Taxation and Labor Force Participation: The Case of Italy

Fabrizio Colonna - Banca d'Italia
Stefania Marcassa - Paris School of Economics*

today

Abstract

Within industrialized countries, labor force participation of Italian women is particularly low and characterized by a positive correlation to husbands' income. In this paper, we show that, despite an individual based tax system, the set of tax credits and cash transfers raises the tax burden levied on two-earner household, generating a disincentive to participate in the labor force for married women, typically the second earner of the family. Moreover, such disincentive is stronger when the first earner's income, conventionally the husband, is low. Using micro data from EU-SILC, we estimate a structural model where men's labor supply and incomes are given, and women decide whether to search for an occupation, and upon receiving it, whether to accept a given job offer or not. We then use the estimated parameters to measure the behavioral effects of alternative tax systems: the joint family taxation, the gender-based taxation (*à la* (Alesina et al., 2011)), and the Working Tax Credit. We show that the first system would imply either a significant tax revenue loss, or a substantial drop in female labor participation. The other two systems would boost the participation rate, with the effect of the latter being concentrated on unskilled and low educated women.

JEL Classification: J21, J22, H31
Keywords: female labor force participation, Italian tax system, marginal tax rate, joint taxation, gender-based taxation, Working Tax Credit

*Corresponding author. Contacts: Paris School of Economics, 48 boulevard Jourdan, 75014 Paris, FR. E-mail: marcassa@pse.ens.fr

1 Introduction

Within industrialized countries, labor force participation of Italian women is particularly low and characterized by a positive correlation to husbands' income. In this paper, we use micro data from the EU-SILC to estimate a structural model where men's labor supply and incomes are given, and we include the characteristics of the Italian tax system.[1]

Our paper is related to three main strands of literature. First, it relates to recent works that argue that the taxation system may create a system of positive or negative incentives to labor force participation, and that it may play an important role in explaining the cross-country differences in labor supply behavior. Some examples are Prescott (2004), (Davis and Henrekson, 2004), (Olovsson, 2009), and Rogerson (2006).

Second, our work draws from the model presented in (Burtless and Hausman, 1978), (Hausman, 1980), (Hausman, 1985), and (Colombino and Del Boca, 1990) where the estimated model is used in conjunction with U.S. and Italian data on labor supply. We enrich their results showing that the model is able to reproduce the positive correlation between wife's labor force participation rate and husband's income, a fact that has not been explored in the literature. Moreover, in the statistical procedure for the wage prediction, we correct for selection bias using a non-linear method that accounts for the probability that an individual with given characteristics opts for a certain labor supply choice.

In our model, the labor supply decisions of women are sequential. First, they decide whether to search for an occupation, and upon receiving it, whether to accept or not a given job offer. We show that, despite an individual based tax system[2], the set of tax credits and cash transfers raises the tax burden levied on a two-earner household, generating a disincentive to participate in the labor force for married women, typically the second earner of the family. Moreover, such disincentive is stronger when the first earner's income, conventionally the husband, is low.

[1] In general, the choice of participating in the labor market depends upon several variables. In particular, it reflects the value assigned to domestic activities (as housework and child care), and the amount of wealth owned. Moreover, social norms play an important role in the decision of women to work, especially in Italy. The *World Value Survey* reports that 80 percent of the Italian population, of both genders, thinks that a child younger than 3 years old suffers if the mother works. In Denmark the percentage is only 18 percent, 46 percent in the Netherlands, United Kingdom, and Spain. It is slightly higher for France (56 percent), and Germany (73 percent). Even thought we recognize the importance of these variables in determining the labor supply decision, it is beyond the scope of this paper to quantify their importance.

[2] In principle, an individual based tax system should not create incentives or disincentives to the labor supply of the two spouses, as both of them are equally treated.

Third, several studies examine the effect of tax reforms on the labor force participation. Italy has not experienced a tax reform, but we use the estimated parameters to measure the behavioral effects of alternative tax systems: joint family taxation (in line with the French system), gender-based taxation (as the one proposed by Alesina et al. (2011)), and a system inspired by the (British and American) Working Tax Credit. We show that the first would imply either a significant tax revenue loss, or a substantial drop in female labor participation. The other two would boost the participation rate, with the effect of the latter being concentrated on unskilled and low educated women. Those latter results are consistent with findings of Bar and Leukhina (2009) and Eissa and Liebman (1996).

This paper is organized as follows. In Section 2, we provide a description of the Italian labor market and taxation system. In Section 3 we specify the empirical strategy, we describe the data, and present the results. In Section 4, we measure the behavioral effects of alternative tax systems. Section 5 concludes.

2 Labor Market and Taxation System in Italy

2.1 Empirical Evidence

In this section we describe the main characteristics the Italian labor market in 2007-2008, and how it differs from the rest of the countries in the European Union.

Despite the improvement in female participation in the labor market, we can see in Table 4, that gender inequalities persist. When we look at the employment rates, we see that, while about 70 percent of women aged 24-54 years old are employed on average across the 15 countries of the European Union, the figure is over 85 percent for men. This results in a gender employment gap of around 15 percentage points. There are large cross-country differences in the gender employment gap. The gap is lower than 10 percentage points for France, Denmark, Sweden and United Kingdom. But, it is over 20 percentage points in Italy, Greece, and Spain.

There are also gender gaps in the intensity of employment participation. In all of 15 European Union countries, a much larger share of female employment is part-time when compared to male employment, with an average of 23.10 percent for women compared to only 3.90 percent for men. The largest gaps in the share of part-time/full-time employment among men and women is in Austria, Belgium, and Netherlands, where over 40 percent of female employees work part-time. In Italy, the gender gap is in line with the average of the 15 European Union countries.

Women are also more likely than men to have a temporary contract, especially in Italy and Spain. Spain is also characterized by a percentage of men with temporary

contract which twice as large as the average of all of the countries.

There is a large gender gap in managerial occupation. The United Kingdom stands out for the larger percentage of women with management and supervision responsibility than the rest of the countries. Italy performs slightly better than the average.

The gender gap is very large in the general participation rate. Italy has the lowest participation rate of women in the 15 European Union countries. That is, a participation gap of about 26 percentage points against an average gap of 17 percentage points. Denmark and Sweden have the highest participation rate of women, and hence the lowest gender gap. The marital status considerably affects the decision to participate, with married women having a participation rates that is about 10 percentage points lower than unmarried women. Moreover, participation rates tend to be lower for mothers. On average 73 percent of married mothers are in the labor force, but only 62 percent in Italy. From Figure 1, we can see that the gap in participation of married and unmarried Italian women persists during the life-cycle, especially for those who have children.

Looking across the European countries, the increase in female participation rates has led to an increase in the share of households where both adults participate in the labor force (and in paid employment (OECD (2011))). Figure 2 shows that in most countries, the dual-participant couples (darker part of the columns) replaced the male breadwinner household (the percentages are written on the columns). Italy stands out for having a percentage of male-only participant families that is about 11 percentage point higher than the average.

This is related to Figure 3, where we can see that the labor force participation of married women is positively correlated to their husbands' gross yearly income. This is in contrast with the other European countries, where the labor force participation appears to be inelastic. This is a feature of the Italian labor force participation of married women that has not been explored in the literature, and that has motivated our project.

To get a measure of the correlation between the labor force participation of married women and the various demographic variables available in the EU-SILC dataset, we run a simple probit regression of this kind:

$$Pr(Y = 1|X) = \Phi(X'\beta) \tag{1}$$

where $Pr(Y = 1|X)$ denotes the conditional probability of participating in the labor market, Φ is the cumulative distribution function of the standard normal distribution, and the parameters β are estimated by maximum likelihood. The vector of controls X includes information on the (logarithm of the) gross yearly income of

husbands, number of children, age of the wife, and years of schooling. We also add country and year fixed effects. We run a separate regression for Italy and the rest of the European countries considered in our data analysis.

Results are in Table 6. Note that, the signs of the coefficients on the number of children, and years of schooling are consistent across countries. The presence of children decreases the probability of participating in the labor market, and the years of schooling have a positive impact on the probability of participating. But, Italy behaves differently than the other countries in the correlation between husband's income and labor force participation. In particular, a significative positive elasticity of 0.05 characterizes the Italian data, versus a negative elasticity of 0.10 for the remaining 14 European countries.

2.2 The Italian Tax System

In this section, we describe the main characteristics of the Italian taxation system. The technical details can be found in the Appendix.

We define the second earner of a household as the worker with the highest elasticity of labor supply to income. In a married couple, the husband is considered as the *first earner*, and the wife is the *second earner*. Generally, the husband participates to the labor market with certainty. On the contrary, the wife's decision to participate depends on the fraction of her expected gross income that will be disposable income, and on the fraction that will increase the total household taxes (other than on non monetary variables).

Let us define the marginal tax rate (or "second earner tax") as follows:

$$\text{Marginal Tax Rate} = \frac{\Delta T}{\Delta I} = \frac{Tax_1 - Tax_0}{I_1 - I_0}$$

where Tax_1 and Tax_0 are the total income taxes paid by the household if the wife works (Tax_1) and if she does not work (Tax_0). I_1 is the gross income earned by the wife when working, and $I_0 = 0$ when she does not work.

