outcome: simulations of alternative tax systems are presented, for instance, in Colombino and Del Boca (1990), Aaberge et al. (1999), and Aaberge et al. (2004). Colonna and Marcassa (2015) has also shown interesting evidence of the high implicit tax rates imposed by the Italian tax system on second earners. However, all of these studies model the labor supply decisions of households in a static framework.

In this paper, we contribute to the literature on dynamic labor supply models by building and estimating a dynamic life-cycle model of household labor supply, saving and fertility decisions. The model incorporates fiscal rules in place in the period 2004-2012, as well as the main features of the family allowances, a welfare benefit for low and middle income households with children. Agents are heterogeneous with respect to human capital (in terms of both education and on-the-job experience), and families differ in the number of children and in the preferences for offspring. Moreover, we account for permanent and unobservable heterogeneity in the behavior of the agents. All relevant parameters are jointly estimated, using the indirect inference method. In that, our approach is similar to the one used by Van der Klaauw and Wolpin (2008) to study the effect of social security reforms on retirement and savings decisions by the elderly in the United States.

Dynamics enters our model in several ways. First of all, agents accumulate human capital while working (as in Imai and Keane (2004)): when comparing the costs and the benefits of employment, married women take into account the fact that each additional year in the market has long-lived effects. Second, households are allowed to accumulate and decumulate savings, thus providing a mechanism through which they can insure against adverse shocks on the labor market. Finally, agents are forward looking, and, in principle, can react not only to the implementation of policies, but also to their announcement; they are allowed to intertemporally adjust both consumption and labor supply.

The model also features fertility choices by the households. In that, we follow the seminal studies by Wolpin (1984) on the estimation of dynamic models of fertility and by Francesconi (2002) on the joint decision on labor supply and fertility.

To the best of our knowledge, our study is the first attempt to structurally estimate a dynamic model which incorporates all the mentioned features.[3] The richness of our model comes at the cost of a heavy computational burden, which we overcome through specific modelling, econometric, and computational choices.

We use the estimated model to assess the effects of changes in the existing tax-and-benefit system on married women's labor supply, and on the distribution of income. Indeed, several studies have focused on the effects associated with the introduction and the extension of family-related cash benefits and on the effects of alternative taxation schemes, which have been implemented in some other developed countries over the last twenty years. For example, the analyses made by Eissa and Liebman (1995) and Meyer (2002) deal with different extensions of the Earned Income Tax Credits in the United States, while Blundell et al. (2000) studies the English Working Families Tax Credits. Understanding the potential effects of similar policies in a low female employment country, like Italy, is thus relevant from a policy perspective.

We find that an increase in households' non-labor income decreases overall poverty (in terms of head-count ratios) but lowers the incentives of married women to supply labor. On the contrary, some policies aimed at increasing the return of the hours worked can have positive effects on both dimensions. Indeed, we find that increasing the generosity of family allowances by about one fourth (for low and middle income households) would reduce full-time employment by almost two percentage points. On the contrary, subsidizing low wages by lowering social security contributions on taxpayers earning less than a certain threshold or introducing a small refundable tax credit – policies comparable in terms of costs for the Government – would increase labor supply at both the intensive and extensive margins, while delivering a comparable reduction in poverty rates.

The rest of the paper is organized as follows. Section 2 introduces the model and our solution method. In section 3 we illustrate the main features of the Italian tax system, as well as those of the family allowances. Sections 4 and 5 provide respectively an illustration of the econometric technique and the data sources we use. The results of the study are presented in sections 6 to 8, while 9 concludes. A brief overview of the Italian labor market is presented in Appendix A.

[3] For a highly preliminary (and non peer-reviewed) version, which did not account neither for unobservable heterogeneity, nor for fertility decisions of the households and in which only very few parameters were estimated, see Marino et al. (2013). The work which is closest to ours is that by Blundell et al. (2013), which features the choice of the education level, but takes fertility and the spousal choice as given.

2 Setup of the model

The household's choice is modelled in a dynamic setting. We assume that the decision maker is the household, which is composed by a husband, a wife and, possibly, children. The agent chooses how much to consume, how many hours the wife spends in a paid occupation, and how many kids to raise to maximize the family's lifetime utility. A series of state variables affects the decision process: the agent takes into account the level of accumulated assets, the realized labor incomes of all the components of the household, as well as the cost related to raising children under different employment statuses. Given the dynamic nature of the problem, household's expectations about the future play a role. Finally, the agent knows the structure of the tax-and-transfer system and its effect on the family net income; nevertheless, due to the presence of some uncertainty over realized future employment status and gross incomes, household cannot know deterministically their disposable income in advance.

2.1 Gross incomes

In order to replicate the main features of the labor market for husbands, we assume that, in any period, with a given probability p each of them receives a job offer (whose characteristics will be described shortly); on the other hand, with probability $(1-p)$, the husband is hit by a shock which prevents him from taking any paid job. In what follows, we parametrize this probability using the average unemployment rates for men (aged 25-54) for the period of interest, by education, as recorded by Eurostat. If a husband is hit by such shock, the household's consumption can be financed by two sources: the labor income of the spouse (if employed) and the accumulated savings. This feature of the model therefore has a small positive effect both on the desire to save for precautionary reasons and on the incentives for the spouse to be employed (spouses provide each other with mutual insurance against any fluctuation in earned income). If the husband is not hit by an unemployment shock, for the sake of simplicity, we assume that he is always employed in a full time-job (except when he is retired). This assumption greatly simplifies the treatment of the problem, is broadly in line with empirical data, and is not unusual in this kind of literature (see for example Eckstein and Wolpin (1989)).

On the other hand, the wife can be in one of the following three labor market statuses: part-time employed , full-time employed, or not employed at all. Allowing for a limited set of discrete choices rather than a continuum of possibilities has become customary since the influential paper by Zabalza et al. (1980). Moreover, it is probably a more realistic description of the available choices for employees and it dramatically eases the computational burden of the estimation (e.g. the budget constraint must be calculated only at a limited number of points for each individual).

The log hourly gross wages for husband (h) and wife (w) – which are taken as given in our partial-equilibrium setup – follow a rather standard Mincer-type structure:

$$log(e^h_{it}) = \alpha^h_0 + \alpha^h_1 age^h_{it} + \alpha^h_2 (age^h_{it})^2 + \alpha^h_3 edu^h_i + \alpha^h_4 north_i + \epsilon^h_{it} \quad (1)$$

$$log(e^w_{it}) = \alpha^w_0 + \alpha^w_1 edu^w_i + \alpha^w_2 exp^w_{it} + \alpha^w_3 (exp^w_{it})^2 + \alpha^w_4 pt_{it} + \alpha^w_5 I(\pi_1)_i + \alpha^w_6 north_i + \epsilon^w_{it} \quad (2)$$

$$\epsilon^g_{it} \sim N(0, \sigma^{2,g}), \quad \forall g \in \{h, w\} \quad (3)$$

The fact that women's wage equation depends on the accumulated experience (exp^w) allows us to incorporate in the model an additional channel through which labor supply decisions (and therefore tax policies) may have long-lasting effects. The coefficient α^w_4 captures the penalty in the hourly wage that a woman incurs when she works in a part-time occupation (pt). Finally, α^w_5 captures the effect of permanent and immutable characteristics of the worker in terms of skills (see also Section 2.4).

