UMR 8184

Thema

THéorie Économique, Modélisation et Applications

Thema Working Paper n°2011-22
Université de Cergy Pontoise, France

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November, 2011

UNIVERSITÉ de Cergy-Pontoise

CNRS CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

Taxation and Labor Force Participation: The Case of Italy

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November 15, 2011

Abstract

Italy has the lowest labor force participation of women among OECD countries. Moreover, the participation rate of married women is positively correlated to their husbands' income. We show that a high tax schedule together with tax credits and transfers raise the burden of two-earner households, generating disincentives to work. We estimate a structural labor supply model for women, and use the estimated parameters to simulate the effects of alternative revenue-neutral tax systems. We find that joint taxation implies a drop in the participation rate. Conversely, working tax credit and gender-based taxation boost it, with the effects of the former concentrated on low educated women.

Keywords: female labor force participation, Italian tax system, second earner tax rate, joint taxation, gender-based taxation, working tax credit

JEL Classification: J21, J22, H31

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1 Introduction

The labor force participation of Italian women is the lowest among OECD countries. Moreover, while the labor force participation of married women is usually negatively correlated to their husbands' incomes, in Italy the correlation is positive. In this paper, we argue that the taxation system partly explains the coexistence of these two features.

Our interest in this topic is motivated by the anemic growth rate of the Italian economy over the last decade. A low labor force participation is an immediate explanation for a stagnant GDP, especially when combined with a declining population. But there is also a public policy issue: if whatever makes Italy's participation rate low involves a distortion rather than a choice, then there is room for improvement in both income and welfare. These considerations are in line with *Europe2020*, the European Union Commission's growth strategy[1] that targets five objectives on employment, innovation, education, social inclusion and climate/energy by 2020. In particular, Italy has set the target for the employment rate to 67-69 percent, implying an increase of about 6 percentage points. Moreover, Italy has committed to a decrease of about 2.2 million of people at-risk-of-poverty, meaning a reduction of 18 percent of the population in this critical situation.[2]

In order to reach these objectives, it is crucial to identify reforms that promote labor force participation in the short-term, mainly for those groups of population that are not well represented in the labor market. Our work goes in the direction of suggesting alternative taxation systems that would boost women's participation by about 3 percentage points, and decrease the percentage of women who are below the poverty line by up to 1.5 percentage points.

The Italian taxation system is based on an individual tax unit. It is characterized by a high tax schedule, a set of tax credits for children and for the spouse who is not employed, as well as cash transfers for dependent children. The combination of these elements raises the tax burden, especially on two-earner households, generating disincentives to participate in the labor force for

[1] A detailed description can be found here: http://ec.europa.eu/europe2020/index_en.htm.

[2] In 2008, the population at-risk-of-poverty in Italy was 19 percent of the total, that is about 12 million of people. See http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-10-009/EN/KS-SF-10-009-EN.PDF.

married women, typically the second earner of the family. Such disincentives are stronger when the first earner's income is low. More specifically, tax credits and universal cash transfers are decreasing functions of the household income. This means that their incidence on the second earner tax rate decreases in total income, providing incentives to participate that are higher for richer households.[3] The second earner tax rate is also increasing in the number of children, and reaches a maximum at husbands' yearly earnings lower than 20,000 euros. Furthermore, the difference between the second earner tax rate of married and unmarried women is large at low incomes, and becomes negligible at higher earnings, discouraging part-time and low skill jobs.[4]

We use micro data from the EU-SILC (2007-2008) to estimate a structural model of labor supply that includes, as main ingredient, the characteristics of the Italian tax system.[5] We model the labor supply decision of women as sequential. First, they decide whether to search for an occupation, and upon receiving a job offer, they accept it or not. Men's labor supply and incomes are given. All of the labor decisions depend on the net yearly income, hence on the characteristics of the taxation system. The model is able to generate the low level of the participation rate, as well as the positive correlation between women's participation rate and husbands' income. It also matches the part-time and full-time employment rates.

Then, we use the estimated parameters to measure the behavioral effects of alternative (revenue neutral) tax systems: joint family taxation (in line with the French system), a system inspired by the (British and American) Working Tax Credit, a gender-based taxation (as proposed by Alesina et al. [2011]), and a mixture of the Italian and the joint taxation system. We assume that the simulated tax systems are characterized by the same taxation rates, but differ in the set of tax credits and

[3]The second earner tax is the amount of tax paid on an additional unit of income when the second earner works relatively to the case in which she is unemployed or out of the labor force.

[4]While the increase in more favorable conditions of part-time jobs may create incentives for (married) mothers to participate in the labor market, Manning and Petrongolo [2008] provide evidence of part-time jobs as potential sources of occupational segregation.

[5]In general, the choice of participating in the labor market depends upon several variables. It reflects the value assigned to domestic activities as housework and child care (Olovsson [2009]), 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. Even thought we recognize the importance of these variables in determining the labor supply decision, we do not include them in our analysis.

transfers.[6]

We show that the joint tax system implies a substantial drop in female labor participation of married women. In particular, the decrease in the participation rate is increasing in the husband's income. On the contrary, the working tax credit and the gender-based system boost the participation rate of all women. The effects of the former concentrates on unskilled and low educated women (and hence, low skill and part-time jobs). In the latter, the reduced tax rates generate a positive shift of the participation rate. But, the tax credits for dependent spouse and children leave unchanged the negative incentives for low income households. The mixture system allows to choose the taxation system that implies the lowest tax burden. The effects on the labor force participation and employment are intermediary between those produced by the two systems separately. The Italian system is chosen for low levels of income, as it gives right to receive tax credits and transfers for children. For higher incomes, households prefer the joint taxation system, as they benefit from the *quotient familial*.[7]

Finally, we compare the effects on welfare of these systems by computing several poverty measures for the women in the sample. We show that the gender-based system increases the well-being of unmarried women, reducing the transfer needed to reach the poverty line. On the contrary, married women are better off in the mixture system.

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

Second, our work belongs to the rich stream of the empirical labor supply analysis, both for the U.S. and Europe. A fundamental role in addressing the relevance of taxation has been played by

[6]The gender-based taxation is assumed to have a lower tax schedule for women.

[7]The *quotient familial* has been adopted in France since 1945. It aims to make the amount of the income tax proportional to households' ability to pay. It consists of a coefficient by which the total household revenue has to be divided. It is a function of the number of household components, and each member has a different weight depending on being adult or child. See Saint-Jaques [2009] for a detailed description of the French system.

Burtless and Hausman [1978], Hausman [1980], and Hausman [1985]. Our paper uses a framework similar to Colombino and Del Boca [1990]. We enrich their results by showing that the model is able to reproduce the positive correlation between wife's labor force participation rate and husband's income. Moreover, in the statistical procedure for the wage prediction, we correct for selection bias using a non-linear method which accounts for the probability that an individual with given characteristics opts for a certain labor supply choice.

Third, several studies examine the effect of tax reforms on labor force participation. Up to twenty years ago, the theoretical literature on taxation converged to an optimal scenario characterized by a basic income transfer and an almost flat income tax. More recently, the literature focused on in-work benefits (Colombino et al. [2000], Saez [2002], Immervoll et al. [2007], Mooij [2008], and Blundell et al. [2011]). Several studies have evaluated the expected labor supply effects from introducing in-work tax credits in the U.S. and U.K. The most recent and relevant studies are for the U.K. Blundell et al. [2000] and Blundell and Hoynes [2003], and for the U.S. Meyer and Rosenbaum [2001] and Fang and Keane [2004]. The results from these studies suggest that there are strong incentive effects from tax credits. The broadening of the tax credit seems to have contributed to increased labor force participation and reduced welfare participation. Our results are also consistent with the findings of Eissa and Liebman [1996], Cavalli and Fiorio [2006], and Bar and Leukhina [2009].

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 of the Italian labor market in 2007-2008, and how it differs from the rest of OECD countries. In Table 1, we can see that, on average, about 70 percent of women aged 26-54 years old are employed. The number is over 86 percent for men.

Table 1: Labor Statistics for 25-54 years old, by gender, 2007-2008

	Employment rates		Share in Part-time Employment	
	Women	Men	Women	Men
Average	70.18	86.48	33.97	4.83
Germany	77.42	92.13	51.16	5.58
Spain	72.45	92.86	20.24	3.39
France	81.01	93.01	32.72	4.58
Italy	**64.00**	**89.82**	**22.89**	**3.71**
U.K.	75.82	78.41	38.73	4.69
U.S.	95.02	95.27	9.10	2.42

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

There are large cross-country differences in the gender gap, which is lower than 10 percentage points in U.K. and U.S. Italy stands out for a gender employment gap of over 20 percentage points, and for the lowest employment rate of women, that is about 6 percentage points lower than the average.

There are also gender gaps in the intensity of employment participation. In all of the countries, a much larger share of female employment is part-time when compared to male employment, with an average of 34 percent for women, and only 5 percent for men. While the largest gap in the share of part-time/full-time employment among men and women is over 40 percent, in Italy the gender gap is lower than the average of the countries.

The gender gap is very large in the general participation rate (see Table 2). Italy has the lowest participation rate of women, and a gender participation gap of about 24 percentage points against an average gap of 17 percentage points.