Note that the marginal tax rate may be quite different of the average income tax paid by an unmarried woman. In particular, in countries like France with the *quotient familial*, the tax on earnings of married women is higher than the tax on earnings of unmarried women.[3]

In Italy, where the tax system is based on the individual and not on the household, we should not observe a marital status dependence of the amount of tax paid.

[3]See Saint-Jaques (2009) for a detailed description of the French tax system and its effects on the female labor force participation.

Nevertheless, tax credits and other transfers to low income households increase the marginal tax rate above the average tax paid by unmarried individuals. More specifically, tax credits for family dependents and universal cash transfers for spouse and dependent children are decreasing functions of the household income and indirectly affect the fiscal burden related to the labor force participation status of the wife.

Let us illustrate the mechanism put at work by the tax credits and the universal cash transfers. Since 2007, the tax system grants a tax credit for dependent spouse who earns less than $2,840.51$ euros a year. The amount of tax credit varies between 0 and 730 euros depending on the spouse's income, and increases the marginal tax on the wife (or second earner)'s income.

Consider the following examples.

(1) Assume that an unmarried woman (not currently employed) receives an offer to work part-time earning $7,200$ euros a year. As the current taxation system includes a no-tax area for yearly income lower than $8,000$ euros, her net disposable income would increase of $7,200$ euros a year. She would pay an marginal tax rate of 0.

(2) Assume now that this same woman is married to an employed man earning $35,000$ euros a year. The tax credit system would grant 720 euros to the household if she did not work. If she were to accept the job offer, she would not depend on the husband anymore, and the husband would not receive the tax credit. The household disposable income would not increase of $7,200$ euros a year, but of $6,480$ euros a year, $(7,200 - 720)$. She would pay an marginal tax rate equal to 10 percent, that is $720/7,200$.

(3) Assume the husband earns $50,000$ euros a year. The tax credit system would grant 517.50 euros to the household if she did not work. She would pay a marginal tax rate equal to 7.2 percent.

(4) Assume the husband earns $100,000$ euros a year. He would not receive the tax credit and the marginal tax rate would be zero.

These four examples show that the amount of tax credit decreases with the total household income and is zero for incomes higher than $95,000$ euros a year. The universal cash transfers for dependent spouse and children put a similar mechanism at work. For single mothers they have the positive effect of reducing the fiscal burden and create positive incentives to labor force participation.

Figure 4 plots the marginal tax rates on earnings of women against gross yearly earnings. In particular, the figures on the left column plot the marginal tax rates

on earnings against the women's gross yearly earnings, for a level of husband's gross yearly earnings of 40,000 euros. The figures on the right column plot the marginal tax rate on earnings against the husbands's gross yearly earnings, for a level of woman's gross yearly earnings of 40,000 euros. The top panel is for women without children, and the bottom panel is for women with two dependent children.

In panel a), we can see that the married-unmarried difference in the marginal tax is particularly relevant for low earning households. Moreover, the marginal tax rate of unmarried women is equal to that of married women when the husband is not employed, or has a very low income. The pick in the marginal tax of married women occurs in correspondence to an yearly earning of $3,000$ euros. At that level of earnings, husbands are not entitled to receives a tax credit for dependent spouse, and the marginal tax rate jumps from 0 to almost 30 percent.

In panel b), we plot the marginal tax for a constant level of women's gross earnings of 40,000 euros. The marginal tax rate of married women is constant until a level of husband's income of about 8,000 euros, as the husband's income belongs to the no-tax area, and only the income of his wife is subject to taxation. After that point, both incomes are taxed and the marginal tax increases to about 34 percent.

In panel c) and d), we plot the marginal tax rates of households with children. In panel c), we can see that low earnings unmarried mothers are subject to negative taxation, as they are eligible to universal cash transfers for dependent children, which are higher than the amount tax they are supposed to pay. Married mothers are subject to a high marginal tax because of the (lower) amount of universal cash transfers for dependent children transferred to the husband. As earnings increase, the difference between the tax paid by married and unmarried women decreases. In panel d), we can see the impact of the universal cash transfers for dependent children. The marginal tax rate is increasing up to an yearly household earning of about 60,000 euros. After that point, households are not entitled to receive the transfers, and the marginal tax rate decreases.

From panel a) of Figure 5, we observe that unmarried women with children have a marginal tax rate which is much lower than that of unmarried women without children. The opposite is true for married women, where the presence of children increases the burden of the taxation.

In summary, the Italian tax system, even if based on individuals and not on households, generates a set of negative incentives to the female labor force participation. We can summarizes them as follows:

(a) the universal cash transfers for dependent children and spouse increase the taxation paid by married women relative to unmarried women;

(b) the distortion in (a) is increasing in the number of children of married women;

(c) the distortion in (a) reaches a maximum at the husband's yearly earnings of about $10,000$ to $30,000$ euros;

(d) the distortion in (a) is decreasing in the wife's earnings. Hence, it has a high negative impact on married women employed in low income jobs, or having part-time contracts.[4]

3 Estimation and Results

3.1 The Model and the Empirical Specification

We build a two-stage model of female labor supply. At the first stage, a woman decides whether to join the labor market and search for a job. If she does, she will enter the second stage and receive, for each possible amount of work time, $h \in H \subset \Re^+$ a job offer characterized by a level of offered gross yearly earning $w_f(h)$. She can accept one of them or reject them all and stays unemployed ($h = 0$).

We denote with $w_m(h)$ the husband gross earnings (which is 0 if the woman is not married) and with y the household gross income coming from other sources. Both $w_m(h)$ and y are taken as given. Consumption equates disposable income

$$c = D(w_f(h), w_m, y, d) = w_f(h) + w_m + y - T(w_f(h), w_m, y, d)$$

where $T(\cdot)$ is the net transfer from the government, given by the difference between tax and benefits, both functions not only of total income, but also of a set of variables d including, for instance, the number of dependent children.

Household preferences are described by a stochastic utility functions $U_h^m(c, X)$, with m denoting marital status (0 for single, 1 for married), c the household consumption and X, a set of individual variables. Notice that the shape of the utility function is allowed to vary also with labor supply h.

We solve the problem by backward induction, starting from stage 2. A woman in the labor market will maximize

$$U(w_m, y, d, X) = \max_h U_h(D(w_f(h), w_m, y, d), X)$$

[4]In 2007 and 2008, 24 percent of working women had a part-time job, while only 5 percent of men did. In general, part-time work characterizes low earning jobs with rather flat career prospects. As Manning and Petrongolo (2008) point out, this may lead to occupational segregation.

In stage 1, the agent decides whether or not to enter the labor market. The problem is the following:

$$\max_s U_s(w_m, X, y, d) = \max\{U_{-1}(w_m, X, y, d), E\left[U(w_m, y, d, X)\right]\}$$

where $s = \{-1, 0\}$ denotes the *out of/in* the labor market state, and $U_s(\cdot)$ the utility associated. Notice that the utility of being in the labor market is $E\left[U(w_m, y, d, X)\right]$, that is the expected utility generated by the maximization problem of stage 2.

We assume a quadratic utility function:

$$\begin{aligned} U_h^m(c, X) &= \alpha_h^m + \beta_1^m c + \beta_2^m c^2 + \gamma_h^m X + \epsilon_h^m \\ U_{-1}(w_m, X, y, d) &= U_{-1}^m(c, X) = \alpha_{-1}^m + \beta_1^m c + \beta_2^m c^2 + \gamma_{-1}^m X + \epsilon_{-1}^m \end{aligned}$$

Notice that marginal utility of income depends on marital status, and the effect of all other variables included in X vary with both m and h.

The difference $(\alpha_h^m - \alpha_0^m)$ captures the disutility of working (utility of leisure) for an amount of time h, and $(\alpha_0^m - \alpha_{-1}^m)$ is the disutility of searching for a job. Finally, ϵ_h is a stochastic error component.

We know that if ϵ are iid according to a type I extreme value distribution, the probability of observing a woman in the labor market, opting for a choice $h = k$ is

$$P_k = P(h = k|s = 1) = \frac{e^{U_k(D(w_f(k), w_m, y, d), X)}}{\sum_h e^{U_h(D(w_f(h), w_m, y, d), X)}}$$

Similarly the probability of being (or not being) in the labor market is $P(s = 0)$ (or $P(s = -1)$)

$$\begin{aligned} P(s = 0) &= \frac{e^{E[U(w_m, y, d, X)]}}{e^{U_{-1}(w_m, X, y, d)} + E\left[U(w_m, y, d, X)\right]} \\ P(s = -1) &= \frac{e^{U_{-1}(w_m, X, y, d)}}{e^{U_{-1}(w_m, X, y, d)} + E\left[U(w_m, y, d, X)\right]} \end{aligned}$$

Finally, for a given observation sample $\{Z_i\}_{i \in I} = \{w_{mi}, w_{fi}(h), y_i, h_i, s_i, d_i, X_i\}_{i \in I}$, we can compute the log-likelihood function:

$$
\begin{aligned}
L(\{z_i\}_{i\in I}) &= \sum_{s_i=-1} \left(U_{-1}(w_m, X, y, d) - e^{U_{-1}(w_m,X,y,d)} + E\left[U(w_m, y, d, X)\right]\right) + \\
&+ \sum_{s_i=0} \sum_{k} I(h_i = k) \left(U_k(D(w_f(k), w_m, y, d), X) - \sum_{h} e^{U_h(D(w_f(h),w_m,y,d),X)} \right)
\end{aligned}
$$

where $I(h_i = k)$ is a binary variable which equals 1 if individual i chooses $h = k$ and 0 otherwise.