The gross hourly earnings of both members of a couple are allowed to depend on the location of the family, in order to reflect some well-known labor market differences across Italian regions: the parameters α^h_4 and α^w_6 capture the premium for working in the northern part of the country[4].

For the year of the delivery, the model assigns each continuously-employed pregnant woman a maternity income which is proportional to the average income of married women with the same observable characteristics (age, number of kids, education, years of work experience, and observable skill level).[5]

Once a member of the family reaches the age of 67, he or she retires and enjoys

[4]Even though the model allows for possible disparities in labor market conditions, the location of the couple is assumed as an exogenous and fixed characteristic of the agents in our model. Such assumption is heavily supported by empirical evidence: internal migrations across broad areas (North vs South of the country) are nowadays quantitatively very limited (according to the Italian national statistical offices, they involved slightly less than 0.3% of the resident population in 2014). Moreover, allowing for location choice across regions would dramatically increase the computational cost of the estimate.

[5]To be consistent with the features of the Italian labor market for employees, we assign each pregnant women 80% of the previous income for the first 6 months and 30% for the next 5 months.

a public pension which is a deterministic function of the income in the last year of employment[6]. Every individual dies with certainty at age 85. Since wives and husbands are not necessarily the same age, the model accounts for possible periods of widowhood too.

2.2 Budget constraint

The households' budget constraint is modelled as follows:

$$\frac{A_{t+1}}{1+r} = A_t + \tau_t(e^h l^h + e^w l^w) - K_t(k_t, l^w) - c_t \tag{4}$$

A_t is the household's net wealth at the beginning of period t, l^h and l^w are the number of hours supplied on the labor market by husband and wife respectively, and τ_t a function which replicates the main features of the tax-and-benefit system in year t. c_t is household consumption; K_t is the cost of childcare in period t: it depends on the number of children in the household in that period, and on the mother's labor market status.

2.3 Preferences and choice set

Household's preferences are defined over consumption, labor supply, and the number of offspring. We follow the existing literature by choosing a multiplicative form for the utility guaranteed by consumption (U_c) and labor (U_l), as in Blundell et al. (2013). As in Adda et al. (2011), the utility of children (U_k) is additive.

$$U_t = U_c \cdot U_l + U_k \tag{5}$$

More specifically, preferences for consumption take the form of a standard CRRA utility function, where η is the coefficient of relative risk aversion:

$$U_c = \frac{(c_t/n_t)^{1+\eta}}{1+\eta} \tag{6}$$

One of the main drawbacks of the standard life-cycle model is its inability to replicate well the shape of consumption pattern over time. Adjusting for the demographic characteristics of the household can help to solve this problem: consumption is hump-shaped and it tracks income (Fernandez-Villaverde and Krueger, 2002). To accommodate for

[6] Since for a woman in our model, earned income is a function of accumulated work experience, this feature generates an additional incentive to participate to the labor market.

demographics, we rescale consumption in the utility function by dividing it by the equivalent number of household members, n_t, as in Laibson et al. (2007) and in Attanasio and Wakefield (2010).[7]

The utility of paid work by wives is modeled as follows:

$$U_l(l_t^w) = \begin{cases} 1 & \text{if } l_t^w = 0 \\ exp(\gamma_0 \cdot (1 - \gamma_1 \cdot I(\pi_1)) + \gamma_2 \cdot ft_t) & \text{if } l_t^w > 0 \end{cases} \quad (7)$$

where ft_t is a dummy which takes value one if the wife is employed in a full-time job and zero otherwise. As will be clearer in the next section, the fixed-cost of working is heterogeneous across types of households: $I(\pi_1)$ is therefore a taste shifter for families of type 1 (see Section 2.4). It can be thought as a permanent component of preferences which subsumes all possible reasons for different tastes for paid work across households.

As for the fertility choice, we model the utility from offspring following Wolpin (1984) and Francesconi (2002):

$$U_k = (\rho + \epsilon_\rho) \cdot k_t + \chi \cdot k_t^2 \quad (8)$$

where ϵ_ρ is a normal shock with zero mean and variance σ_{ϵ_ρ}. This allows the utility of having kids to be heterogeneous across families and across time. Moreover it is not constrained to be linear. Economic theory would predict that $\rho > 0$ and $\chi < 0$ (i.e. each additional kid is expected to increase utility at a decreasing rate).

Summing up, in each period during the working life of the wife, the household chooses consumption and the optimal labor supply of the wife. If the wife is in her fertile age, the household has the option to have a new baby too.[8] In that case, the wife is prevented from working for one year. For the sake of simplicity, we assume that the couple has full control over fertility, as in many other structural models on this topic (Francesconi, 2002). During retirement the only choice is over consumption.

The recursive problem can be written as follows:

$$V_t(X_t^h, X_t^w, A_t, k_t) = max_{\{l^w, A_{t+1}, k_{t+1}\}}\{U_t + \beta E[V_{t+1}(X_{t+1}^h, X_{t+1}^w, A_{t+1}, k_{t+1})]\}$$

[7] We divide total household consumption by the square root of the number of household members.

[8] We constrain the number of kids per family to a maximum of 6. Given our sample, this seems to be a reasonable assumption. For the sake of simplicity, we assume that older women cannot be pregnant, by exogenously fixing the maximum fertile age at 46.

subject to the budget constraint specified in Equation (4). X^h and X^w are the state variables which affect the behavior of the husband and the wife respectively (including the realization of the shocks).[9]

2.4 Heterogeneity and initial conditions

The agents in the model are heterogeneous in several dimensions. Firstly, individuals and families differ according to several observable characteristics (age, cohort, age difference between husband and wife, experience, education, level of accumulated assets, geographical location, number of kids and age of the youngest kid). Secondly, the preferences for the number of offspring are not the same either in any given period, or across households. Thirdly, we allow families to differ in a permanent and unobservable fashion in both their attitude towards wife's employment and in the wife's labor market ability level. As customary in this kind of discrete choice dynamic models (Heckman and Singer, 1984), we allow the population of families to be composed of a small and discrete number of types ($j = 1, ..., J$). In what follows, we set $J = 2$, which we found to be a good compromise between the needs for realism and for computation tractability. The probability of being of a certain type j is modeled as a standard logit:

$$Prob(i = j) = \frac{exp(b_j X_{t=0})}{1 + \sum_{j=1}^{J-1} exp(b_j X_{t=0})} \tag{9}$$

where $b_{j=1}$ are coefficients to be estimated together with the preference parameters. These parameters will drive the estimated proportion of types in our sample. As in Van der Klaauw and Wolpin (2008), we allow the probability of being of a certain type to depend on the initial observables ($X_{t=0}$). For the estimation of our model, initial conditions are those prevailing in the first wave in which we record any observation. Some of these characteristics (such as the presence of kids and the accumulated experience at that point in time) cannot simply be considered as exogenous in the presence of permanent unobserved heterogeneity. On the other hand, given household type, with i.i.d. shocks to wages, unemployment probability and preferences, observed initial conditions are exogenous (see Aguirregabiria and Mira (2010) and Skira (2015)).