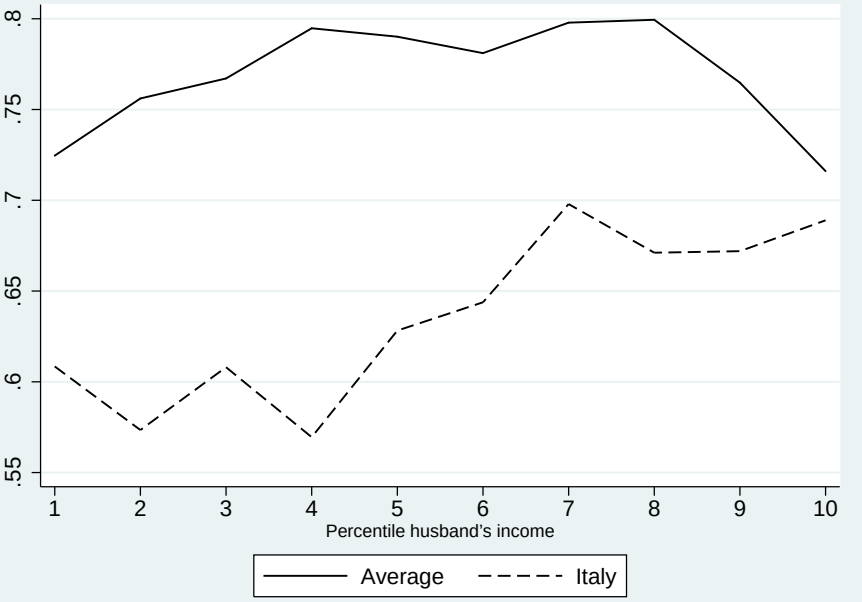
Table 2: Labor Force Participation for 25-54 years old, 2007-2008

			Married women		Unmarried women	
	Women	Men	w/children	w/o children	w/children	w/o children
Average	78.75	95.60	73.57	79.47	80.00	88.89
Germany	83.19	97.35	72.50	87.61	90.88	95.00
Spain	78.49	96.31	71.53	71.53	87.01	92.26
France	85.74	97.04	81.28	86.09	87.35	93.96
Italy	**71.72**	**95.58**	**63.76**	**65.57**	**81.53**	**86.61**
U.K.	76.40	79.81	81.83	90.72	71.72	77.13
U.S.	76.40	87.70	71.53	79.38	82.06	80.11

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

The marital status considerably affects the decision to participate, with married women having a participation rate 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 64 percent in Italy.[8]

Figure 1: Labor Force Participation of Women by Percentile of Husband's Income



Source: Authors' computations from EU-SILC data (2007-2008). Note: The countries included in the average are: Germany, Spain, France, U.K., and U.S.

[8]From panel a) of Figure 4, 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.

Another important feature of the Italian labor market can be observed in Figure 1, where we can see that the labor force participation of married women is positively correlated to their husbands' yearly income. More specifically, the participation rate is around 60 percent for husbands' incomes lower than 20,000 euros; it increases up to about 70 percent at husbands' earnings of 30,000 euros, to remain at that same level in correspondence of the highest percentiles of income.

This is in contrast with the other countries, where the labor force participation appears to be inelastic. To the best of our knowledge, this characteristics of the Italian labor force participation of married women has not been explored in the literature, and it is one of the facts that strongly 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 and IPUMS USA dataset,[9] 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 a standard normal distribution, and the vector of parameters β is estimated by maximum likelihood.

The vector of controls X includes information on the (logarithm of the) yearly income of husbands, number of children, age of the wife, and years of schooling. We also add year fixed effects. We run a separate regression for Italy and the rest of the countries considered in our data analysis. Results are in Table 3.[10]

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, while the years of schooling have a positive effect. Italy, however, behaves differently than other

[9] The description of the data can be found in Section 3.2 and in the Appendix.

[10] Table 9 in the Appendix reports the coefficients and the standard errors of the control variables.

countries in the correlation between husband's income and labor force participation: a significative positive elasticity of 0.032 characterizes Italian data, versus a negative elasticity which ranges from 0.201 (in Germany) to 0.046 (in the U.K.) for the remaining countries.

Table 3: Probit - Coefficients

$Y = 1$ (in labor force)	**Italy**	Germany	Spain	France	U.K.	U.S.
log(husband's income)	**0.035****	-0.201***	-0.074***	-0.091***	-0.046	-0.233***
	(0.013)	(0.021)	(0.020)	(0.034)	(0.022)	(0.044)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Log likelihood	-9502.118	-4564.177	-6182.067	1699.061	-3134.585	-362221.86
Obs.	16198	9235	11567	4185	7062	675969

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

In summary, the Italian labor market exhibits distinctive features. There is a disparity between men and women in the participation rate, mainly regarding married couples. Once employed, Italian women are more likely than men to have a part-time job (or a temporary contract), but this probability is lower than in other OECD countries. In what follows, we bridge these facts to the Italian tax system.

2.2 The Italian Tax System

In this section, we describe the main characteristics of the Italian taxation system. More 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. Generally, in a married couple, the husband is considered to be the *first earner*, who participates to the labor market with certainty. The wife is the *second earner*. Her decision to participate depends on several economic and non economic variables. In particular, it depends on the fraction of her expected gross income that will be disposable, net of total taxes. To understand the impact of taxes on the decision to work, we make use of the concept of *second earner tax rate*.

Let us define the *second earner tax rate* (SET) as follows:

$$\text{SET} \equiv \frac{\Delta T}{y_f} = \frac{Tax(y_m, y_f) - Tax(y_m, 0)}{y_f}$$

where $Tax(y_m, y_f)$ and $Tax(y_m, 0)$ are the total income taxes paid by the household if the wife works and if she does not work, respectively. y_f is her gross income when she works, and y_m is the husband's gross income. We assume that her income is equal to zero when she does not work (i.e. she is either out of the labor force or unemployed).

Now, depending on the unit of the fiscal system (individual or family), the second earner tax rate and the average tax rate of a married woman may be significantly different than those of an unmarried woman.[11]

In Italy, however, we should not observe a marital status dependence of the amount of tax paid, because the tax system is based on the individual and not on the household. Nevertheless, tax credits for family dependents and universal cash transfers for children are decreasing functions of the household income and indirectly affect the fiscal burden related to the labor force participation status of the wife. Hence, the SET can be expressed as the sum of the tax rate of wife and a distortion which depends on tax credits (TaxCred) and universal cash transfers (UnivCash), in the following way:

$$\begin{aligned} SET &= \frac{Tax(y_f)}{y_f} + distortion(TaxCred, UnivCash) \\ &= \frac{Tax(y_f)}{y_f} + \frac{TaxCred(y_m,0) - TaxCred(y_m,y_f)}{y_f} + \frac{UnivCash(y_m,0) - UnivCash(y_m,y_f)}{y_f} \end{aligned}$$

Since 2007, the tax system grants a tax credit for dependent spouse who earns less than $2,840.51$ euros a year, a very low labor income. The amount of tax credits for dependent spouse varies between 0 and 730 euros depending on the total household's income. To better understand the incidence of the distortion, 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

[11] The average tax rate is the ratio between the total household taxes and the gross household income.

income lower than 8,000 euros, her net disposable income would increase of 7,200 euros a year. She would pay a SET 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 he would not receive the tax credit. The household disposable income would not increase by 7,200 euros a year, but by 6,480 euros a year, i.e. (7,200 − 720). She would pay a SET equal to 10 percent (720/7,200).

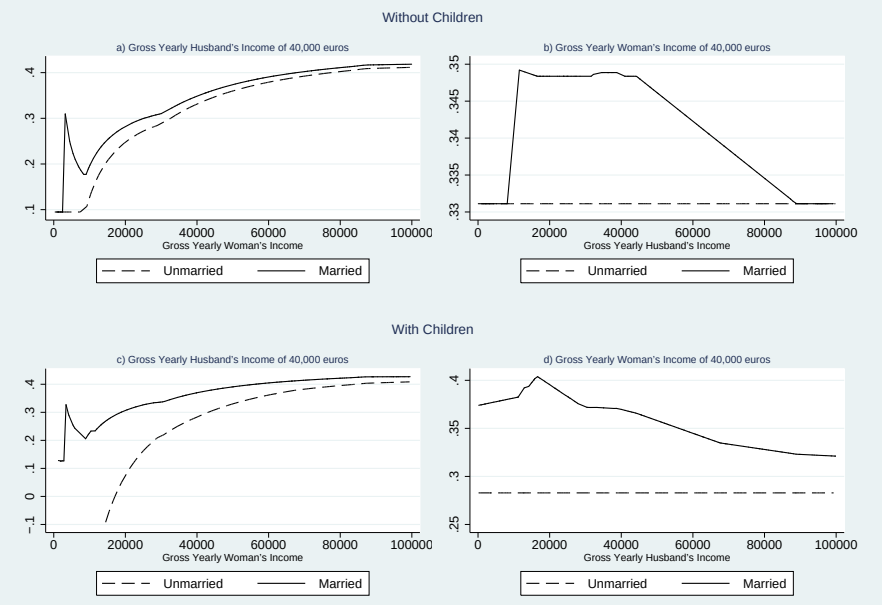
(3) Assume the husband earns 50,000 euros a year. The tax credit system would grant 517.50 euros to the household if she did not work. She would pay a SET equal to 7.18 percent (517.50/7,200).

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

These examples show that the amount of tax credits decreases with the total household income, and it is zero for incomes higher than 95,000 euros a year. The universal cash transfers for children put a similar mechanism at work in married households. On the contrary, they have the positive effect of reducing the fiscal burden of unmarried mothers, and create positive incentives to their participation rate (as in example (1)). Figure 2 plots the SET on earnings of women for different levels of gross yearly earnings.

The figures in the left column plot the SET against women's gross yearly earnings, at a given level of husbands' gross yearly earnings of 40,000 euros. The figures in the right column plot the SET on earnings against husbands' gross yearly earnings, at a level of women'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.

Figure 2: Second Earner Tax Rate by Marital Status



Source: Authors' simulations

In panel a), we can see that the married-unmarried difference in SET is particularly relevant for low women's earnings, and dies down as the income increases. The pick of the SET of married women occurs in correspondence of yearly earnings of about $3,000$ euros. At that point, husbands are not entitled to receive a tax credit for dependent spouse, and the SET jumps from 0 to about 30 percent. These couples face a trade-off between having the wife participating in the labor market earning a very low salary and not receiving tax credits (but still increasing the total household income), versus not participating and paying lower taxes (because of the tax credits).