3.2 The Data

We use micro data from the EU-SILC, the Community Statistics on Income and Living Conditions. The survey collects information relating to a broad range of issues in relation to income and living conditions. SILC is conducted by the Statistics Offices of the European countries involved in the project on an annual basis, in order to monitor changes in income and living conditions over time.

EU-SILC provides two types of data: cross-sectional data pertaining to a given time or a certain time period with variables on income, poverty, social exclusion and other living conditions, and longitudinal data pertaining to individual-level changes over time, observed periodically over a four years period.

Every person aged sixteen years and over in a household is required to participate to survey. Two different types of questions are asked in the household survey: household questions, which cover details of accommodation and facilities together with regular household expenses (mortgage repayments, etc.). This information is supplied by the Head of the Household; personal questions, which cover details of items such as work, income and health, are obtained from every household member aged 16 years and over. We combine household and personal information to construct a data set which contains information on the spouse of the in the interviewed household member.[5]

We focus on the cross-sectional information of the years 2007 and 2008. We restrict the sample to women of age between 25 to 54 years old, to avoid the modeling of schooling and retirement decisions. Descriptive statistics are in Table 3.

The data set provide information about gross labor income of all members of the household (w_m,w_f), and total household income. By difference it is possible to compute non-labor income (y).

[5]The detailed description of the construction of the data set and the list of the variables can be found in the Appendix.

Nevertheless it is necessary to compute *potential* income for all possible labor supply choices $h \in H$, including for the non-employed. To correct for the selection bias a non-linear procedure is adopted.

We assume that:

$$E(w_f(h)|X) = \beta X + \mu_h(q_0(Z), q_1(Z), ..., q_H(Z)) \tag{2}$$

where X is a set of exogenous variables and μ is a given function of $q_k(Z) = Pr(h = k|Z)$, the probabilities that an individual with characteristic Z opts for labor supply choice $h = k$.

We consider three possible labor supply choices: $h = \{0, 1, 2\}$ where $\{0, 1, 2\}$ denote unemployment, part-time and full time employment, respectively.

The propensity scores q are estimated by a standard probit procedure, with variables Z including: age, dummy variables for region, marital status interacted with presence of dependent children, education, net income from other sources (both husbands income, if any, and non labor income).

3.3 Results

The model is estimated allowing the parameters to differ between married and unmarried women. That is, we allow the elasticity of labor force participation to change with the marital status. We include several variables that affect the decision to participate in the labor market, as the age, the education level, the years of past work experience, the region of origin, and the presence of children.

The model replicates the percentage of women in the labor force, and the percentage of women who are employed. This is shown in Figure 6. The left and the right panel plots the labor force participation and the employment rates respectively, by education level. In Figure 7, we plot the participation rates of unmarried and married women with and without children. Again, the model matches the rates in all of the subcases. We obtain a similar figure for the employment rates (Figure 8).

In Figure 9, we compare the actual labor force participation rates with those generated by the model, by husband's income, education level, and presence of children. The model overestimates the participation rates of women with low income or unemployed husbands, for any educational level. But, it generates the positive correlation between husband's income and participation rate of women, even thought it is lower than the actual one.

Table 7 summarizes the results of the estimation. It is interesting to underline that the taxation system alone is sufficient to reproduce the main characteristics of the labor market, and especially the elasticity to husband's income.

4 Alternative Taxation Systems

In this section, we use the parameters obtained from the estimation of the model to simulate the labor force participation rate and the employment rate under three different taxation systems: joint family taxation, the gender-based taxation, and the Working Tax Credit. In Tables 8 and 9, we summarize the main characteristics of these alternative systems.

The results of the simulations are in Table 10.[6]

4.1 Joint Family Taxation

The joint taxation system can be found in Portugal, France and Germany. It provides tax advantages to large families with low income as the average tax rate decreases with the number of household components. As shown by some existing literature[7], this system creates a system of negative incentives to participation for both of the spouses, and especially for women.

We simulate a taxation system similar to the one currently implemented in France, where the gross income is the household income divided by the number of parts (the *quotient familial*, a coefficients which increases with the number of household components).

Let Y_1 and Y_2 be the gross incomes of the two spouses, q be *quotient familial*, and $t(\cdot)$ be the tax rate. Then, the amount of tax is equal to $qt((Y_1+Y_2)/q)$ instead of $t(Y_1)+t(Y_2)$. In the simulations, we drop all of the tax credits for dependent spouse and the universal cash transfers. The *quotient familial* is assumed to equal the number of the household components.

As we can see from Table 10, this tax system implies a reduction in the average tax rate (from 12 to 10 percent), and of the tax revenue, which decreases by 17 percentage points. Consider the case of constant tax revenue.

The participation and employment rates would decrease by about 6 percentage points. Under this system, the participation of unmarried women would remain almost unchanged. Married women would be the most negatively affected. In particular, married children without children would decrease their participation rate by 10 percentage points, and married women with children would decrease it by 7 percentage points. Similarly, the employment rate would mostly decrease for married

[6]It is worth noting that these are results of a partial equilibrium model where the individuals' labor choices do not affect labor earnings.

[7]See Buffeteau and Echevin (2003) for France, Steiner and Wrohlich (2004) for Germany, and Aassve et al. (2007) for Italy.

women.

In Figure 10, we can see that women (both with and without) children would participate less if married to a medium-high income husband, and more if married to a low income or unemployed husband.

The marginal tax rates are in Figure 11. It is the convexity of the function $t(\cdot)$ that generates negative incentives to the labor force participation of the second earner. In fact, without universal cash transfers, the marginal tax rate of the second earner is now equal to $q[t((Y_1 + Y_2)/q) - t(Y_1/q)]/Y_2$. This ratio is always positive and increasing in the incomes' difference. The effect of excluding the tax credit for dependent spouse becomes clear in Figure 11. In panel a) and c), we see that the marginal tax of married women does not depend on her own income, and it is increasing in her husband's income (panel b) and d)).

4.2 The *Working Tax Credit*

The American *Earned Income Tax Credit* (EITC) and the British *Working Tax Credit* (WTC) are two mechanisms of negative taxation. Based on these taxation systems, women or households where both of the spouses are employed, have the right to receive a tax credit which is increasing in the size of the family and which can even become a transfer.[8] These tax credits differ from the Italian tax credit, and have a positive effect on the employment on part-time or low earnings jobs. Chote et al. (2007) provide evidence of an increase from 45 to 55 percent in employment rates of unmarried mothers in Great Britain. Eissa and Liebman (1996) and Ellwood (2000) obtain similar results for the EITC.

The introduction of the Working Tax Credit is simulated by assuming that it will substitute the current individual tax credit for the same amount. We also eliminate the tax credits for dependent spouse and we set the universal cash transfers to 137 euros a month for the first child and 121 euros a month for the following children, regardless of the total household income.

This system would provide incentives mostly to unmarried workers with children and to married couples where both partners work (see Table 10 and Figure 12). The model forecasts an increase in participation and employment rates of about 3 percentage points. The increase would mostly concern married women with children (5 percentage points), as the system promotes part-time and low earnings jobs.

From Figure 13, we can see that the marginal tax rate of married women would not be different from that of unmarried women. Moreover, the universal cash trans-

[8]For example, in the WTC, households with two parents working at least 16 hours a week can obtain a reimbursement of 80 percent of the child care costs.

fers (that are independent of the total household income) would not affect the incentives of married women to work when the husband is employed, but it would positively boost them when unmarried. In all kinds of households, the decrease in the marginal tax rate would be higher for medium-low income earners.

4.3 Gender-based Taxation

Alesina et al. (2011) have suggested a gender-based taxation system which implies lower tax rates for individuals characterized by a participation rate more elastic to income. That is, they propose a lower tax rate for women than for men, regardless of the marital status. This would result in a higher participation rate of women, and in a change in the division of labor inside the household in favor of women. In fact, their bargaining power would increase as a consequence of the higher net income.

At the same time, the gender-based taxation would favor high income women and would penalize low income men. Moreover, it would imply an equal treatment of two single parent families identical in income but different in the gender of parent. Saint-Paul (2007) underlines the fact that there is not reasons to believe that participation rate of women is always more elastic than that of men. For example, single women, with and without children, do not behave differently than men. Alternatively, Saint-Paul (2007) suggest to apply a lower tax rate to supplemental hours worked, regardless of the gender.