Finally, observationally identical individuals may find optimal to behave very differ-

[9] Aside from the realized shocks, the set of state variables include age and education level of both adult members of the couple, experience, cohort, level of accumulated net worth, type, number of kids and age of the youngest one, if present.

ently because of different realization of shocks. Indeed, the households are exposed to some variability to gross incomes and unemployment status of the husband.

2.5 Solution of the model

The presence of several continuous and discrete state variables makes the full solution of the dynamic programming problem infeasible. Therefore, we follow an approximation method which is customary in this kind of large dynamic models (Keane and Wolpin, 1994). This approach is based on drawing a random subset of the points in the state space at each point in time and solving for the optimal value function there, while approximating the expected value function elsewhere on the basis of a flexible function of the state variables. The solution of the model is then obtained through value function iteration, starting from the last period and working backwards. The shocks are approximated numerically through Monte Carlo integration. The optimal level of consumption is obtained in each period, and for each selected point of the state space, through a modified version of the golden section search algorithm, which is applied once for each possible discrete choice for the wife (working full-time, working part-time, not working in any paid occupation, and having a new baby).

The solution of the dynamic programming allows us to obtain the optimal choices of the agents in each possible situation. Because of that, we can simulate the life of our households from the first period in which we observe them in the data onward. For each member of the household we simulate 50 realizations of the wage, unemployment and fertility shocks. Our simulations involve about 101,000 wage offers in each period. For each of them, and for each possible labor supply choice, we compute the income of the members of the family, net of taxes and social security contributions and the implied level of family allowances. These simulations are at the basis of our econometric strategy to recover the model parameters.[10]

3 The Italian tax and benefit system

As explained above, this model takes into account the main features of the Italian tax and welfare benefit system affecting families.

[10]In order to deal with the computational burden implied by the very high number of computations, we choose `Fortran 90` as programming language and we parallelize both the value function iteration and the simulation with the `OpenMP` libraries. Our program runs in parallel on as many as 32 processors.

In Italy individuals are subjected to a personal progressive income tax (the so-called "Irpef"). While every taxpayer faces the same schedule of tax brackets and marginal rates (see Table 4), specific tax reliefs are granted in the form of deduction from taxable income (as for the period 2004-06) or tax credits (as for the years 2004 and 2007-2012), whose amounts and schedule vary according to the type of earned income, and the number and kind of dependents (Tables 5, 6 7, 8, and 9). This last feature of the tax code, together with the fact that the amounts of these tax reliefs are inversely related to individual income, generates different degrees of progressivity by source of income and family type. Even though the Italian personal income tax is a very important tool for income redistribution, it is not designed to properly target people with very low incomes, or, more generally, taxpayers whose tax liabilities are smaller than their tax credits (i.e. it does not feature significant refundable tax credits, or negative income tax programs).

As for welfare benefits, we consider family allowances (called "Assegni per il nucleo familiare"), which are tax-exempt cash transfers granted by the government to families whose overall income falls below certain thresholds.[11] The amount of the support guaranteed through this welfare benefit is related positively to the size of the household and inversely to the gross household income.[12] Specific provisions are made for lone parents and for families with disabled members. While the amounts of the family allowance are kept constant, family income brackets are updated annually on the basis of inflation.

In our analysis the features of the individuals and, if relevant, of the family are used to compute net incomes. In particular, in the case of families with at least one children, child benefits (in terms of family allowances and tax credits) are assigned until the youngest kid in the family turns 26.

4 Econometric strategy

We estimate the coefficient of relative risk aversion, the parameters of the disutility of working, as well as those driving the fertility choices. These parameters are estimated jointly with those of the wage offers and those concerning the distribution of types in the population. We identify the parameters ($\hat{\theta}$) by searching for the vector of values which minimizes a weighted distance between the observed data and the behavior of the agents

[11] To be eligible for these cash transfers , the sum of taxable earned and pension incomes of the household components must account for at least 70 per cent of the gross family income.

[12] As an example, according to the 2010 values, a family with two kids and a gross income below 13,000 euros would have been eligible for a monthly family allowance of about 260 euros.

as simulated by our model. Such strategy is known as Method of Simulated Moments (or Indirect Inference), as in McFadden (1989). More formally, the econometric problem is the following:

$$\hat{\theta} = argmin\{g(\theta)'Wg(\theta)\}$$

and

$$g(\theta)' = [m_1^D - m_1^S(\theta), \ldots, m_J^D - m_J^S(\theta)]$$

where m_j^D be the j-th moment in the data and m_j^S the j-th simulated moment. The latter is found as an average across all the simulated individual observations, that is as $m_j^S = \frac{1}{NS}\sum_{s=1}^{NS} m_j^s(\theta)$ where θ is the vector of parameters to be estimated.

The weighting matrix W is a diagonal matrix whose entries on the main diagonal are the inverse of the variances of the sample moments.[13]

The variance of the estimator is:

$$\hat{V} = (1 + \frac{1}{NS}) \cdot (\hat{G}'W\hat{G})^{-1} \qquad \text{and} \qquad \hat{G} = \frac{\partial g(\theta)}{\partial \theta} |_{\theta=\hat{\theta}}$$

where NS is the number of replications per number of observed households. $\hat{G}$ is a matrix which contains the first derivatives of every moment with respect to every parameter.[14]

We estimate 25 parameters, using 93 moments. These moments include the proportion of families in which wives are employed, work full-time, as well as the median value of net worth. The pattern in the accumulation of the assets by the households is used to identify the coefficient of relative risk aversion, as in previous studies, such as those by Cagetti (2003) and Gourinchas and Parker (2002). The parameters governing the scale and the shape of the disutility from working are identified by the share of observations in each labor market status. Regressions of net-of-taxes log hourly wages on observable characteristics, coupled with our tax-and-benefit calculations, allow us to identify the parameters in the wage offers. Finally, a group of moments related to the number of kids per family is used to identify the preferences driving fertility choices. Table 10 provides a list of the moments used in the estimation procedure, together with a broad indication of which parameters they help to identify.

[13] The variances are obtained through bootstrap re-sampling with 200 replications.

[14] The derivatives are approximated numerically with the finite-differences method.

In order to obtain the optimal value of the parameters, our algorithm has to iterate between the solution of the model (and the simulation of the optimal behavior of our agents) and the minimization of the objective function. Because the objective function is likely to be discontinuous, we adopt a minimization algorithm which is based on the function values only, namely the Nelder and Mead (1965) method.