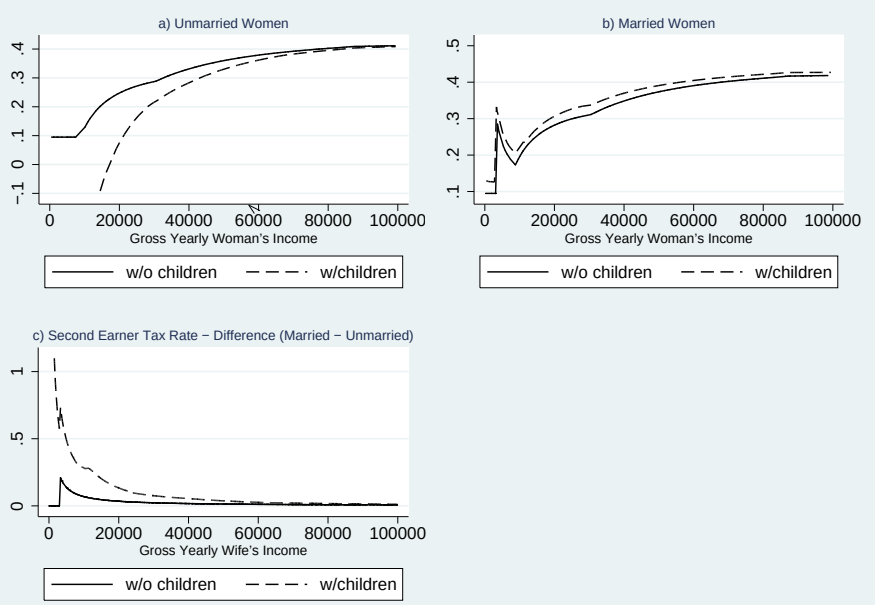
In panel b), the SET of married women is constant and equal to the one of unmarried women, until a level of husband's income of about 8,000 euros. In the interval $[0, 8,000]$ euros, the husband's income belongs to the no-tax area, and only his wife's earnings are subject to taxation. After that point, both incomes are taxed and the SET increases to about 35 percent. It is worth noting that the SET remains high for medium levels of households' incomes, to decrease and reach the second earner tax rate of unmarried women for husbands' earnings in the highest percentiles.

In panel c) and d), we plot the SET 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 of taxes that they are supposed to pay. Married mothers are subject to a higher SET because of the (lower) amount of universal cash transfers for dependent children agreed to the husband. As earnings increase, the difference between the tax paid by married and unmarried women decreases. In panel d), we can see more clearly the impact of the universal cash transfers for dependent children. The SET of married mothers is increasing up to yearly household earnings of about 60,000 euros. After that point, households are not entitled to receive transfers, and the SET decreases.

Now, we take a closer look at the impact of taxes by presence of children (Figure 3, panel a) and b)), and by marital status (Figure 3, panel c)).

Figure 3: Second Earner Tax Rate by Marital Status and Presence of Children



Source: Authors' simulations

In panel a), we observe that unmarried women with children have a SET which is much lower than that of unmarried women without children, as the former receive cash transfers for the dependent children. For married women (panel b)), the presence of children does not affect the second earner tax rate. Panel c) plots the difference of SET between married and unmarried women by presence of children, against their yearly earnings. The difference is significatively positive for low-income

mothers whose husbands are entitled to receive tax credits and transfers. But it is very close to zero for higher incomes and, in general, for childless women.

In summary, the Italian tax system, even if based on individuals and not on households, generates a set of negative incentives to female labor force participation. This is due to universal cash transfers and tax credits for dependent children and spouse that increase the second earner tax rate of married relative to unmarried women. The distortion is increasing in the number of children, and reaches a maximum at a level of husband's yearly earnings of about $10,000$ to $20,000$ euros.

Having discussed the empirical features that motivate our work, we present, in the next section, the model and the results of the estimations.

3 Estimation and Results

3.1 The Model and the Empirical Specification

We build a two-stage model of female labor supply. In 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 working time, $h \in H \subset \Re^+$ a job offer characterized by a level of gross yearly earning $w_f(h)$. She can accept one of them or reject them all and stay 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. This is the hypothesis held by Kleven et al. [2009] in their modeling of employment among couples. We assume that consumption equates disposable income

$$c = D(w_f(h), w_m, y, X) = w_f(h) + w_m + y - T(w_f(h), w_m, y, X), \tag{2}$$

where $T(\cdot)$ are net transfers from the government, given by the difference between taxes and benefits. They are functions of total income, and a set of demographic variables X including, for instance, the number of dependent children.

Household preferences are described by a stochastic utility function $U_h^p(c, X)$, with p denoting marital status (0 for unmarried, 1 for married), and c the household consumption. 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 utility

$$U(w_m, y, X) = \max_h U_h^p(D(w_f(h), w_m, y, X), X). \tag{3}$$

In the second stage, a woman faces a trade-off between the utility from non working (enjoying leisure and carrying out domestic work) and working, augmenting the disposable income of the household.

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

$$\max_s U_s(w_m, y, X) = \max\{U_{-1}(w_m, y, X), E\left[U(w_m, y, X)\right]\}, \tag{4}$$

where $s = \{-1, 0\}$ denotes the *out of/in* the labor market states, and $U_s(\cdot)$ is the utility associated to each state. Here, the utility of being in the labor market is $E\left[U(w_m, y, X)\right]$, that is the expected utility generated by the maximization problem in stage 2. To make her choice, she compares the utility from not participating and the expected utility from entering the labor market.

We assume a quadratic utility function:

$$U_h^p(c, X) = \alpha_h^p + \beta_1^p c + \beta_2^p c^2 + \gamma_h^p X + \epsilon_h^p \tag{5}$$

$$U_{-1}(w_m, y, X) = U_{-1}^p(c, X) = \alpha_{-1}^p + \beta_3^p c + \beta_4^p c^2 + \gamma_{-1}^p X + \epsilon_{-1}^p \tag{6}$$

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

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

We know that, if ϵ is i.i.d. 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

$$P_k = P(h = k|s = 1) = \frac{e^{U_k(D(w_f(k),w_m,y,X),X)}}{\sum_h e^{U_h(D(w_f(h),w_m,y,X),X)}}. \tag{7}$$

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

$$P(s = 0) = \frac{e^{E[U(w_m,y,X)]}}{e^{U_{-1}(w_m,y,X)} + E\left[U(w_m, y, X)\right]} \tag{8}$$

$$P(s = -1) = \frac{e^{U_{-1}(w_m,y,X)}}{e^{U_{-1}(w_m,y,X)} + E\left[U(w_m, y, X)\right]}. \tag{9}$$

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

$$\begin{aligned} L(\{z_i\}_{i\in I}) &= \sum_{s_i=-1} \left(U_{-1}(w_m, y, X) - e^{U_{-1}(w_m,y,X)} + E\left[U(w_m, y, X)\right]\right) \\ &+ \sum_{s_i=0} \sum_k \mathbf{1}_k(h_i) \left(U_k(D(w_f(k), w_m, y, X), X) - \sum_h e^{U_h(D(w_f(h),w_m,y,X),X)}\right) \end{aligned} \tag{10}$$

where $\mathbf{1}_k(h_i)$ 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.

Every person aged 16 years and over in a household is required to participate to the survey. Two different types of questions are asked in the household survey: household questions, and personal questions. The former covers details of accommodation and facilities together with regular household expenses (mortgage repayments, etc.). This information is supplied by the Head of the Household.

The latter covers details of items such as work, income and health, and 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 interviewed household member.

We focus on the cross-sectional informationof the years 2007 and 2008, because they are the last two years available of EU-SILC after a few changes in the tax system that took place from 2006 to 2007.[12] We restrict the sample to women aged 26-54 years, to avoid the modeling of schooling and retirement decisions. Descriptive statistics are in Table 7 in the Appendix.

The data set provides information on 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). Nevertheless, it is necessary to compute *potential* income for all possible labor supply choices $h \in H$, including the non-employed. To correct for selection bias, a two-stage non-linear procedure is adopted which differs in few features from the standard Heckman correction.

In the first stage, the propensity scores $q_k(X) = Pr(h = k|X)$ are estimated by a standard probit procedure,[13] with variables X including: age, years of work experience, dummy variables for geographical regions, dummy variables for living with the parents (if unmarried), presence of dependent children, education, and net income from other sources (both husbands income, if any, and non labor income). Unlike the standard Heckman selection procedure, we consider three possible labor supply choices: $h = \{0, 1, 2\}$, where $\{0, 1, 2\}$ denote unemployment, part-time and full time employment, respectively. Moreover, we distinguish between married and unmarried women. The marginal effects obtained from the probit regressions are in Table 10 in the Appendix.

In the second stage, we estimate the wage equation assuming that:

$$E(w_f(h)|X) = \beta X + \mu_h(q_0(X), q_1(X), ..., q_H(X)),$$

[12]EU-SILC provides two types of data: (1) cross-sectional data pertaining to a given time or a certain time period with variables on income, poverty, social exclusion and other living conditions; (2) longitudinal data pertaining to individual-level changes over time, observed periodically over a four years period.