In the simulation, we apply a 50 percent reduction in the tax rate of women, and decrease the amount of tax credit for dependent spouse and universal cash transfers. From Figure 15, we can see that this system would lead to a decrease of the marginal tax rate of every woman, event thought it would maintain a high marginal tax rate on low income married women (as we did not change the system of tax credit and universal cash transfers). From Figure 14, we can see that it would imply an increase in the labor force participation rate of every married woman, regardless of her husband's income. In particular, it would increase both participation and employment rates by more than 2 percentage points, regardless of the marital status and the number of children.

5 Conclusions

In this paper, we use micro data from EU-SILC to estimate a structural model of labor supply. In particular, men's labor supply and incomes are given, and women decide whether to search for an occupation, and upon receiving it, whether to accept a given job offer or not.

We show that the model matches the of the Italian labor force participation and employment rates, and replicates the positive correlation between wife's participation rate and husband's yearly income. Moreover, we show that the Italian individual taxation system generates disincentives to women labor supply, especially when married with children. This is due to a set of tax credits for dependent spouse and universal cash transfers for children that increases the fiscal burden of low income households, and the marginal tax rate on women married to low income or unemployed men.

We then use the estimated parameters to measure the behavioral effects of alternative tax systems: joint family taxation, gender-based taxation and a system inspired by the British Working Tax Credit. We show that the first would imply either a significant tax revenue loss, or a substantial drop in female labor participation. The other two would boost the participation rate, with the effect of the latter being concentrated on unskilled and low educated women.

In particular, the results of the simulations show that moving towards a system of tax credit in line with the British or American ones, would reduce the fiscal burden of low earnings workers, mostly married women. Moreover, cash transfers that are independent of the total household income would reduce the disincentives to work of both partners.

We could also expect that providing incentives to low income jobs would decrease the incentives of taking up irregular jobs.

A Details of the Italian Tax System

The methodological information on personal system, compulsory social security contributions, universal cash transfers, parameter values, and tax equation, are from OECD (2010).

In the Tables 1 and 2, we report the tax schedule, the amounts of tax credits allowed by different levels of taxable income, and the amount of universal cash transfers. The equations for the Italian system (as on page 316 of OECD (2010)), are mostly repeated for each individual of a married couple. But the spouse credit is relevant only to the calculation for the principal earner and any child credit which the spouse is unable to use is transferred to the principal.

Table 1: Italian Taxation System - Tax Schedule, Tax Credits, and Universal Cash Transfers

Tax Schedule	
Bracket (EUR)	Rate (%)
Up to 15,000	23
Over 15,001 up to 28,000	27
Over 28,001 up to 55,000	38
Over 55,001 up to 75,000	41
Over 15,001	43
Standard Tax Credits	
Level of Taxable Income (EUR)	Amount of Tax Credit (EUR)
From 8,001 to 15,000	1,338
From 15,001 to 23,000	1,338
From 23,001 to 24,000	1,348
From 24,001 to 25,000	1,358
From 25,001 to 26,000	1,368
From 26,001 to 27,000	1,378
From 27,001 to 28,000	1,363
From 28,001 to 55,000	1,338
Up to 8,000	1,840
From 8,001 to 15,000	1,338+502*(15,000-Taxable Income)/7,000
From 15,001 to 55,000	Tax Credit*(5,000-Taxable Income)/4,000
Over 55,001	0

Table 2: Italian Taxation System - Tax Schedule, Tax Credits, and Universal Cash Transfers, cont.d

Tax Credits for Family Dependents (earning less than EUR 2,840.51)	
Level of Taxable Income (EUR)	Amount of Tax Credit (EUR)
Up to 15,000	800-110*Taxable Income/15,000
From 15,001 to 29,000	690
From 29,001 to 29,200	700
From 29,201 to 34,700	710
From 34,701 to 35,000	720
From 35,001 to 35,100	710
From 35,101 to 35,200	700
From 35,201 to 40,000	690
From 40,001 to 80,000	690*(80,000-Taxable Income)/40,000
Over 80,000	0

Tax Credits for Dependent Children		
	Younger then 3 years old	Older than 3 years old
1 child	900*(95,000-Taxable Income)/95,000	800*(95,000-Taxable Income)/95,000
2 children	900*(110,000-Taxable Income)/110,000	800*(110,000-Taxable Income)/110,000
3 children	900*(125,000-Taxable Income)/125,000	900*(125,000-Taxable Income)/125,000
4 children and over	200	200

Universal Cash Transfers				
		Number of Children		
		1	2	3
Both parents	Max amount (EUR)	137.50	258.33	375.00
Single parent	Max amount (EUR)	137.50	258.33	458.33
	Max household income (EUR)	65,210	71,445	83,494

There are fiscal deductions for families that bear child care or other similar costs. That is:

- it is possible to deduct from the tax amount, the 19% of the kindergarten fees paid for children younger than 3 years old. The max amount of the deduction is 632 EUR per child, that is a max of 120 EUR per child;
- it is possible to deduct from the taxable income, the social security contributions paid for housekeeping services (the max amount is 1,549.37 EUR).
- it is possible to deduct from the tax amount, the 19% of the costs paid for services related to physically impaired household members, for a maximum

amount of 2,100 EUR a year.

We do not include these deductions on the simulation of the model as there is not information available on EU-SILC data set.

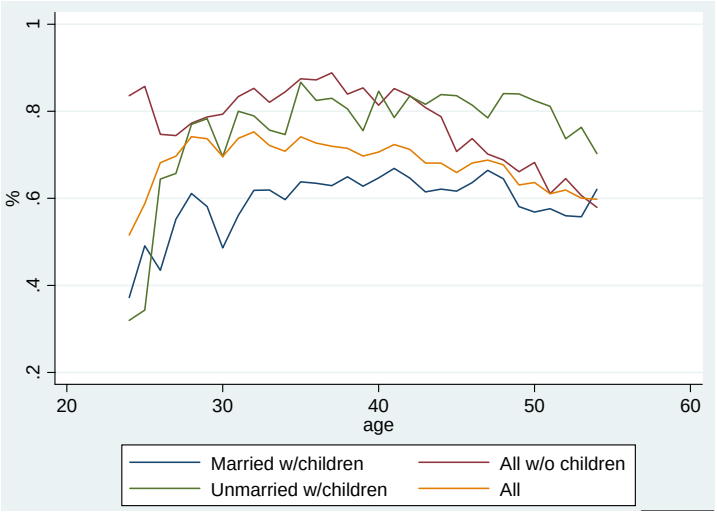
B EU-SILC and Variables

Table 3: Descriptive statistics, EU-SILC 2007-2008

Variable	Unmarried Women	Married Women	Unmarried Men	Married Men
Number of observation	7301	14476	8674	12576
Age	37.02	41.90	35.77	43.15
With children (%)	22.18	73.31	9.03	75.39
Activity Rate (%)	85.48	64.78	92.47	97.72
Unemployment Rate (%)	12.90	9.74	10.90	2.82
Incidence of Part-time (%)	17.84	26.01	5.37	2.56
Yearly working time (months, for employed)	11.49	11.43	11.62	11.81
Average annual earnings (euros)	19300.07	19499.02	22593.28	28070.52
Hourly wage rate (euros)	11.17	12.00	11.83	14.06
Non-labor Income (euros)	18944.78	8005.41	22819.55	15339.48
Average husband's earnings (euros)	-	27821.00	-	-
Region				
North-West	23.33	20.49	23.02	20.50
North-East	23.90	22.68	24.21	23.19
Center	24.72	23.46	24.20	23.65
South	20.57	24.28	20.44	23.89
Islands	7.48	9.09	8.13	8.77
Education				
<Secondary School	28.99	40.41	34.64	42.09
Secondary School	41.09	39.17	44.09	39.94
> Secondary School	29.91	20.42	21.27	17.97

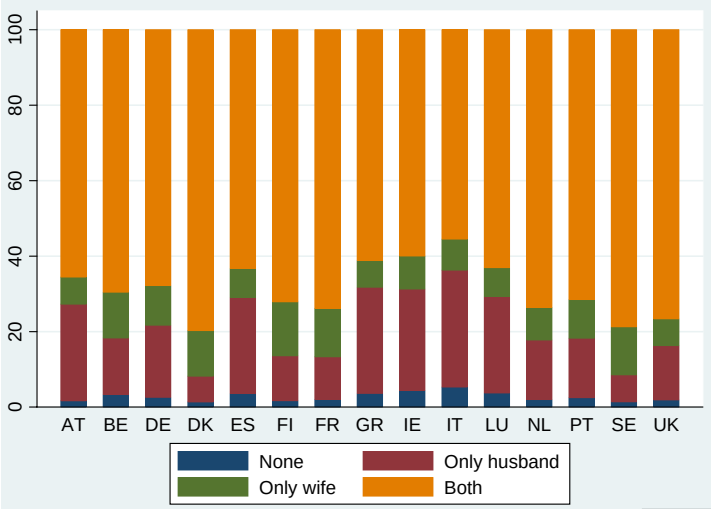
C Figures

Figure 1: Labor Force Participation of Women



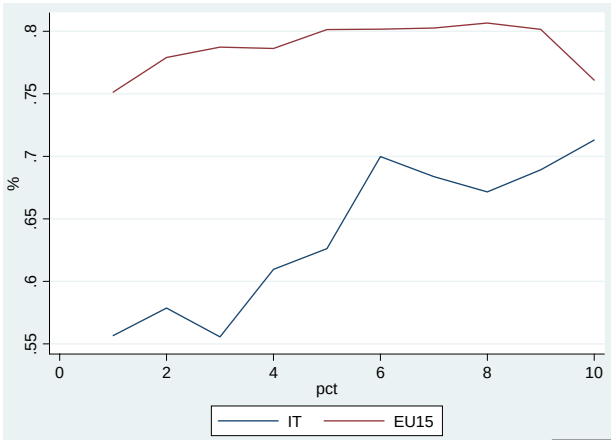
Source: Authors' computations from EU-SILC data (2007-2008)