5 Data

Our main data source is the Bank of Italy Survey on Household Income and Wealth (SHIW), which provides information on net worth, net incomes, family composition and labor market status. All monetary values are expressed in 2012 euros using the official price indexes computed by the Italian National Statistical Office (ISTAT).

The Bank of Italy has been collecting a nationally representative household survey since the 1960s. The SHIW collects information about sources of income and wealth allocation for about 8,000 households in each wave. Since 1989, it features a longitudinal component. About half of the families are interviewed in up to five waves. Given its detailed information on assets, this dataset has been used widely in previous studies[15] and it is well suited for our research goal.

We use five bi-annual waves of the SHIW: from 2004 to 2012. We focus only on (continuously) married individuals, who, in each wave, are either employed as dependent workers or not employed at all. Our selection decision is dictated by the fact that the rules for the determination of taxable income and some features of the tax structure are different for self-employed with respect to employees. We drop very few observed households who accumulated an extremely high or extremely low level of assets and couples where the hourly earnings of at least one member are very high. We also drop household with more than two earners and those who are not interviewed in at least two consecutive waves. Since the SHIW is a rotating panel, our resulting sample is unbalanced. We are left with 998 households: about 54 percent of them are observed in at least three waves. Overall, our resulting sample is composed of 2,953 household-years observations.

Table 11 reports some simple unweighted descriptive statistics about the household in our sample in the first wave they are observed. The average net worth is slightly higher

[15] See for example Jappelli and Pistaferri (2000).

than 190,000 euro. Only about 60 percent of married women is employed, while only about two fifths of them works full-time. The number of children per family is about one and a half.

Some parameters are kept constant throughout the estimation (Table 12). In particular, the discount rate β is set to 0.99 in line with many studies on life-cycle behavior; the real net annual rate of return on assets r is set to 2.5%, as in Jappelli et al. (2008). Data from the ISTAT 2012 survey on consumption is used to parametrize childcare costs, which vary according to the labor market status of the mother and the number of kids in the household. We parametrize the gross replacement rate of social security using the age distribution of the agents in our sample and the official forecasts by the Italian Treasury (Ragioneria Generale dello Stato, 2016), fixing it at about 65.9%.[16] As mentioned above, we exogenously fix unemployment probability for husbands: to this aim, we use Eurostat data for average unemployment rates for men aged 25-54 for the years 2004-14. The number of hours worked in each discrete choice case is set to be broadly in line with median figures measured in our sample.

6 Results of the estimates

The estimates for the wage equations are shown in Table 13. The return of an additional year of education is about 6% for men and 8% for women. These figures are well inside the range of the values found in the literature (Belzil, 2007). As expected, the wage profile is hump-shaped. Experience has a positive and significative effect on offered wages for women (one additional year on the job increases offered hourly wage by about 4%). Part-time jobs come with a small penalty: *ceteris paribus*, hourly wages are about 1% lower than in full-time occupations (the coefficient is not statistically different from zero, though). Living in the north of the country allows for significantly higher hourly wage offers for both husband and wife.

Tables 14 and 15 summarize our estimates for the preferences parameters and the distribution of types. We find a coefficient of relative risk aversion of about -1.8, which is within the range of the existing estimates. Moreover, the size of the disutility from working varies with the number of hours worked and the family type. Type 1 families are those who find paid employment for the wives more attractive. Wife's accumulated

[16] This figures is broadly in line with the latest available estimate by the OECD for private-sector workers with average wages, i.e. 69.5% (OECD, 2015).

work experience as observed in the first wave is positively correlated with the probability of being of type 1. The effect of additional children is not linear ($\rho > 0$ and $\chi < 0$) and highly heterogeneous across families.

7 Fit of the model

The fit of the model to the observed data is satisfactory (see 16 for some selected statistics). The model replicates quite closely the labor market behavior of Italian married women: slightly less than 60 percent of them are employed, and about two fifth of them work full-time. In terms of fertility behavior, the model replicates quite well both the average number of kids and its dispersion across couples.

The model broadly matches the median level of net worth in each wave. Most importantly, though, it captures its trend over time and over the life-cycle in real terms. Moreover, as depicted in Figure 1, the asset distribution mirrors closely what can be observed in the data; this is even more important given that the characteristics of the distribution of the assets are not included among the moments used by our econometric procedure.

Our model is able to predict several other features of the population of interest. As an example, figure 2 and figure 3 show the salient characteristics of the distribution of net earnings (inclusive of family allowances) for both husband and wife in the data and the model (in the pooled sample). Even though many moments of the wage functions were not directly targeted in the estimation procedure, the actual and the simulated distributions align quite well. In particular, the average value of *accepted* wages for wives is 14,655 euro in the data, and 15,385 in the model. The corresponding average values for husbands are 19,843 and 20,498 euro. Standard deviation look alike as well. This is an indirect evidence of both the goodness of fit of the model and the correctness of our fiscal simulation algorithm.

In terms of consumption, our model predicts an average monthly consumption level of about 2,700 euro per family, which is close to that reported by ISTAT for the generality of families whose head of the household is a dependent worker.[17]

[17] In 2012, the average monthly consumption for families with a blue-collar or a white-collar head was respectively 2,329 and 2,953 euros (ISTAT, 2013).

8 Policy experiments

The goal is to study the effects of different structures of the tax-and-transfer system on household behavior. We use the model to simulate the effects of hypothetical changes to the tax-benefit system mainly on married women labor supply and on the overall poverty rate.[18] The policy exercises can be divided in two main groups: changes that increase the non-labor income of the households in the lowest part of the income distribution and changes that directly influence labor income. In particular, the policy experiments belonging to the first group include: i) an increase in family allowances; ii) a rise in child-related tax credits. The second group of experiments include: i) an increase in the generosity of the existing *non-refundable* work-related tax credits; ii) a subsidy to low earnings; iii) the introduction of a refundable tax credit linked to earned income.

All policy changes are implemented without any prior announcement. Therefore, they come as a surprise for agents in the model, who perceive them as permanent from time $t = 1$ on. From the computational point of view, all simulations in this section are conducted by replicating 50 times each family in our sample and taking as initial conditions at time $t = 1$ those predicted by the model at the beginning of 2013. The sequence of agents' optimal choices, obtained solving the dynamic programming problem and using the estimated parameters in equation (6) is then observed for 5 years and it is the basis for our analysis of the comparative effects of the mentioned policies.

To ensure comparability across different simulations all policy alternatives produce a reduction ranging between 4.1% and 4.3% of the total net revenue cashed at time $t = 1$ from the households in the simulated sample, with respect to the baseline scenario (which considers the actual tax-benefit system).[19] We define *net revenue* as the sum of tax revenue and social security contributions, net of family allowances.[20]

The main results are summarized in Table 17, which illustrates the effects of the simulated policies on female overall employment, full-time employment and household

[18] We define as poor the households whose net income is below the relative poverty line reported by ISTAT (which, for a two-people household, is equal to the average per-capita consumption; ISTAT (2015)). It should be noticed that such poverty line is calculated in terms of consumption expenditure. However, in general in the lowest part of the income distribution consumption and net income tend to be of the same magnitude. As measure of poverty we consider the head-count ratio.