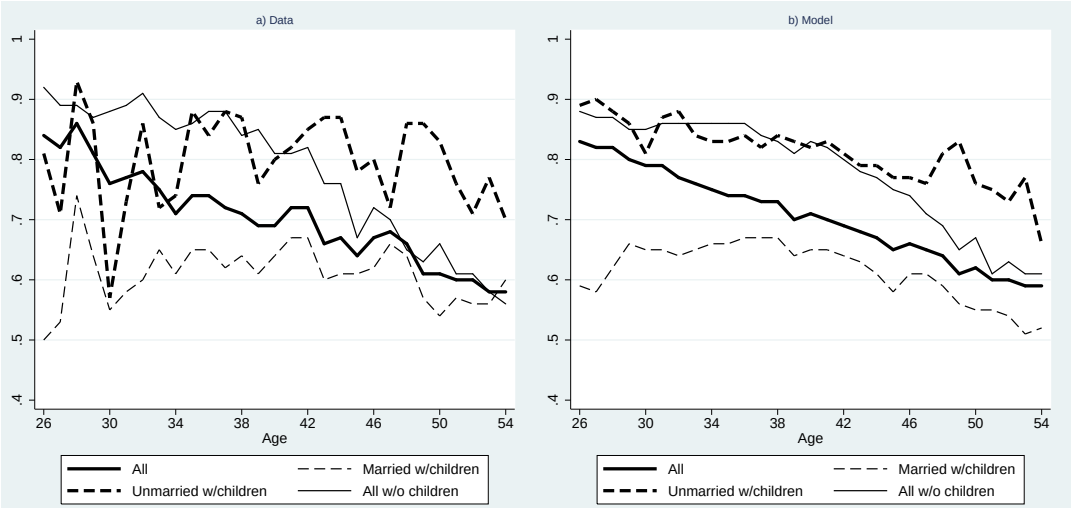
[13]The propensity scores are the probabilities that an individual with characteristic X opts for labor supply choice $h = k$.

where μ is a given function of the propensity scores $q_h(X)$. In particular, $\mu_h(\cdot)$ is a function of the percentiles of $q_h(X)$, for $h = \{0, 1, 2\}$. We use them in the OLS estimation of the wage equation, and report the coefficients in Table 11 in the Appendix. Finally, we use the residuals of the wage equation estimation to compute the predicted wages for part-time and full-time employment choices.

3.3 Estimation Results

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

Figure 4: Labor Force Participation of Italian Women by Age



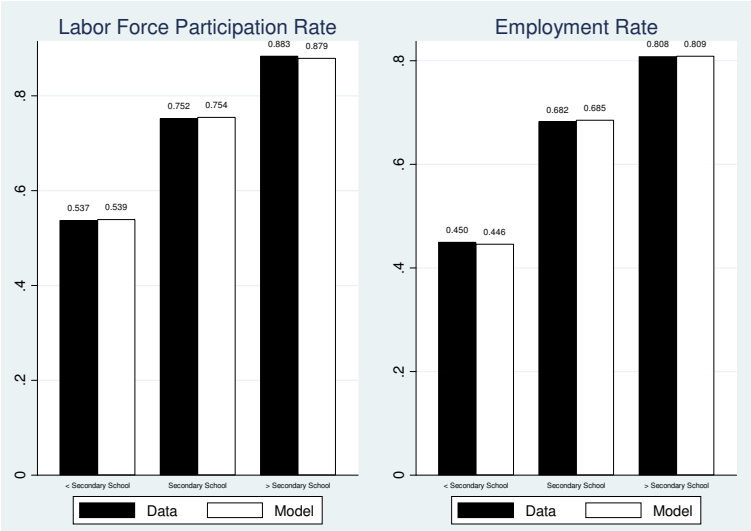
Source: Authors' computations from EU-SILC data (2007-2008)

Panel b) of Figure 4 plots the estimated participation rates by age, and marital status. Comparing it to the data in panel a), we can observe that the model generates the levels and the decreasing trend of the participation rate of the different subgroups of women. Even thought the taxation system is not age-dependent, the age of women is correlated with their own earnings, their husband's earnings, and the number of children. As we described above, all of these elements affect the tax burden, and

hence, the labor decision of second earners.

The model replicates the percentage of women in the labor force, and the percentage of women who are employed (in part-time and full-time jobs). The results are shown in Figure 5. Moreover, in the last three panels of Table 13 in the Appendix, we summarize the results of the estimation of the labor force participation and employment rates (part-time and full-time).[14] It is worth noting that these are results of a partial equilibrium model where the individuals' labor choices do not affect labor earnings.

Figure 5: Results by Education Level - Data vs Model



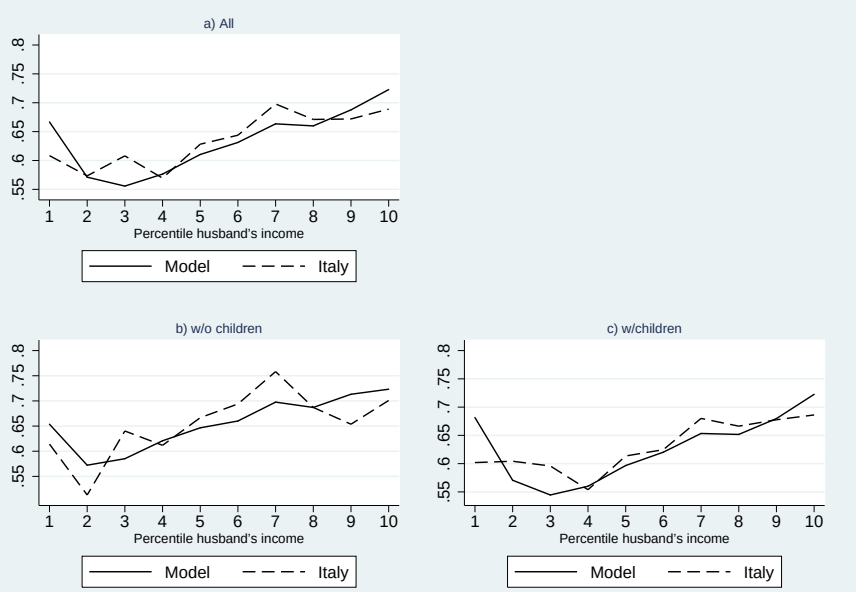
Source: Authors' computations from EU-SILC data (2007-2008)

Figure 6 plots the realized and predicted labor force participation rates of married women by percentile of husbands' incomes. The model slightly overestimates the participation rates of women married to husbands in the lowest and in the highest percentiles (panel a)). Comparing panels b) and c), we can see that the presence of children does not alter the increasing trend in the participation rates. The distortion takes place regardless of the presence of children. Childless households may still be eligible to receive tax credits for dependent spouse, increasing the amount of their SET.

[14]We also relegate Figure 12 and Figure 13 to the Appendix. Figure 12 plots 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 13).

To better understand the role of the taxation system, we estimate a model where the labor choice of women depends on the yearly gross labor income, and not on the net income as in the benchmark model. Figure 7 plots the differences in the participation rates produced by the two models, by husband's income.[15]

Figure 6: Labor Force Participation by Percentile of Husband's Earnings - Data vs Model



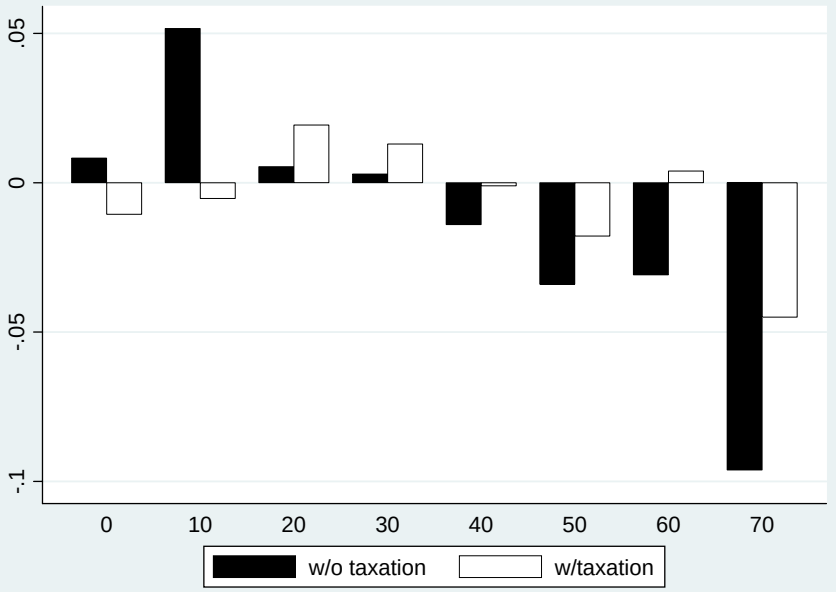
Source: Authors' computations from EU-SILC data (2007-2008)

This counterfactual experiment shows that ignoring the taxation system would produce a significative and increasing underestimation of the participation rates of married women for husbands' incomes higher than 40,000 euros (black columns). This underestimation is not significative for the benchmark model (blank columns). For lower incomes, the participation rates are significative overestimated in the model without tax.

All these results support our hypothesis that the taxation system is partly responsible for generating the positive correlation between husband's income and women labor force participation. Moreover, the high tax schedule is responsible for the low level of the rate.

[15] In the x-axis, 0 corresponds to the case in which the husband is unemployed, while $10 - 20 - 30 - \cdots - 70$ stands for the classes of husband's income, that is $1 - 10,000$ euros, $10,000 - 20,000$ euros, $20,000 - 30,000$ euros, etc.

Figure 7: Labor Force Participation Rate, Difference (Model - Data)



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

4 Alternative Taxation Systems

The reform of the taxation system has been a topic of several discussions in the Italian government. 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 four different taxation systems that have been considered in the political and academic debate.

That is: the joint taxation, the working tax credit, the gender-based taxation, and a mixture of individual (or Italian) and joint tax system. In Tables 12 in the Appendix, we summarize the main characteristics of these alternative systems.