Figure 2: Household Members in Labor Force (%)



Source: Authors' computations from EU-SILC data (2007-2008)

Figure 3: Labor Force Participation of Women by Percentile of Husband's Income



Source: Authors' computations from EU-SILC data (2007-2008)

Figure 4: Marginal Tax Rate

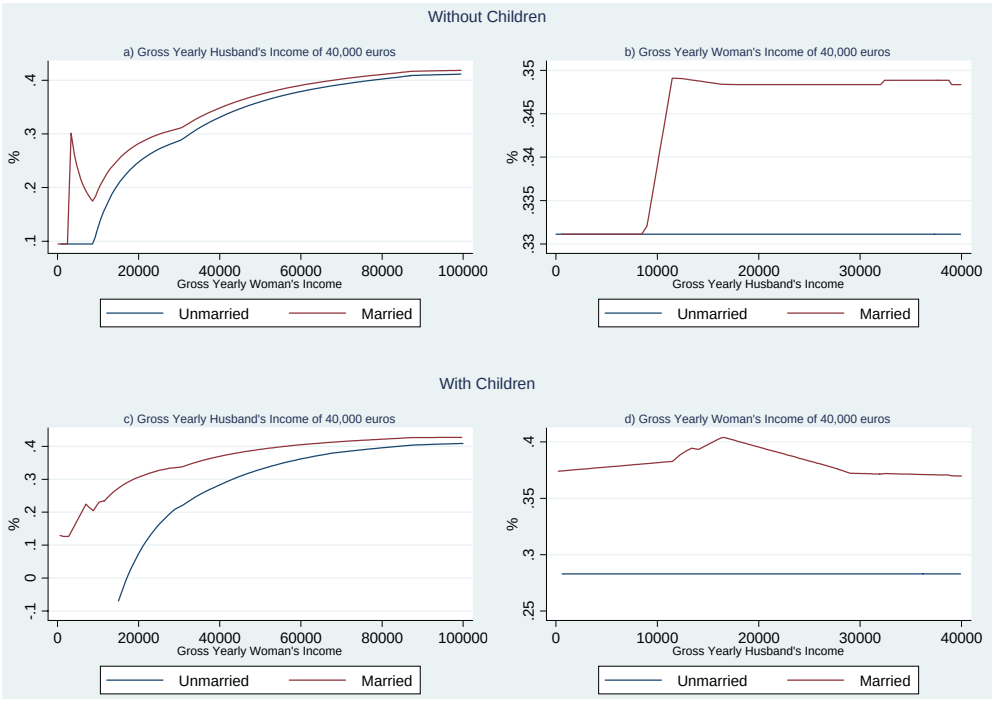


Figure 5: Marginal Tax Rate

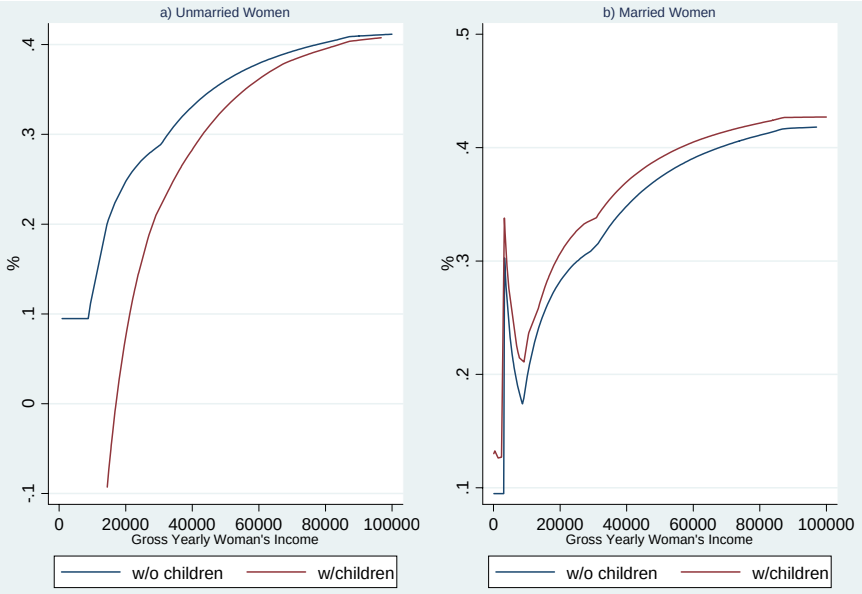


Figure 6: Results - Data vs Model

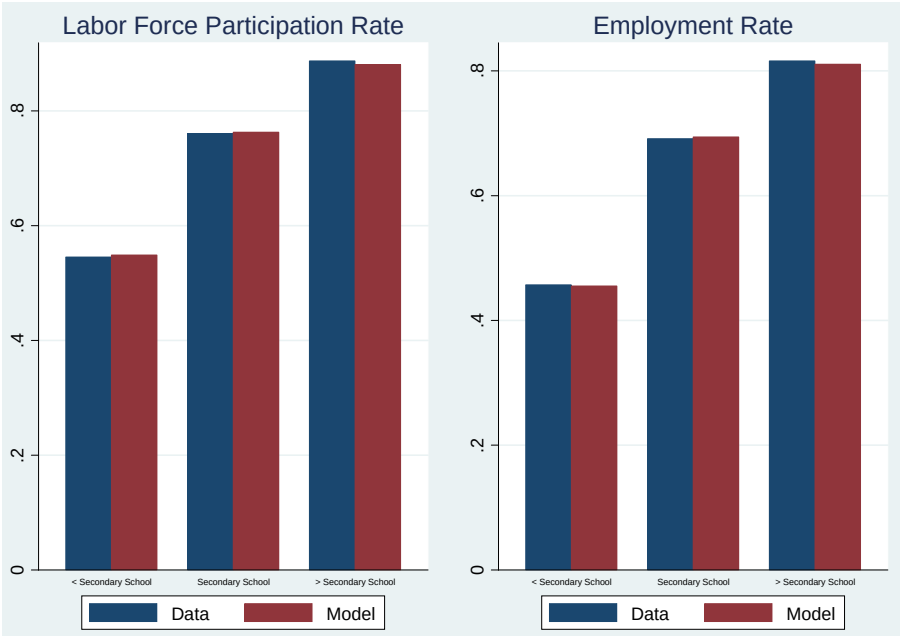


Figure 7: Labor Force Participation Rate - Data vs Model

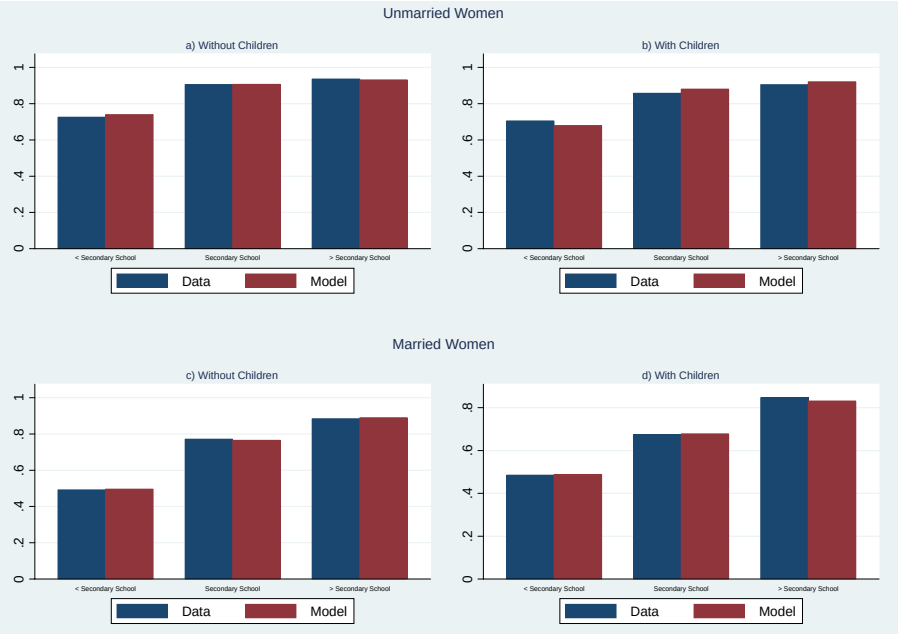


Figure 8: Employment Rate - Data vs Model

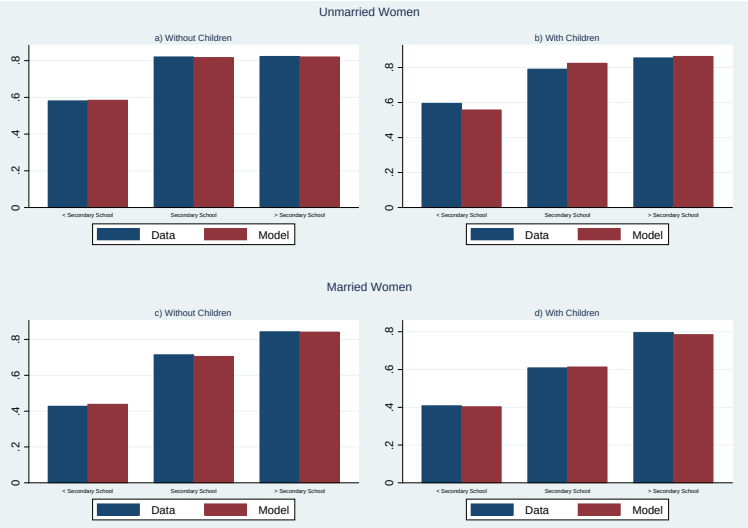
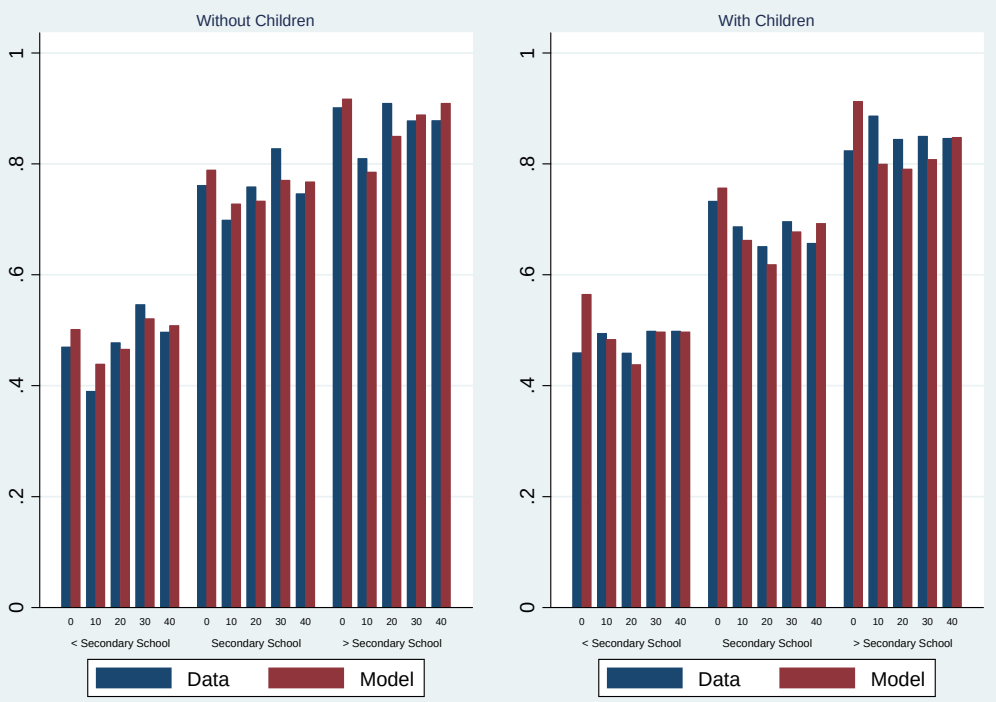