[19] It has to be noted that, also because the household in our sample represent only a specific subgroup of taxpayers, the reduction in revenue cannot be straightforwardly reported to the National Account data.

[20] From the computational point of view, this measure is obtained as the average value of the net revenue over all our replications.

poverty head-count ratio. The table shows also the effects on individual and family incomes, overall consumption, and asset dynamics. As expected, all policy experiments reduce the overall poverty head-count ratio. They however differ in the magnitude of the effect. Fertility decisions are not affected by these various policies.

Some policies aimed at increasing the households' non-labor income can be somehow detrimental in terms of female labor supply. For example, when we simulate an increase of the family allowances (column (2) in Table 17), we obtain a small overall decrease of female employment, with a more preeminent decline of full-time employment. This result can be explained by the structure of the family allowances, which declines with family (not individual) earned income and increases with the number of children.

In the case of an increase in child-related tax credits (column (3)) we get almost no results in terms of overall employment. Full-time employment increases, albeit by an extremely small fraction. To understand this result, one should keep in mind that in Italy, the child tax credit is *non-refundable*, i.e. its availability depends on the presence of some positive tax liability. Moreover, parents allocate the full credit to the one of them with the highest gross income. Therefore, a few families find it optimal to increase the hours worked by wives to maximize their net incomes.

On the other hand, positive effects on the number of hours worked by married women result from the policies targeting directly the return from work. In all these cases, two competing effects play a role: on the one hand, households are usually richer thanks to the higher take-home pay of husbands (who, in our model, always work full time, if not unemployed); on the other hand, though, these policies tend to increase the opportunity cost of not working for wives.

In column (4) we show the results of a simulation which implements a generalized increase of work-related tax credits by 30%.[21] Overall, this policy results in a shift of married women from part-time towards full-time employment. This can be explained by both the incentive provided by the policy-induced increase in the return of additional hours of work (in terms of net-of-tax earnings), and by the desire to fully exploit the non-refundable tax credits.

The last two columns of the table show the effect of similar policies in favor of low and middle incomes. The first one (column 5) is the case of a simple subsidy whose

[21] As this credit is non-refundable, the magnitude of the actually exploitable benefit turns out to be smaller.

generosity increases with gross incomes up to a threshold (and is equivalent to, say, a reduction of social security contributions for low and middle incomes workers).In our exercise, the low-wage subsidy (equal to 2.8 per cent of gross income) is guaranteed to incomes between 5,000 and 25,000 euro per year. The second one (column 6) is the case of an earned income refundable credit, which, unlike in the United States, is based on individual income and does not vary with the number of dependent children.

The U.S. EITC was first introduced in 1975 as a relatively small anti-poverty program, designed to counteract the effect of payroll taxes on the net incomes of low-income taxpayers. Over time, its generosity has been considerable extended and now this credit represents a major policy tool to fight poverty in the United States. The EITC is a fully-refundable tax credit, whose amount first increases (in the so-called phase-in region), then flattens (plateau), and finally decreases very slowly with earned income. It has been found by a considerable body of literature to be extremely effective at raising lone mothers' (and singles, in general) labor supply, while decreasing poverty (Nichols and Rothstein, 2015). On the other hand, though, being based on household overall income, rather than on individual one, it was found to discourage additional work effort by second earners (Eissa and Hoynes, 2004) because additional earnings would generally place the household in the phase-out region of the benefit. As the generosity of the EITC varies widely with the number of dependent children in the family, some have argued that it may induce an increase in fertility rates among low-income families over the medium term (Keane and Wolpin, 2010). In our exercise, the maximum benefit is capped to slightly more than 500 euro per year; the phase-in region goes from 5,500 to 15,000 euro and the phase out from 22,000 to 32,000 euro.

The effects of these two last policies, which strongly depend on the details of the implementation,[22] are very similar one another. In both cases, both overall employment and full-time occupation increase. Overall employment increases because the average tax rates are reduced, in some case quite significantly, because of the policies. In the first case, the increase in full-time employment can be explained by the fact that the subsidy is unavailable, by design, to workers who earn too little. In the second case, as in the case of the U.S. EITC, the credit features an initial steep phase-in area where the generosity of the benefit is increased as gross income grows.

[22] Indeed, the incentives generated by these policies crucially depend on the distribution of offered wages in the population of interest.

In comparative terms, these two last policies are those who seem to be more effective in combining the goals of tackling poverty and stimulating labor supply. This can be explained by the fact that these policies are available to all low income workers, irrespective of their tax liabilities. On the contrary, very low income workers may find themselves with not enough liabilities to take advantage of an increase in non-refundable tax credits.

9 Conclusions

In this work, we build and estimate a large dynamic life-cycle model of labor supply, consumption, asset accumulation, and fertility for a sample of Italian families, which were observed between 2004 and 2012. The model accounts for several sources of heterogeneity across agents, and it incorporates the main features of the tax-and-benefit schemes in place at that time.

The estimates reveal that families are heterogeneous with respect to their degree of distaste for paid work by the wives. On average utility is affected positively by new kids, but this effect is non-linear. Italian families are risk averse.

The Italian labor market is characterized by a low employment rate of married women. As highlighted by a series of previous works, the tax code may play an important role. Using the estimated model and a series of simulations, we show the possible effect on labor supply of a list of hypothetical partial reforms to the system. Some policies can have positive effects on the reduction of overall poverty, while being detrimental to the degree of labor market participation of married women. This is the case for the welfare and tax tools which are related to family rather than individual income, as well as policies which increase transfers to families without regards to labor market status of their members. On the other hand, we find that there is a series of policies which can be effective both at stimulating labor market attachment of married women and at decreasing overall poverty.

All the policy experiments we simulate bear a cost for the public accounts. However, in a context such as the Italian one where public finance is under severe strain, the identification of a policy mix which stimulates labor supply while being revenue neutral could be of interest. On the other hand, since no new resources would be injected in the system, the attention to the distributional consequences of such a policy should be even higher, with a deep and detailed analysis of its impact on poverty and income distribution. Indeed, the trade-offs can be substantial. Such distributional analysis is out of the scope of the present work and we leave it to future research.

A Some features of the Italian labor market

Italian labor market participation and employment rates are considerably lower than those of the other major European countries (Table 1), as well as the targets sets by the Europe 2020 strategy. Although the decade preceding the 2008 financial crisis has seen a substantial improvement in both dimensions, the gap is still far from closing. In fact, the economic crisis has further deteriorated the picture. In particular in the years 2008-2014, Italy has shown a slacker dynamics both in the employment and participation rates with respect to the other large EU countries (being Spain an exception).