An important issue involved in our tax simulation exercises is that, when different tax units and tax systems are considered, the total tax revenue might change. We analyze what happens to the amount of tax paid by a household in the case of constant total tax revenue. Constant tax revenue is achieved by increasing each household tax by a constant amount.[16] The results of the simulations

[16] A simulation that does not take this into account shows that the joint tax system implies a revenue loss of about

are in Table 13 that can be found in the Appendix.

Moreover, we compute several measures of poverty to compare the effects on the well-being of individuals for each of the taxation system that we consider.

4.1 Joint Family Taxation

The joint taxation system is currently implemented 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,[17] 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 we find 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_m and y_f be the gross yearly incomes of the two spouses, q be *quotient familial*, and $t(\cdot)$ be the tax schedule. Then, the amount of tax is equal to $qt((y_m + y_f)/q)$ instead of $t(y_m) + t(y_f)$. In the simulation, we drop all tax credits for dependent spouse and universal cash transfers. The *quotient familial* is assumed to equal the number of household components.

This tax system implies an increase in the average tax rate from 21 to 24 percent, and an even higher increase in the SET. The increase concerns all marital status, regardless of the presence of children (Table 13 in the Appendix).

Participation and employment rates decrease by about 3 percentage points. Under this system, unmarried women do not change their behavior significantly. Married women are the most negatively affected. In particular, married women without children decrease their participation rate by 6 percentage points, and married women with children decrease it by 5 percentage points.

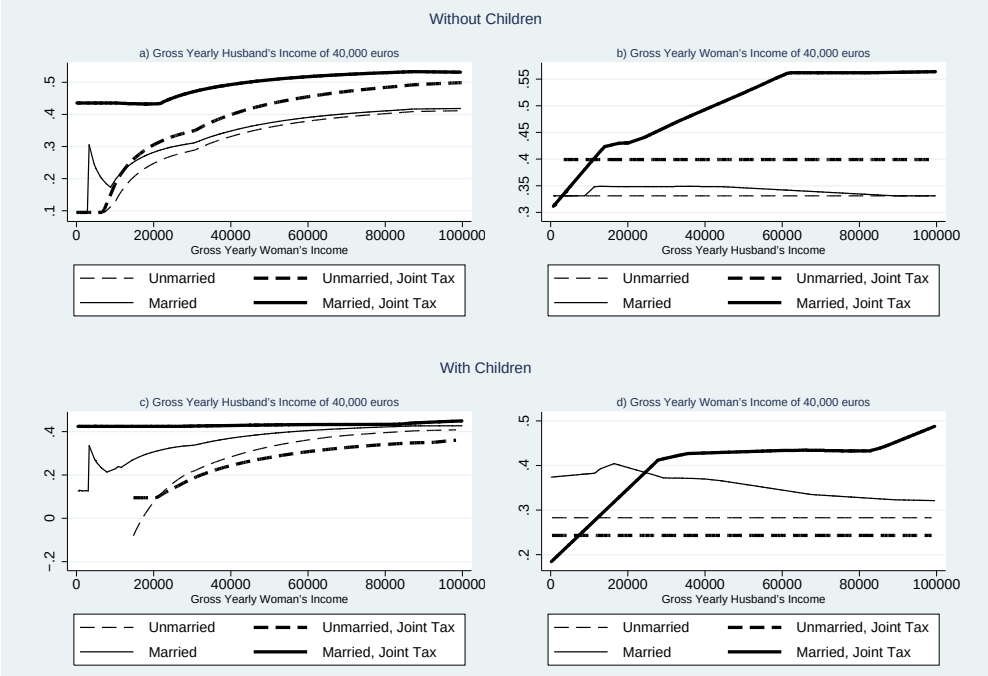
As shown in Figure 8, the SET of married women increases in husband's income (panels b) and

18%; the working tax credit of about 2%; the gender-based system of about 11%.

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

d)), and exhibits higher values than the benchmark model (panels a) and c)), implying a decreasing labor force participation in husband's income. The reason is that, without tax credits and universal cash transfers, the SET is now equal to $q[t((y_m + y_f)/q) - t(y_m/q)]/y_f$, which is positive for every $y_m \geq y_f$, and increasing in the difference $(y_m - y_f)$. The employment rate, both part-time and full-time, shows a similar pattern (see Table 13 in the Appendix).

Figure 8: Second Earner Tax Rate by Marital Status and Presence of Children - Joint Taxation



Source: Authors' simulations

But then, what are the reasons of the high (and inelastic) labor force participation rate of French women? Despite the disincentives created by the *quotient familial*, the French government provides a wide range of allowances, tax deductions, and reductions in social security contributions to families with children. For example, an allowance of 50% up to a maximum of 2,300 euros per child under seven years of age is granted towards the costs of child care outside of the home. Moreover, a tax allowance of 50% is credited against the costs of assistance with domestic duties, which include child care. To these fiscal measures, we should add the widespread system of day-care centers (both individual and collective) for children both younger and older than three years of age; monetary

transfers to parents who decide to exit the labor to take care of the children; and, a system of primary schools that offers overtime assistance to children with parents at work.[18] This set of services (other than fiscal) provide incentives to low income French mothers to enter (or to remain) in the labor force participation. In Italy the disincentives created by the fiscal system are not offset by any other family policy aimed to reduce the burden of the child care cost.

4.2 The *Working Tax Credit*

The American *Earned Income Tax Credit* (EITC) and the British *Working Tax Credit* (WTC) are two systems of negative taxation. The tax unit is the individual. Based on them, 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.[19] 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.

We assume that individual working tax credits are of the same amount of the Italian tax credits. Moreover, we 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.[20] This proposition is in line with the tax system of several European countries, and the suggestions of Atkinson [2011] and Levy et al. [2007].

This system provides incentives to married women, especially when they have children. The model forecasts an increase in participation and employment rates of about 3 percentage points. There is no change for unmarried women. Contrary to the Italian system, the working tax credit has all of the characteristics of an individual taxation system. In fact, tax credits or transfers (and hence, second earner tax rates) do not depend on the spouse's income, and hence does not vary with

[18] See Adema and Thévenon [2008] for a discussion of the existing policies directed to French families.

[19] 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.

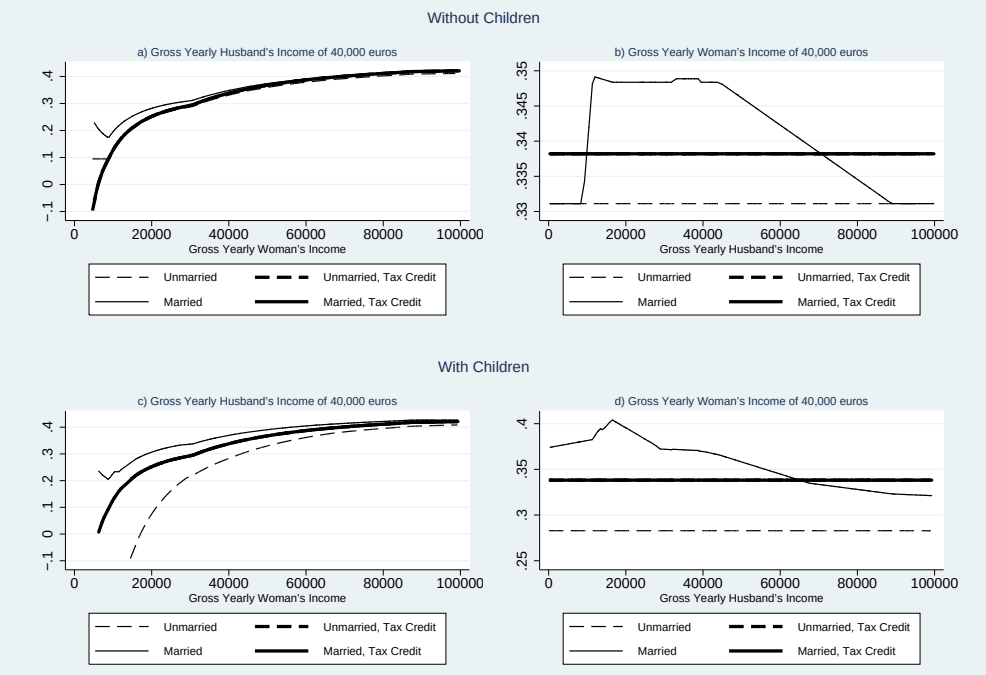
[20] We assume that the transfers for the first and second child are equal to the maximum amount of transfers guaranteed by the Italian tax system in the two cases.

the marital status.

This is shown in Figure 9, panels b) and d), where the SET is constant at about 34 percent, and independent of the marriage. Similarly, panels a) and c) show that the SET changes only with women's income.

Another interesting features of this system is that it provides incentives to undertake low earnings jobs. As we can see in Figure 9 (panel a) and c)), the SET is particularly low (and even negative) at low levels of earnings. Additionally, as reported in Table 13, the working tax credit is the only system that generates an increase in part-time employment.