Figure 9: Labor Force Participation by Husband's Earnings - Data vs Model



Note: in the x-axis, 0 corresponds to the case in which the husband is unemployed, while $10 - 20 - 30 - 40+$ stands for the classes of husband's income, that is $1 - 10,000$ euros, $10,000 - 20,000$ euros, $20,000 - 30,000$ euros, $30,000 - 40,000$ euros, and $40,000$ euros and over.

Figure 10: Labor Force Participation by Husband's Earnings - Benchmark vs Joint Taxation

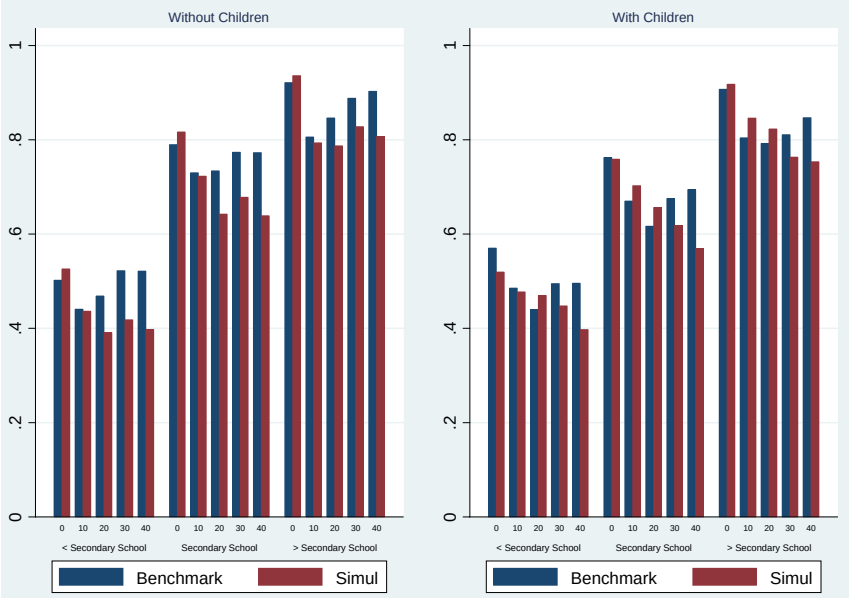


Figure 11: Marginal Tax Rate - Joint Taxation

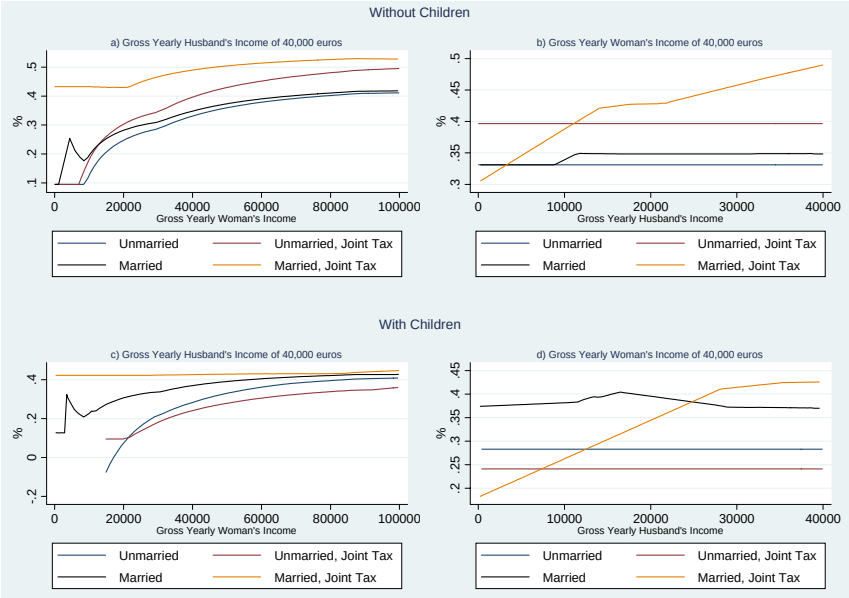


Figure 12: Labor Force Participation by Husband's Earnings - Benchmark vs Working Tax Credit