Two aspects of the Italian labor markets are worth highlighting. First, the positive dynamics in employment observed in the pre-crisis period was determined mainly by the expansion in part-time and temporary contracts, whose shares increased by 6.8 and 5.3 percentage points respectively in the period 1997-2007 (almost 3 and 2 times the EU average). Second, long-term unemployment is much more widespread in Italy than in other EU countries: in 2007 the unemployment spell was at least 12 months for more than 47.5% of the Italian unemployed workers while the EU average was 42.9%; in 2014 the incidence of long term unemployment increased in Italy up to 61.4%, while the rise in the other EU countries was on average much more limited (49.5%).

The aggregate data hide the large disparities that affect different groups of workers and that have led to an increasing dualism of the labor market. In particular, the poor overall performance of the labor market partly reflects the status of women and young workers in general. Indeed, these are the dimensions along which Italy records some of the biggest gaps with respect to the other large countries in Europe. Differences by gender and age are well reflected in activity and employment rates (Table 2).

The activity rate registered on average in Italy in 2014 for women in the age group 15-24 is lower than the corresponding value for the EU economies by almost 16 p.p. (21 p.p. with respect to Germany and almost 30 p.p. compared to UK). For what concerns employment the picture is analogous, with rates largely below the other major EU countries.

Moreover, women participation and employment rates in 2014 were the lowest ones within the EU (with the exception of Malta for participation and Greece for employment). At the same time, the gap between men and women it is almost double than what can be observed on average in the EU, both in terms of participation and employment rates (respectively 19.2 and 17.9 p.p. in Italy vs. 11.6 and 10.5 on average in the EU in 2014). Finally, the gender gap enlarges sensibly in case of married workers with children and in correspondence of lower levels of education attainment (Table 3).

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Table 1: Overall activity and employment rates (15 to 64 years)

	Activity rate			Employment Rate		
	2004	2012	2014	2004	2012	2014
European Union (EU)	69.3	71.7	72.3	62.9	64.1	64.9
Euro area (EA)	69.4	72.0	72.4	63.0	63.7	63.9
Germany (DE)	72.6	77.2	77.7	65.0	73.0	73.8
Spain (ES)	68.9	74.3	74.2	61.3	55.8	56.0
France (FR)	69.8	70.7	71.4	63.8	64.0	64.3
Italy (IT)	62.8	63.5	63.9	57.7	56.6	55.7
United Kingdom (UK)	75.3	76.1	76.7	71.7	69.9	71.9

Source: Eurostat (October 2015).

Table 2: Activity rates and employment rates by sex and age groups (%) - 2014

	Activity rate							Employment Rate						
	EU	EA	DE	ES	FR	IT	UK	EU	EA	DE	ES	FR	IT	UK
								Males						
15-24	44.4	42.6	52.0	37.3	40.4	31.0	59.6	34.3	32.4	47.7	17.4	30.5	18.2	48.3
25-54	91.5	91.6	92.6	92.6	93.2	87.7	92.2	83.2	81.9	88.0	72.5	84.9	78.2	88.0
55-64	63.9	63.8	75.5	64.3	53.0	60.2	70.9	58.8	58.1	71.4	51.2	48.9	56.5	67.8
15-64	78.1	78.1	82.5	79.5	75.5	73.6	82.2	70.1	69.0	78.1	60.7	67.7	64.7	76.8
								Females						
15-24	38.9	37.5	47.7	34.0	33.7	23.1	56.1	30.6	28.9	44.3	16.0	26.2	12.8	47.8
25-54	79.5	79.4	82.5	82.0	83.4	66.4	79.9	71.7	70.4	78.8	62.3	76.1	57.6	76.2
55-64	48.4	49.5	62.9	46.9	48.6	38.3	56.4	45.2	45.7	60.0	37.8	45.3	36.6	54.4
15-64	66.5	66.7	72.9	68.8	67.5	54.4	71.3	59.6	58.8	69.5	51.2	60.9	46.8	67.1

Source: Eurostat (October 2015).

Table 3: Gender employment rate gap (women vs men) by highest level of education attained and household composition (in p.p.) - 2014

	Single adult with children	Single adult without children	Adult living in a couple with children	Adult living in a couple without children
		Total		
EU	-11.5	-3.9	-19.9	-11.9
EA	-9.7	-3.0	-19.8	-11.2
DE	-11.7	0.2	-20.1	-9.4
ES	-8.7	-3.5	-20.2	-12.2
FR	-9.5	-4.3	-13.5	-6.0
IT	-7.9	-7.2	-29.9	-21.8
UK	-16.2	-0.2	-20.1	-12.2
		Pre-primary, primary and lower secondary education		
EU	-21.4	-8.9	-32.2	-17.8
EA	-19.6	-9.0	-32.3	-17.7
DE	-15.5	-2.3	-32.7	-18.0
ES	-11.1	-11.8	-28.3	-20.3
FR	-26.7	-4.4	-27.0	-8.6
IT	-17.8	-14.3	-43.2	-28.5
UK	-24.2	-1.4	-31.9	-16.9
		Upper secondary and post-secondary non-tertiary education		
EU	-9.5	-4.6	-21.2	-10.2
EA	-7.2	-2.6	-20.7	-8.3
DE	-7.0	0.3	-17.3	-7.5
ES	-10.7	-5.5	-24.6	-11.9
FR	-7.4	-4.6	-15.4	-3.1
IT	-6.8	-5.7	-29.8	-17.6
UK	-12.2	2.4	-22.0	-11.5
		First and second stage of tertiary education		
EU	-4.5	-3.1	-13.3	-6.1
EA	-2.9	-3.5	-12.8	-5.8
DE	-5.6	-0.2	-16.2	-4.5
ES	-8.0	-3.3	-15.0	-2.9
FR	0.5	-6.8	-8.8	-6.1
IT	-1.6	-6.5	-17.1	-12.5
UK	-9.2	-1.6	-15.0	-7.8

Source: Eurostat (October 2015).

Table 4: Income brackets and tax rates

2004		2005-2006		2007-2012	
Income brackets (euros)	Tax rates	Income brackets (euros)	Tax rates	Income brackets (euros)	Tax rates
0 - 15,000	23%	0 - 26,000	23%	0 - 15,000	23%
15,000 - 29,000	29%	26,000 - 33,500	33%	15,000 - 28,000	27%
29,000 - 32,600	31%	33,500 - 100,000	39%	28,000 - 55,000	38%
32,600 - 70,000	39%	Above 100,000	43%	55,000 - 75,000	41%
Above 70,000	45%			Above 75,000	43%

Table 5: Tax deductions (2004 - 2006)

Income source	Maximum amount (DEDB) (euros)	Dependent people	Maximum amount (DEDF) (euros)
Employee	7,500	Spouse	3,200
Retiree	7,000	Child	2,900
Self-employed	4,500	Child younger than 3 years	3,450
Other	3,000	Child with handicap	3,700

Using: $x_i = \frac{26{,}000+DEDB-y}{26{,}000}$

Using: $x_i = \frac{78{,}000+DEDF-y}{78{,}000}$

$$Amount = \begin{cases} 0, & \text{if } x_i \leq 0 \\ x_i * \text{DED}, & \text{if } 0 < x_i < 1 \\ \text{DED}, & \text{if } x_i \geq 1 \end{cases}$$

y is overall gross income, net of social security contributions.