Figure 9: Second Earner Tax Rate by Marital Status and Presence of Children - Working Tax Credit



Source: Authors' simulations

4.3 Gender-based Taxation

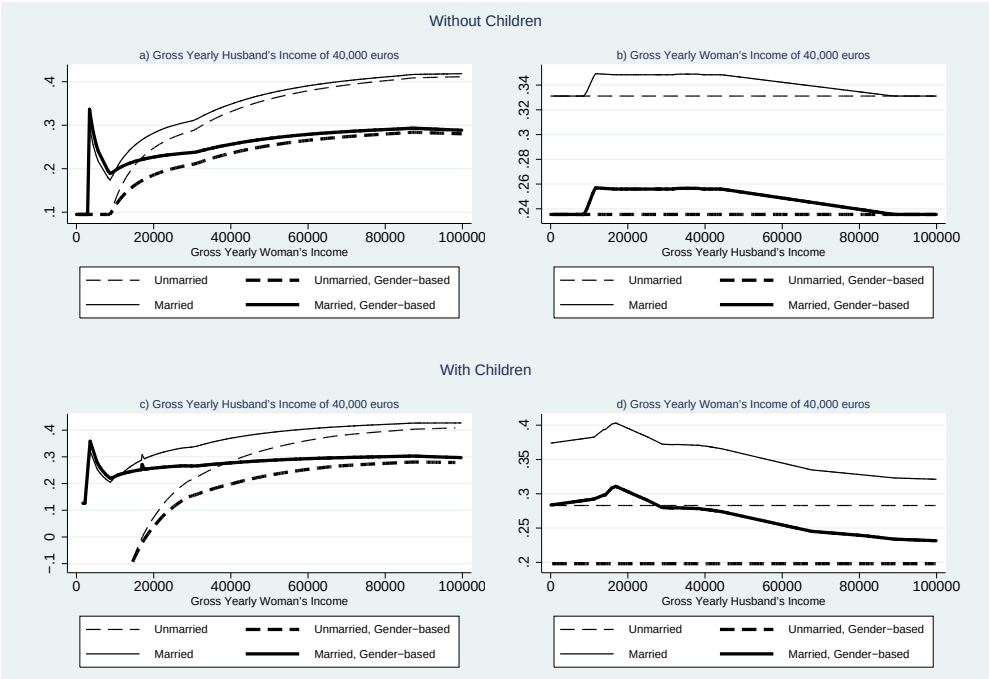
Alesina et al. [2011] suggest a gender-based taxation system which implies a lower tax schedule for individuals characterized by a participation rate elastic to income. In other words, they propose a lower tax rate for women than for men, regardless of the marital status. They show that this results

in a higher participation rate of women. Moreover, the increase in wives' bargaining power, due to an increase in their net disposable income, affects the division of labor inside the household in their favor.

At the same time, the gender-based taxation favors high income women and would penalize low income men. Furthermore, it would imply an equal treatment of two single parent families identical in income but different in the gender of the parents. Saint-Paul [2007] underlines that there is not reason 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 rates of women, and a decrease in the amount of tax credits for dependent spouse and universal cash transfers.

Figure 10: Second Earner Tax Rate by Marital Status and Presence of Children - Gender-based Taxation



Source: Authors' simulations

The lower tax rates boost the participation and the employment rate of all women. In particular, it increases both participation and employment rates by more than 2 percentage points, regardless of the marital status and the number of children. However, the tax credits for dependent spouse and cash transfers continue to generate the positive correlation between labor force participation and husband's income. From Figure 10, we can see that this system leads to a decrease in the SET of every woman, even thought it maintains a relatively high SET of low-income married women (as we did not change the system of tax credits and universal cash transfers).

4.4 Mixture Individual and Joint Tax System

In this system, we allow agents to choose between the Italian and the joint tax system.[21] In other words, they will choose the tax system that implies the lowest amount of taxes to be paid. Once the net income has been computed, and the tax system has been chosen, the labor supply choice is estimated as in the previous cases.

The resulting participation and employment rates have values that are intermediate between the benchmark model and the simulated joint taxation system. Under this mix system, the labor force participation is higher than the benchmark for low levels of husband's income, but it is lower than the benchmark as the husband's income increases. This is especially valid if there are children in the household. Also, the rates decrease with the husband's income as in the pure joint taxation model.

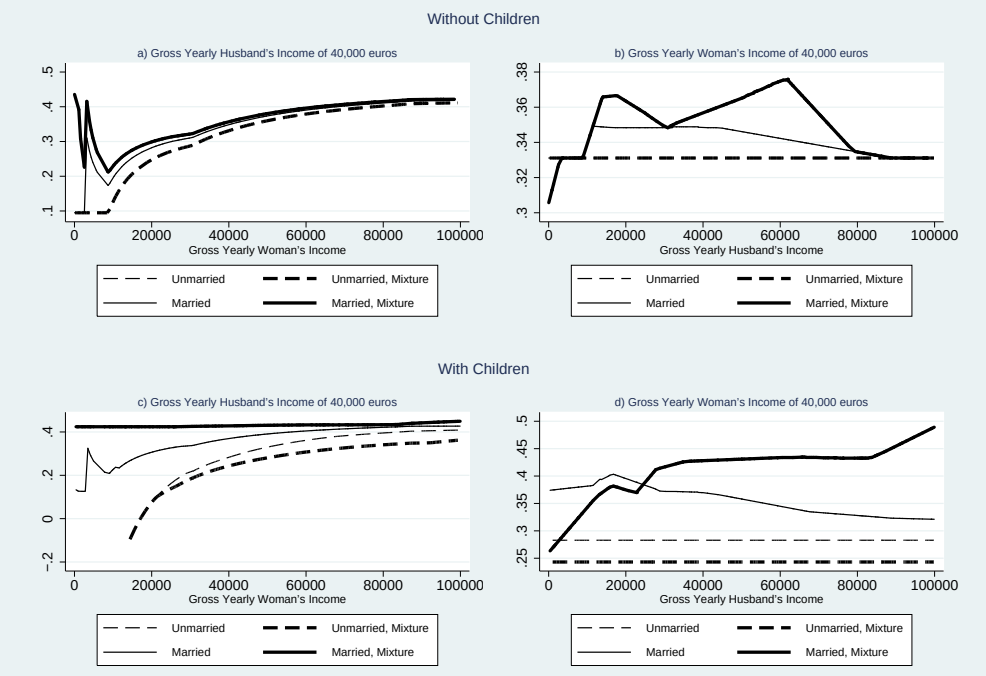
These results are driven by the choice of the Italian system for low income households: as the income increases, households switch to the joint taxation system. More specifically, when the husband's income is higher than 30,000 euros, the preferred system is the joint taxation. Similarly, unmarried women prefers the Italian system only at low levels of income. The rational behind these choices is that the Italian tax system grants tax credits and transfers that lower the tax burden of low income households. For higher incomes, tax credits and transfers decrease and lose importance in reducing the tax amount. In these cases, the joint taxation allows families to get a tax reduction

[21] A similar regime is in act in the U.S., where married couples can choose between joint and individual filing.

through the *quotient familial*, a tool which is independent of income. This explains the switch from the benchmark to the joint system at medium-high levels of household income.

In panels b) and d) of Figure 11, we can see that the SET of married women is still increasing in husband's income (as in the joint taxation system). In panel a), the SET of married women is slightly higher than the benchmark only for incomes lower than 10,000 euros. In panel c), we observe that the SET of married mothers behaves exactly as in the pure joint system. Moreover, the SET of unmarried women is lower than the benchmark only if they have children.

Figure 11: Second Earner Tax Rate by Marital Status and Presence of Children - Mixture Taxation



Source: Authors' simulations

4.5 Welfare Implications

In order to evaluate the welfare effects of the estimated and simulated tax systems, we compute several measures of poverty. In general, the tax system has a pervasive impact on poverty, both directly through its role in the distribution of society's resources, and indirectly through its effects on the incentives for economic decisions like working and saving. We decide to focus on poverty

measures as we think that the impact of tax reform on low-income families is especially important in light of the persistence of poverty, wage stagnation at the bottom, and the growth of income inequality. Our choice is also motivated by the last report of the National Institute of Statistics of Italy (Istat [2009]), which documents an increase in the poverty incidence among the households with a worker as reference person.[22]

In our computations, we define $y_i(j)$ as the *equivalised disposable income* of individual i in household j, that is the total income of a household, after tax and other deductions, which is available for spending or saving, divided by the number of household members converted into equalised adults.[23] The poverty measures are defined as follows:

(1) Head count index: it measures the proportion of the population for whom income is below the poverty line.[24] Let $s(j)$ be the number of members of household j and P the poverty line. Then, the head count index is defined as

$$HC = \sum_i HC_i = \sum_i \left(\frac{\mathbf{1}_P(y_i^j) * s(j)}{\sum_j s(j)} \right)$$

where

$$\mathbf{1}_P(y_i(j)) = \begin{cases} 1 & \text{if } y_i(j) \leq P \\ 0 & \text{otherwise} \end{cases}$$

The head count index has the disadvantage of ignoring the differences in well-being between different poor individuals.

(2) Poverty gap: it is the average, over all individuals, of the gaps between the income of individuals that are below the poverty line and the poverty line. The gap is zero for everyone else. The

[22] As we mentioned in the introduction, the reduction of the population below the poverty line is also a target of *Europe2020*, the project of the European Commission.

[23] See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Equivalised_disposable_income.

[24] The poverty threshold is reported by Eurostat (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Main_Page, File: At-risk-of-poverty rate and At risk poverty threshold in the EU, 2007). In Italy, it equals 9,007 euros in 2007.

poverty gap is

$$PG = \sum_i PG_i = \sum_i [HC_i * (P - y_i(j))]$$

(3) Aggregate poverty gap: it measures the average transfer (in euros) to poor households that is necessary to reach the poverty line.

$$APG = \sum_i \left[\frac{s(j) * \max[(P - y_i(j)), 0]}{1,000} \right]$$

Both (2) and (3) provide the amount of transfers that have to be transferred to an individual (2), and to an household (3) to bring their expenditure up to the poverty line. The results are in Table 4.

The joint taxation system stands out for the highest head count index. That is, it implies the highest percentage of women below the poverty line. The mixture system provides the lowest measures for married women, which are the lowest percentage of women below the poverty line, and the lowest transfer necessary to reach the poverty line. The percentage of married women with children below the poverty line decreases by 0.36 percentage points, and by 0.09 percentage points if they do not have children. Given the income of the husband, the mixture of Italian and joint tax minimizes the amount of tax to be paid, which turns out to be lower than the taxes paid in the gender-based system. The gender-based system decreases the poverty measures for all unmarried women, as it increases the net yearly income. The decrease is of 1.54 percentage points for women with children, and 0.46 for those without children.[25]

[25]We can think of alternative measures of welfare. One note is important at this point. Given the assumptions of our model, the labor force participation rate is obtained as probability to participate in the labor market, given some individual exogenous characteristics. This probability is a monotone transformation of the utility function. Hence, changes in participation rates reflect the directions of changes in welfare, as computed directly from the model.