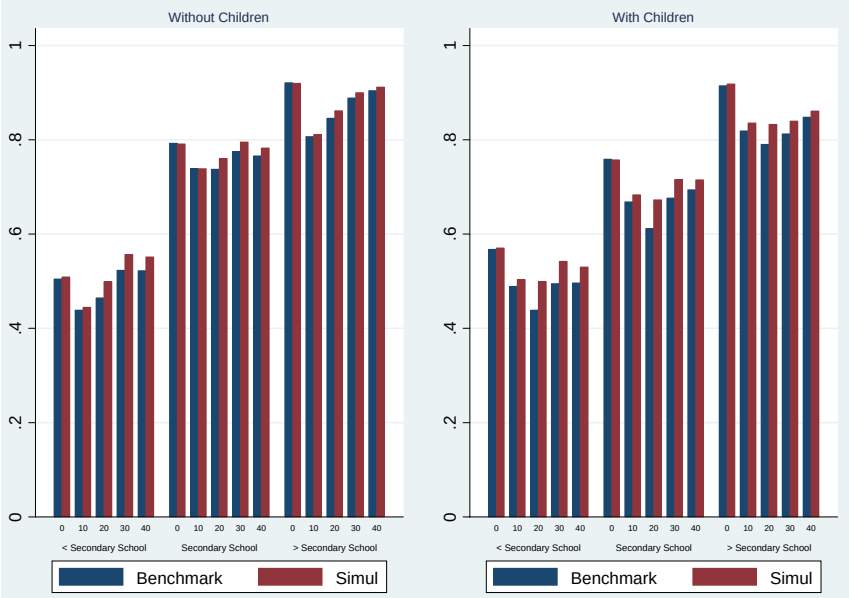


Figure 13: Marginal Tax Rate - Working Tax Credit

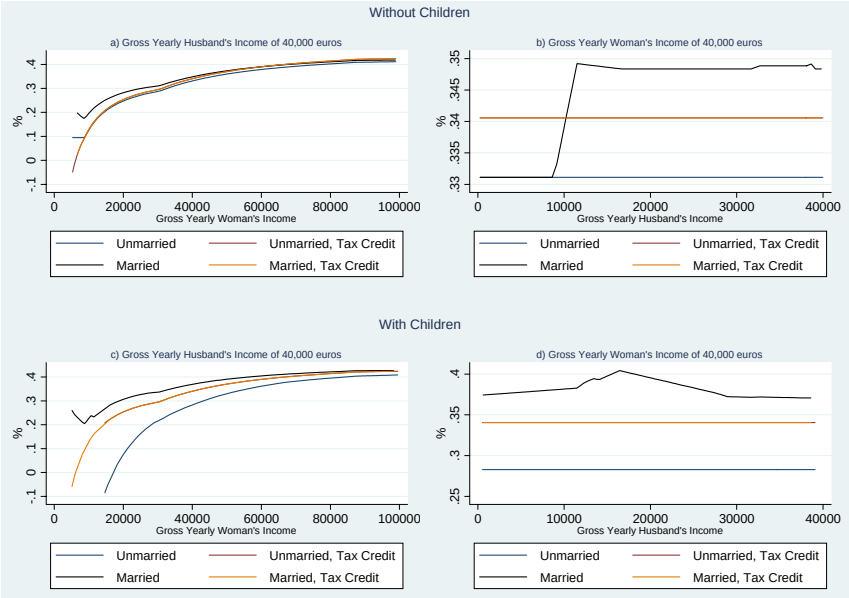


Figure 14: Labor Force Participation by Husband's Earnings - Benchmark vs Gender-based Taxation

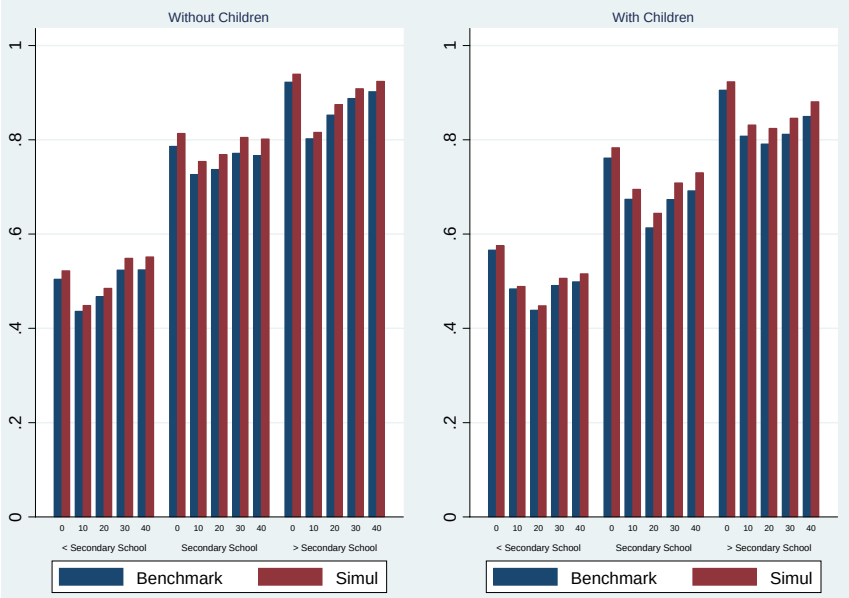
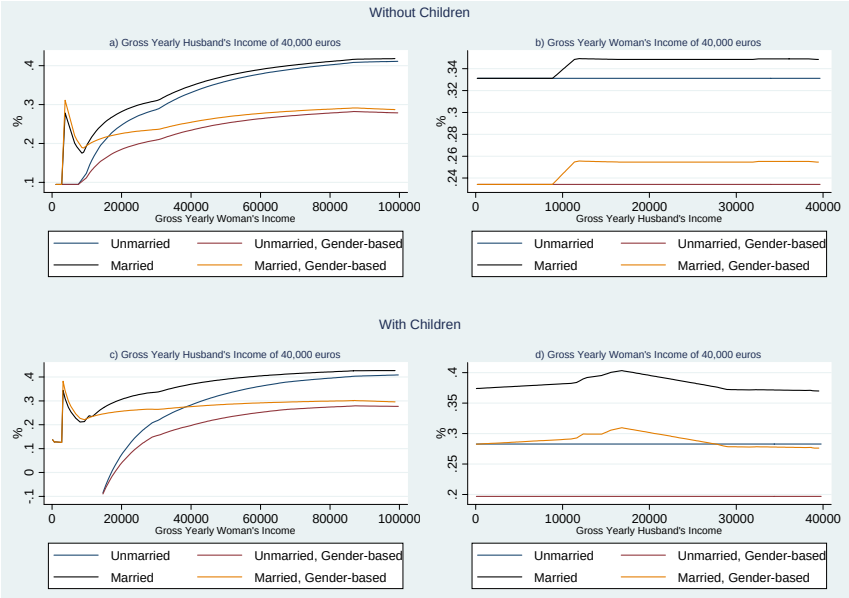


Figure 15: Marginal Tax Rate - Gender-based Taxation



D Tables

Table 4: Labor Statistics for 25-54 years old, by gender, 2007-2008

	Employment rates		Share in part-time employment		Share in temporary employment		Share of managers who are females
	Women	Men	Women	Men	Women	Men	
EU15	70.18	86.48	33.97	4.83	15.40	11.44	32.09
Austria	69.47	89.44	42.95	4.39	5.98	3.92	26.52
Belgium	72.49	86.05	42.87	6.47	11.94	6.74	27.48
Denmark	83.90	91.41	22.36	2.88	-	-	28.14
Finland	78.52	87.47	13.0	4.55	19.91	10.10	26.40
France	75.50	88.75	32.14	4.25	16.88	11.52	35.88
Germany	71.16	85.38	53.12	5.19	10.80	6.98	27.38
Greece	60.84	86.87	14.87	3.83	25.42	22.08	35.38
Ireland	64.79	80.14	38.09	6.78	8.53	4.64	38.38
Italy	**59.38**	**85.00**	**24.13**	**4.07**	**17.22**	**11.46**	**33.98**
Luxembourg	67.05	89.92	36.01	2.45	10.91	8.41	33.57
Netherlands	80.36	94.80	75.28	11.34	13.47	10.74	27.56
Portugal	72.13	85.16	10.96	2.96	20.25	18.65	34.35
Spain	63.55	84.29	19.42	2.44	30.06	23.57	31.23
Sweden	82.56	89.14	33.02	5.24	12.27	8.60	35.53
United Kingdom	71.32	76.05	38.39	4.61	3.95	2.74	40.27

Source: Authors' computations from EU-SILC data (2007-2008)

Table 5: Labor Force Participation for 25-54 years old, 2007-2008

	Labor force participation		Married women		Unmarried women	
	Women	Men	w/children	w/o children	w/children	w/o children
EU15	78.75	95.60	73.57	79.47	80.00	88.89
Austria	75.71	96.25	66.27	82.14	76.42	90.44
Belgium	83.90	95.75	80.33	72.75	90.39	92.22
Denmark	90.67	95.78	92.76	94.72	89.67	80.50
Finland	85.68	95.48	83.51	94.89	79.47	89.68
France	87.78	96.60	85.12	91.39	85.73	94.05
Germany	80.61	94.13	71.95	88.34	83.81	88.27
Greece	71.56	96.58	65.15	65.67	81.40	89.85
Ireland	70.55	95.57	63.91	70.83	65.23	89.75
Italy	**68.27**	**93.80**	**61.69**	**65.49**	**69.31**	**83.06**
Luxembourg	73.32	96.57	64.29	74.05	76.90	93.29
Netherlands	83.84	97.42	79.53	83.92	86.01	93.68
Portugal	82.38	95.46	82.07	80.02	79.87	89.05
Spain	74.83	95.94	67.99	69.64	79.03	89.70
Sweden	90.68	96.02	91.76	94.92	89.82	87.54
United Kingdom	81.82	97.11	76.23	90.72	70.92	94.55
Average			75.05		84.97	

Source: Authors' computations from EU-SILC data (2007-2008)

Table 6: Simple Probit - Coefficients

$Y = 1$ (in labor force)	Italy	EU15 Countries
log(husband's income)	0.047***	-0.104***
	(0.019)	(0.009)
Children	-0.137***	-0.183***
	(0.016)	(0.007)
Age	-0.002	0.011***
	(0.002)	(0.001)
Education	0.392***	0.218***
	(0.014)	(0.005)
Year Fixed Effects	Yes	Yes
Country Fixed Effects	No	Yes
Log likelihood	-5786.734	-24694.32
Obs.	9516	52975

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' computations from EU-SILC data (2007-2008)

Table 7: Model and Data, Results (%)

		Unmarried Women		Married Women	
		With children	Without children	With children	Without children
Labor Force Participation Rate	Data	80.94	86.23	63.19	65.11
	Model	81.23	86.52	63.14	65.18
Employment Rate	Data	72.97	75.02	56.47	59.32
	Model	73.07	74.90	56.23	59.50
Part-time	Data	18.32	11.94	16.13	10.70
	Model	18.71	11.58	16.21	10.65
Full-time	Data	54.64	63.08	40.34	48.62
	Model	54.36	63.32	40.01	48.85

Source: Authors' computations from EU-SILC data (2007-2008).