Table 6: Tax credits for work-related expenses (2004)

Type of tax payer	Income bracket (euro)	Tax credit (euro)
Employee	0 - 27,000	0
	27,000 - 29,500	130
	29,500 - 36,500	235
	36,500 - 41,500	180
	41,500 - 46,700	130
	46,700 - 52,000	25
	Above 52,000	0
Retiree	0 - 24,500	0
	24,500 - 27,000	70
	27,000 - 29,000	170
	29,000 - 31,000	290
	31,000 - 36,500	230
	36,500 - 41,500	180
	41,500 - 46,700	130
	46,700 - 52,000	25
	Above 52,000	0
Self-employed	0 - 25,000	0
	25,000 - 24,900	80
	24,900 - 31,000	126
	31,000 - 32,000	80
	Above 32,000	0

Table 7: Tax credits for work-related expenses (2007 - 2012)

Income source	Income brackets (euro)	Tax credit (euro)
Employee	0 - 8,000	1,840
	8,000 - 15,000	1,338+502*[(15,000-y)/7,000]
	15,000 - 55,000	1,338*[(55,000-y)/40,000]
	Above 55,000	0
	Plus:	
	23,000 - 24,000	10
	24,000 - 25,000	20
	25,000 - 26,000	30
	26,000 - 27,700	40
	27,700 - 28,000	25
Retiree aged less than 75	0 - 7,750	1,725
	7,750 - 15,000	1,255+470*[(15,000-y)/7,500]
	15,000 - 55,000	1,255*[(55,000-y)/40,000]
	Above 55,000	0
Retiree aged 75 and more	0 - 7,750	1,783
	7,750 - 15,000	1,297+486*[(15,000-y)/7,250]
	15,000 - 55,000	1,297*[55,000-y)/40,000]
	Above 55,000	0
Self-employed	0 - 4,800	1,104
	4,800 - 55,000	1,104*[(55,000-y)/50,200]
	Above 55,000	0

Table 8: Tax credits for dependent people (2004)

Dependent person	Income bracket (euro)	Tax credit (euro)
Spouse	0 - 15,493.71	546.18
	15,493.71 - 30,987.41	
	30,987.41 - 51,645.69	
	Above 51,645.69	
First child and other dependent people	Up to 51,645.69	303.68
	Above 51,654.69	285.08
Children (other than the first one)	Up to 51,645.69	336.73
	Above 51,654.69	285.08

Table 9: Tax credits for dependent people (2007 - 2012)

Dependent people	Income brackets (euro)	Tax credit (euro)
Spouse	0 - 15,000	$800 - 110 * [y/15,000]$
	15,000 - 40,000	690
	40,000 - 80,000	$690 * [(80,000 - y)/40,000]$
	Above 80,000	0
	Plus:	
	29,000 - 29,200	10
	29,200 - 34,700	20
	34,700 - 35,000	30
	35,000 - 35,100	20
	35,100 - 35,200	10
Child	Aged 3 or more	$(800 * n.child) * [\frac{((95{,}000+15{,}000*(n.child-1))-y)}{(95{,}000+15{,}000*(n.child-1))}]$
	Younger than 3	$(900 * n.child) * [\frac{((95{,}000+15{,}000*(n.child-1))-y)}{(95{,}000+15{,}000*(n.child-1))}]$
	With handicap	(1)
	More than 3 children	(2)
Other dependent people		$(750 * n.other) * [\frac{((80{,}000+15{,}000*(n.other-1)-y)}{(80{,}000+15{,}000*(n.other-1))}]$

(1) Previous formulas but 800 and 900 euros are increased by 200 euros.

(2) Maximum amount augmented by 200 euros for each child after the first one.

Table 10: Moments

Description	Number	Helps to identify
Median net worth by year	3	Risk aversion
Coefficients of an OLS regression of net worth on wife and husband education, and husband age	12	Risk aversion
Average net worth by age (younger and older than 40)	2	
Average female employment by year	5	Disutility of working
Coefficients of an OLS regression of not-employed on lagged employment status, by year	6	
Coefficients of an OLS regression of employment on lagged employment	6	Types
Coefficients of an OLS regression of employment on observables and initial conditions	7	Correlation between initial conditions and type
Average female full-time employment by year	5	Slope in disutility of working
Coefficients of an OLS regression of husband log hourly net earnings on observables	5	Husband wage equation
Husband median hourly net earnings by year	5	
Correlation between husband log net hourly earnings and age	1	
Standard deviation of husband log net hourly earnings by year	5	
Coefficients of an OLS regression of wife log hourly net earnings on observables	6	Wife wage equation
Wife median hourly net earnings by year (full-time)	5	
Wife median hourly net earnings by year (part-time)	5	
Correlation between wife log net hourly earnings and experience	1	
Standard deviation of wife log net hourly earnings by year	5	
Autocorrelation of wife log net hourly earnings	1	
Average number of kids per couple by year	2	Utility of kids
Coefficients of an OLS regression of number of kids on lagged number of kids	4	
Standard deviation of the number of kids by year	2	
Total number of moments:	93	

Table 11: Descriptive statistics

	Average	S.D.
Family-level data:		
Net worth	190,637	178,123
Number of kids	1.46	0.92
Individual-level data:		
Wife age	39.29	6.28
Wife years of education	11.25	3.62
Wife experience	7.74	8.53
Wife employment rate	0.57	0.49
Wife full-time employment rate	0.39	0.49
Husband age	42.59	6.36
Husband years of education	11.10	3.70

Source: our calculations on the SHIW sample.
Net-worth data in 2012 euros.

Table 12: Parametrization

Name		Value
Social security replacement rate		0.659
Real net interest rate	r	0.025
Discount rate	β	0.99
Unemployment probability low education (ISHED 11 0-2)	(1-p)	0.086
Unemployment probability mid-level education (ISHED 11 3-4)		0.052
Unemployment probability high education (ISHED 11 5-8)		0.048
Annual childcare cost per kid (mother employed; euro)		1367.63
Annual childcare cost per kid (mother not employed; euro)		753.29
Annual hours worked if employed part-time (wife)		1000
Annual hours worked if employed full-time (wife)		1800
Annual hours worked if employed (husband)		1900

Childcare costs are per child and in 2012 Euro.