Table 4: Poverty Measures - Women

		Head count Index (%) (1)	Poverty Gap (2)	Aggregate Poverty Gap (3)
		Benchmark Model		
Married	with children	15.504	442.235	21,030.047
	without children	9.459	256.793	9,491.913
Unmarried	with children	26.846	1,173.436	7,150.922
	without children	11.734	358.895	16,146.328
		Joint Tax		
Married	with children	16.524	520.412	24,747.667
	without children	9.440	256.933	9,499.081
Unmarried	with children	27.552	1,195.397	7,284.750
	without children	11.834	367.239	16,521.730
		Working Tax Credit		
Married	with children	16.554	457.929	21,776.337
	without children	9.507	249.910	9,239.425
Unmarried	with children	26.108	1,105.584	6,737.426
	without children	11.458	355.650	16,000.356
		Gender-based Tax		
Married	with children	15.595	444.291	21,127.818
	without children	9.526	257.531	9,521.187
Unmarried	with children	25.304	1,086.421	6,620.651
	without children	11.274	352.879	15,875.688
		Mixture Individual and Joint		
Married	with children	15.149	433.812	20,629.489
	without children	9.370	248.576	9,190.093
Unmarried	with children	26.748	1,155.420	7,041.131
	without children	11.616	354.682	15,956.796

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

5 Conclusions

In this paper, we have used micro data from EU-SILC to estimate a structural model of female labor supply. In particular, men's labor supply and incomes are given, and women decide, in two stages, whether to search for an occupation, and to accept it or not.

We show that the model matches the low level of the Italian labor force participation and employ-

ment 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 children, and universal cash transfers for children that increases the fiscal burden of low income households, and the second earner tax rate of 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, a system inspired by the British Working Tax Credit, the gender-based taxation, and a mixture of the Italian and joint taxation system. We show that the first implies a substantial drop in the participation rate of married women. The working tax credit and the gender-based tax systems boost the participation rate, with the effects of the former being concentrated on unskilled and low educated women. Unsurprisingly, the mixture system generates a set of results that combines those of the Italian and the joint tax systems. The participation rate is higher than that produced by the joint tax rate but lower than the benchmark. Moreover, it generates a negative correlation between the participation rate and the husband's income, as in the joint tax system.

Overall, the results of the simulations show that moving towards a system of tax credits in line with the British or the American ones, would reduce the fiscal burden of low earnings workers, mostly married women. Cash transfers that are independent of the total household income would reduce the disincentives to work created by the Italian taxation system.

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

Appendix

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 5 and 6, 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. The spouse credit is relevant only to the calculation for the principal earner.

Table 5: 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 75,001	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 6: 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 in the model because there is not information available on EU-SILC data set.

B Summary Statistics

Table 7: Descriptive statistics, EU-SILC 2007-2008

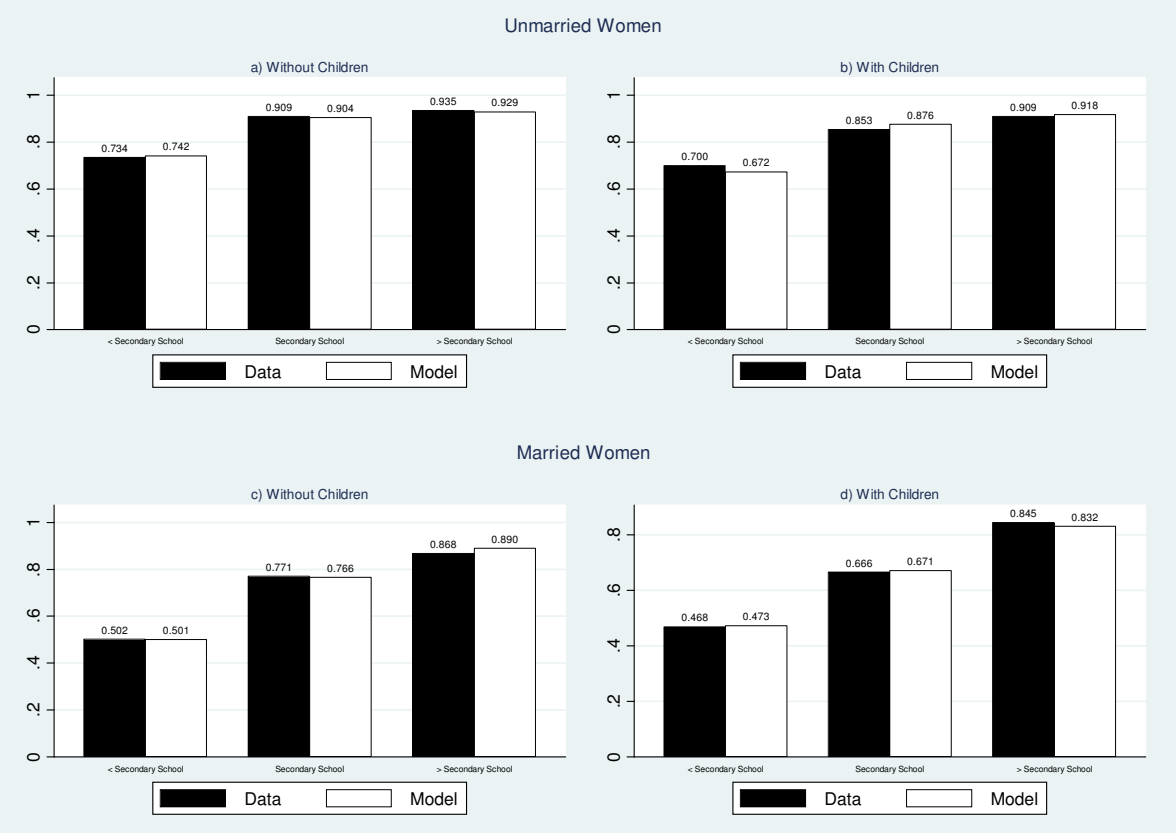
Variable	Women			
	Unmarried		Married	
	Mean	Std.dev.	Mean	Std.dev.
Number of observation	5,326		12,388	
Age	38.11	8.24	42.16	0.63
With children (%)	24.39		73.51	
Activity Rate (%)	84.73		62.74	
Unemployment Rate (%)	12.36		10.30	
Incidence of Part-time (%)	17.65		26.05	
Average annual earnings (euros)	14,653.61	13,186.39	14,086.64	12,603.67
Hourly wage rate (euros)	9.49	7.24	9.64	7.82
Non-labor Income (euros)	18,045.01	22042.35	7,665.97	12,365.17
Average husband's earnings (euros)			18,872.72	18,661.40
Region				
North-West	23.75		19.92	
North-East	22.53		21.36	
Center	24.22		23.50	
South	21.65		25.45	
Islands	7.85		9.77	
Education				
<Secondary School	31.71		43.21	
Secondary School	39.34		38.28	
> Secondary School	28.95		18.51	

Table 8: Descriptive statistics, IPUMS USA 2007-2008

Variable	Women			
	Unmarried		Married	
	Mean	Std.dev.	Mean	Std.dev.
Number of observation	314,480		12,388	
Age	40.07	8.70	41.53	7.98
With children (%)	40.67		71.00	
Activity Rate (%)	80.71		73.97	
Unemployment Rate (%)	6.53		3.82	
Incidence of Part-time (%)	5.67		10.98	
Average annual earnings (US dollars)	36,873.65	38,111.27	36,063.20	34,403.76
Hourly wage rate (US dollars)	19.43	43.85	21.01	111.25
Non-labor Income (US dollars)	3,141.695	16,523.22	4,310.554	15,740.51
Average husband's earnings (US dollars)			57,857.6	66,563.08
Education				
<Secondary School	46.02		40.03	
Secondary School	25.84		24.81	
> Secondary School	28.14		35.16	