Table 8: Alternative Taxation Systems - Main Characteristics

Bracket (euros)	Rate	Individual Tax Credit	Tax Credit for Dependent Spouse	Tax Credit for Dependent Children	Universal Cash Transfers
			Italian Taxation System		
0-15,000	23%	between 0 and 1,840 euros,	between 0 and 800 euros,	800euros per child,	137.50 euros monthly per child,
15,000-28,000	27%	decreasing in	decreasing in	decreasing in	decreasing in
28,000-55,000	38%	income	income	income	family income
55,000-75,000	41%				
more than 75,000	43%				
			Joint Tax System		
0-15,000	23%	between 0 and 1,840 euros,	0	0	0
15,000-28,000	27%	decreasing in			
28,000-55,000	38%	income			
55,000-75,000	41%				
more than 75,000	43%				
			British working tax credit		
0-15,000	23%	between 0 and 1,840 euros,	0	0	137.50 euros monthly per child,
15,000-28,000	27%	decreasing in			independent of income
28,000-55,000	38%	income			
55,000-75,000	41%				
more than 75,000	43%				

Table 9: Alternative Taxation Systems - Main Characteristics, cont.d

Bracket (euros)	Rate	Individual Tax Credit	Tax Credit for Dependent Spouse	Tax Credit for Dependent Children	Universal Cash Transfers
			Gender Based Taxation System		
			Men		
0-15,000	23%	between 0 and 1,840 euros,	between 0 and 800 euros,	800 euros per child,	137.50 euros monthly per child,
15,000-28,000	27%	decreasing in	decreasing in	decreasing in	decreasing in
28,000-55,000	38%	income	income	income	family income
55,000-75,000	41%				
more than 75,000	43%				
			Women		
0-15,000	11.50%	between 0 and 920 euros,	between 0 and 400 euros,	400 euros per child,	67 euros monthly per child,
15,000-28,000	13.50%	decreasing in	decreasing in	decreasing in	decreasing in
28,000-55,000	19.0%	income	income	income	family income
55,000-75,000	20.50%				
more than 75,000	21.50%				

Table 10: Alternative Taxation Systems - Results, %

Taxation System	Unmarried Women: Without children	Unmarried Women: With children	Married Women: Without children	Married Women: With children	All women	Loss in tax revenue
			Average Tax Rate			
Benchmark	22.54	8.75	24.30	18.53	19.92	-
Joint Tax	22.54	13.77	20.39	15.54	17.79	-17
Constant Tax Revenue	27.64	16.71	23.56	18.95	21.76	0
Working Tax Credit	20.90	8.23	22.92	16.20	18.00	-4.21
Constant Tax Revenue	21.06	8.33	22.40	16.99	18.62	0
Gender Based Tax	16.02	4.21	21.91	16.93	16.97	-11.18
Constant Tax Revenue	17.21	5.26	24.10	19.19	18.91	0
			Marginal Tax Rate			
Benchmark	16.82	6.44	15.01	14.55	14.65	-
Joint Tax	16.82	9.88	17.00	14.34	14.96	-
Constant Tax Revenue	20.42	12.19	18.82	16.87	17.76	-
Working Tax Credit	15.74	6.32	12.58	10.38	11.80	-
Constant Tax Revenue	15.84	6.11	12.93	10.93	12.14	-
Gender Based Tax	12.21	3.16	11.66	11.75	11.22	-
Constant Tax Revenue	13.11	3.93	12.85	12.72	12.18	-
			Participation Rate			
Benchmark	86.50	81.32	65.69	63.15	70.56	-
Joint Tax	86.50	80.75	61.99	61.94	69.22	-
Constant Tax Revenue	85.71	80.13	58.91	58.18	66.54	-
Working Tax Credit	86.62	81.37	67.46	66.65	72.71	-
Constant Tax Revenue	86.49	81.45	67.46	66.47	72.54	-
Gender Based Tax	87.36	82.09	67.87	65.57	72.44	-
Constant Tax Revenue	87.19	82.04	67.30	65.13	72.10	-
			Employment Rate			
Benchmark	74.88	73.26	60.04	56.23	62.69	-
Joint Tax	74.88	72.44	56.47	55.11	61.38	-
Constant Tax Revenue	73.65	71.65	53.43	53.40	58.62	-
Working Tax Credit	75.08	73.37	61.80	59.59	64.78	-
Constant Tax Revenue	74.91	73.07	61.75	59.41	64.59	-
Gender Based Tax	76.24	74.16	62.34	58.68	64.73	-
Constant Tax Revenue	75.99	74.17	61.79	58.24	64.37	-

Source: Authors' computations from EU-SILC data (2007-2008)

E Acknowledgement

We would like to thank the participants to the Applied Economics Lunch Seminar at the Paris School of Economics. We also benefited from numerous comments from several presentations at the Bank of Italy. All errors are ours.

References

Aassve, A., Pazienza, M. and Rapallini, C. (2007). Does italy need family income taxation? Working Papers 77, ECINEQ, Society for the Study of Economic Inequality.

Alesina, A., Ichino, A. and Karabarbounis, L. (2011). Gender-based taxation and the division of family chores. *American Economic Journal: Economic Policy* Forthcoming.

Bar, M. and Leukhina, O. (2009). To work or not to work: Did tax reforms affect labor force participation of married couples? *The B.E. Journal of Macroeconomics* 9(1).

Buffeteau, S. and Echevin, D. (2003). Taxation, marriage and labor supply: Evidence from a natural experiment in france. Cahiers de recherche 340, CIRPEE.

Burtless, G. and Hausman, J. (1978). The effect of taxation on labor supply: Evaluating the gary negative income tax experiments. *Journal of Political Economy* 86(6):1103–30.

Chote, R., Emmerson, C., Leicester, A. and Miles, D. (2007). The ifs green budget: January 2007. Tech. rep.

Colombino, U. and Del Boca, D. (1990). The effect of taxes on labor supply in italy. *Journal of Human Resources* 25(3):390–414.

Davis, S. and Henrekson, M. (2004). Tax effects on work activity, industry mix and shadow economy size: Evidence from rich-country comparisons. NBER Working Papers 10509, National Bureau of Economic Research, Inc.

Eissa, N. and Liebman, J.B. (1996). Labor supply response to the earned income tax credit. *The Quarterly Journal of Economics* 111(2):605–37.

Ellwood, D. (2000). The impact of the earned income tax credit and social policy reforms on work, marriage, and living arrangements. *National Tax Journal* 53(4):1165–86.

Hausman, J. (1980). The effect of wages, taxes, and fixed costs on women's labor force participation. *Journal of Public Economics* 14(2):161–194.

Hausman, J. (1985). Chapter 4 taxes and labor supply. In: A. Auerbach and M. Feldstein (eds.) *Handbook of Public Economics*, vol. 1, pp. 213–263. Elsevier.

Manning, A. and Petrongolo, B. (2008). The part-time pay penalty for women in britain. *Economic Journal* 118(526):F28–F51.

OECD (2010). Taxing wages 2008-2009. Special feature: Non-tax compulsory payments as an additional burden on labour income, OECD.

OECD (2011). Doing better for families. Tech. rep., OECD Publishing.

Olovsson, C. (2009). Why do europeans work so little? *International Economic Review* 50(1):39–61.

Prescott, E. (2004). Why do americans work so much more than europeans? *Quarterly Review* (July):2–13.

Rogerson, R. (2006). Understanding differences in hours worked. *Review of Economic Dynamics* 9(3):365 – 409.

Saint-Jaques, G. (2009). Individualization of taxes and tanfers and the labor supply decision of women: Simulating the current french system and possible reforms. Masters dissertation, École normale supérieure.

Saint-Paul, G. (2007). Against "gender-based taxation". CEPR Discussion Papers 6582, C.E.P.R. Discussion Papers.

Steiner, V. and Wrohlich, K. (2004). Household taxation, income splitting and labor supply incentives: A microsimulation study for germany. Discussion Papers of DIW Berlin 421, DIW Berlin, German Institute for Economic Research.