Table 13: Estimates: wage equations

	Husbands		Wives	
	Coeff	(se)	Coeff	(se)
Age	0.04	0.01	-	
Age^2	-0.00	0.00	-	
Experience	-		0.04	0.01
$Experience^2$	-		-0.00	0.00
Part-time	-		-0.01	0.02
Type 1	-		0.45	0.23
Education	0.06	0.00	0.08	0.00
North	0.11	0.02	0.06	0.03
Constant	0.83	0.14	0.74	0.21
s.d. of shocks	0.43	0.01	0.23	0.02

Table 14: Estimates: preferences

Consumption:			*Fertility* $(\cdot 10^{-1})$*:*		
η	-1.76	0.16	ρ	1.39	0.18
Disutility of Labor:			σ_ρ	8.01	6.33
Constant	0.59	0.31	χ	1.66	0.15
Type 1	0.91	0.06			
Full-time	0.11	0.03			

Table 15: Estimates: initial conditions and type proportions

Constant	0.81	0.12
First observed age	-0.07	0.01
First observed kids	-0.15	0.06
First observed experience	0.81	0.26
Implied types proportion:		
Type 1: 40.3%, Type 2: 59.7%		

Table 16: Fit of the model for selected variables

Year	Data	Model
Household median net worth (thousands euros):		
2006	173.7	162.9
2008	174.6	166.4
2010	187.7	172.9
Household median net worth by age (thousands euros):		
less than 40	168.8	160.7
40 and older	228.7	223.8
Average number of kids per household:		
2010	1.7	1.6
2012	1.8	1.6
Husbands' average net hourly wage rate:		
2004	10.3	10.3
2006	10.7	10.6
2008	10.6	10.6
2010	10.7	10.7
2012	10.4	10.6
Wives' average net hourly wage rate (full-time):		
2004	9.6	9.8
2006	10.1	10.0
2008	9.8	10.2
2010	9.7	10.1
2012	10.1	10.1
Wives' employment rate:		
2004	53.3	52.4
2006	58.1	54.7
2008	58.5	57.1
2010	58.0	59.2
2012	58.1	61.7
Wives' full-time employment rate:		
2004	38.6	34.9
2006	37.0	36.8
2008	40.5	38.1
2010	40.9	40.1
2012	34.2	40.4

Figure 1: Household net worth (pooled sample) by percentile

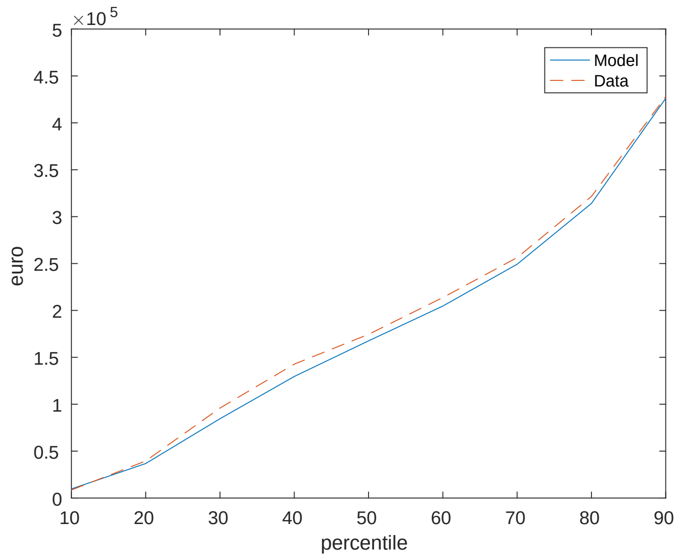

Figure 2: Wife net earnings (pooled sample) by percentile

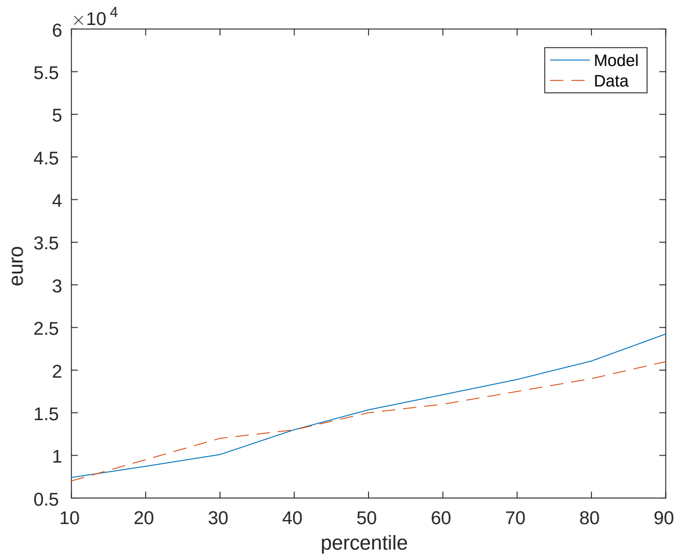

Figure 3: Husband net earnings (pooled sample) by percentile

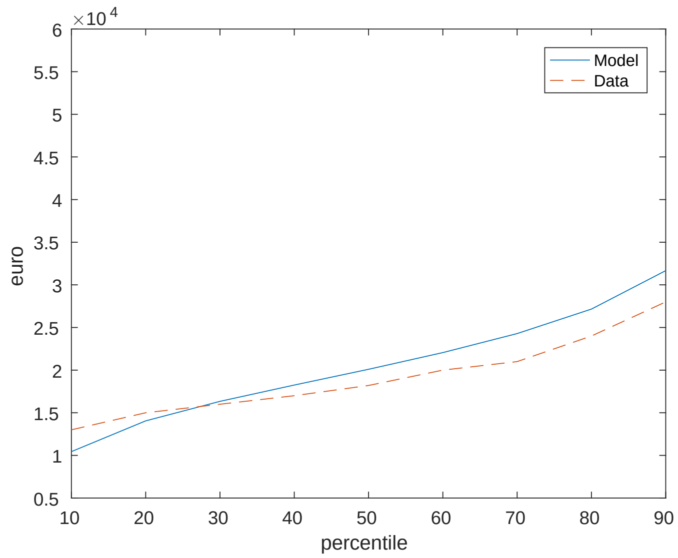

Table 17: Policy experiments: baseline and deviations from baseline (first year effects)

	Baseline	(1)	(2)	(3)	(4)	(5)
Asset (thousand euro; % change):	2.06	-0.08	0.11	0.08	0.16	0.17
Monthly consumption:	2619.98	30.23	15.23	21.04	17.66	19.53
Below poverty line:	19.34	-2.09	-1.82	-1.46	-1.76	-1.91
Overall employment:	57.46	-0.29	0.06	0.12	0.53	0.27
Full-time employment:	36.17	-1.64	0.22	1.09	1.57	2.39
Number kids:	1.62	0.00	0.00	0.00	0.00	0.00
Husband net earned income:	20350.18	288.27	303.29	215.69	239.11	263.99
Wife net earned income:	14818.98	-67.02	150.56	325.96	376.13	478.56
Household total net income:	28917.57	206.65	399.43	421.67	535.58	580.92

Policies:
(1) Raising family allowances by 28% for families earning less than 50,000 euros
(2) Raising child-related tax credits by 50%
(3) Raising work-related tax credits by 30%
(4) 2.8% low-wage subsidy
(5) Refundable earned income tax credit

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