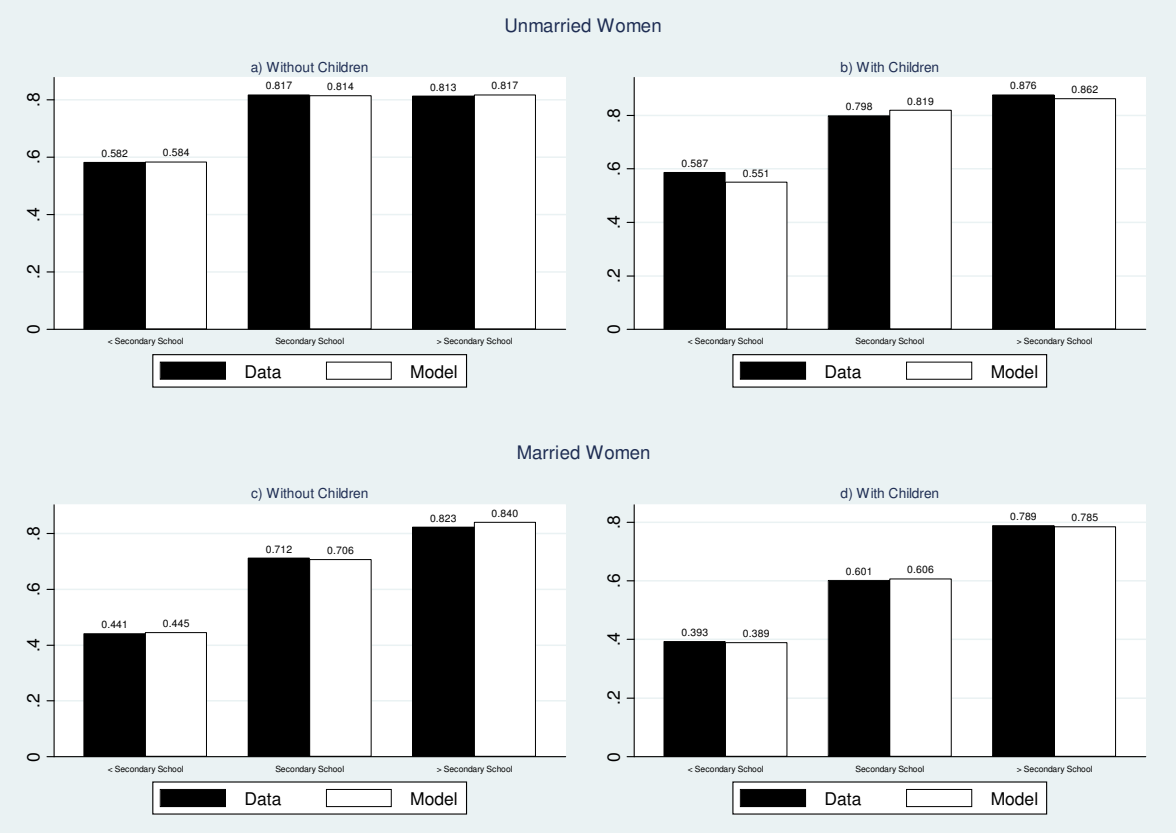
C Figures

Figure 12: Labor Force Participation Rate by Marital Status, Presence of Children, and Education Level - Data vs Model



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

Figure 13: Employment Rate by Marital Status, Presence of Children, and Education Level - Data vs Model



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

D Tables

Table 9: Probit - Coefficients

$Y = 1$ (in labor force)	Italy	Germany	Spain	France	UK	US
log(husband's income)	0.035**	-0.201***	-0.074***	-0.091***	-0.046	-0.233***
	(0.013)	(0.021)	(0.020)	(0.034)	(0.022)	(0.044)
Children	-0.275***	-0.720***	-0.234***	-0.500***	-0.425***	-0.170***
	(0.026)	(0.039)	(0.031)	(0.067)	(0.043)	(0.001)
Age	0.090***	0.190***	0.083***	0.126***	0.050***	0.115***
	(0.008)	(0.014)	(0.011)	(0.020)	(0.012)	(0.002)
Age^2	-0.001***	-0.002***	-0.001***	-0.002***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education:						
Secondary School	0.564***	0.340***	0.395***	0.495***	1.111***	0.545***
	(0.023)	(0.053)	(0.033)	(0.057)	(0.047)	(0.007)
> Secondary School	1.096***	0.686***	0.940***	0.901***	1.355***	0.870***
	(0.032)	(0.054)	(0.035)	(0.070)	(0.053)	(0.007)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Log likelihood	-9502.118	-4564.177	-6182.067	1699.061	-3134.585	-362221.86
Obs.	16198	9235	11567	4185	7062	675969

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

Table 10: Probit - Marginal Effects

	Unmarried Women		Married Women	
Dependent variable	$Y = 1$ (in labor force)	$Y = 1$ (employed)	$Y = 1$ (in labor force)	$Y = 1$ (employed)
Age	-0.004***	-0.001	-0.001	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Work experience	0.001	0.001	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Living with parents	-0.051***	-0.132***	-	-
	(0.012)	(0.016)	-	-
Have children	-0.084***	-0.126***	-0.057***	-0.055***
	(0.013)	(0.017)	(0.010)	(0.010)
Partner's earnings	-0.001***	-0.001***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Non-labor earnings	-9.69e-07***	-5.64e-07*	-1.76e-06***	-2.16e-06***
	(0.000)	(0.000)	(0.000)	(0.000)
Education:				
Secondary School	0.108***	0.183***	0.170***	0.190***
	(0.008)	(0.011)	(0.009)	(0.010)
> Secondary School	0.133***	0.203***	0.297***	0.337***
	(0.008)	(0.012)	(0.001)	(0.013)
Regions:				
North-East	0.047***	0.065***	0.037***	0.050***
	(0.010)	(0.015)	(0.013)	(0.013)
Center	-0.002	-0.046***	-0.027**	-0.045***
	(0.011)	(0.016)	(0.013)	(0.013)
South	-0.123***	-0.286***	-0.199***	-0.256***
	(0.016)	(0.019)	(0.014)	(0.013)
Islands	-0.112***	-0.307***	-0.253***	-0.289***
	(0.022)	(0.028)	(0.018)	(0.017)
Log likelihood	-2313.844	-3119.533	-8199.144	-8479.242

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

Table 11: Wage Equation - OLS, Coefficients

	Unmarried Women		Married Women	
	Part-time	Full-time	Part-time	Full-time
Age	0.041	-0.014	0.018	-0.032**
	(0.038)	(0.014)	(0.029)	(0.014)
Age^2	-0.001	0.000	-0.000	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Partner's age	0.006	-0.010	-0.012*	-0.010***
	(0.014)	(0.005)	(0.006)	(0.003)
(Partner's age)^2	9.67e-06	-0.000	-0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Work experience	0.055***	0.020***	0.025***	0.020***
	(0.011)	(0.004)	(0.008)	(0.004)
(Work experience)^2	-0.001***	-0.001***	-0.000**	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Partner's Work experience	-0.019	0.008	-0.007	0.007*
	(0.019)	(0.008)	(0.006)	(0.003)
(Partner's Work experience)^2	0.000	-0.000*	0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Education:				
Primary Education	-0.502***	0.007	-0.775***	-1.275***
	(0.162)	(0.056)	(0.184)	(0.102)
Lower Secondary Education	-0.607***	0.191***	-0.732***	-1.077***
	(0.133)	(0.064)	(0.173)	(0.093)
Upper Secondary Education	-0.183**	0.231***	-0.393***	-0.602***
	(0.085)	(0.071)	(0.103)	(0.052)
Tertiary Education	0.218**	0.433***	-0.135**	-0.292***
	(0.097)	(0.070)	(0.062)	(0.030)
Regions:				
North-East	0.167**	-0.064**	-0.046	-0.033**
	(0.070)	(0.026)	(0.044)	(0.025)
Center	-0.002***	-0.054*	-0.103**	-0.155***
	(0.070)	(0.025)	(0.047)	(0.025)
South	-0.315**	-0.145***	-0.408***	-0.506***
	(0.123)	(0.047)	(0.111)	(0.059)
Islands	-0.220*	-0.138**	-0.270**	-0.404***
	(0.134)	(0.056)	(0.135)	(0.071)
Ever worked	0.009	0.016***	0.010	0.026***
	(0.012)	(0.004)	(0.007)	(0.004)
(Ever worked)^2	0.000	-0.000	0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Have children	-0.128*	-0.026	0.062	-0.037
	(0.063)	(0.025)	(0.044)	(0.021)
Pctile of Pr(in LFP)	yes	yes	yes	yes
Pctile of Pr(in LFP)*Pctile of Pr(empl)	yes	yes	yes	yes

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

Table 12: 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,	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%				
			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%				
			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%				
			Mixture Individual and Joint		
			Agents choose between individual (Italian) and joint tax system		

Table 13: Alternative (Revenue Neutral) Taxation Systems - Results (%)

Taxation System	Unmarried Women: Without children	Unmarried Women: With children	Married Women: Without children	Married Women: With children	All women
			Average Tax Rate		
Benchmark Model	22.37	7.51	25.07	21.44	21.19
Joint Tax	27.36	16.66	27.82	22.38	24.12
Working Tax Credit	21.54	8.60	24.72	19.61	20.12
Gender-based Tax	17.34	5.09	23.79	21.35	19.30
Mixture Benchmark and Joint	26.99	16.40	27.37	21.87	23.84
			Second Earner Tax Rate		
Benchmark Model	22.37	7.51	24.73	25.41	22.97
Joint Tax	27.36	16.66	36.37	33.26	28.31
Working Tax Credit	21.54	8.60	20.83	18.20	18.78
Gender-based Tax	17.34	5.09	20.56	21.95	19.00
Mixture Benchmark and Joint	26.99	16.40	35.11	30.03	28.95
			Participation Rate		
Data	86.69	81.09	65.32	61.82	69.48
Benchmark Model	86.43	80.82	65.42	62.05	69.54
Joint Tax	85.69	79.58	58.74	57.19	65.55
Working Tax Credit	86.41	80.60	67.29	65.43	71.62
Gender-based Tax	87.04	81.48	67.27	63.85	71.01
Mixture Benchmark and Joint	86.43	80.87	64.51	57.90	67.24
			Employment Rate: Part-time		
Data	11.53	18.51	10.67	16.18	14.27
Benchmark Model	11.55	18.35	10.69	16.15	14.25
Joint Tax	11.80	17.42	9.60	14.73	13.31
Working Tax Credit	11.75	18.37	11.15	17.14	14.89
Gender-based Tax	11.15	17.89	10.57	16.14	14.10
Mixture Benchmark and Joint	11.55	18.31	10.41	14.91	13.56
			Employment Rate: Full-time		
Data	63.05	54.43	49.22	38.87	47.42
Benchmark Model	63.15	54.33	49.07	38.94	47.41
Joint Tax	61.69	53.64	43.62	35.63	44.32
Working Tax Credit	62.94	54.10	50.42	41.16	48.74
Gender-based Tax	64.55	55.64	51.12	40.77	49.15
Mixture Benchmark and Joint	63.15	54.44	48.50	36.17	45.89

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

Acknowledgements

We would like to thank the participants to the Applied Economics Lunch Seminar at the Paris School of Economics, several presentations at the Bank of Italy, Julien Prat, Paola Profeta, and the members of the Committee in charge of awarding the prize in *memoriam* of Etta Chiuri (2011). All errors are ours.

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