Taxation and Labor Force Participation: The Case of Italy

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Résumé

L'Italie se caractérise par la faible participation des femmes au marché du travail. En outre, la participation des femmes mariées est positivement corrélée au revenu du mari. Cet article montre comment le barème fiscal et les crédits d'impôts créent des incitations à l'inactivité pour les femmes mariées à des hommes à faible revenu. Un modèle structurel d'offre de travail des femmes est estimé et utilisé pour simuler des systèmes fiscaux alternatifs. On trouve que la taxation conjointe baisse le taux de participation. Par contre, le *working tax credit* et la taxation basée sur le genre augmentent la participation. Les effets du *working tax credit* concernent surtout les femmes peu qualifiées. Ce système fiscal incite au travail à temps partiel et permet d'envisager une diminution du travail au noir.

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May 16, 2012

Abstract

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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 most European 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 that targets five objectives on employment, innovation, education, social inclusion and climate/energy by 2020.[1] 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 2 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

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[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 of about $8,000$ euros for childless couples, and $19,000$ euros for couples with children. 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

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[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.

tax systems are characterized by the same taxation rates, but differ in the set of tax credits and transfers.

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 burden generates 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. 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*.[6]

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

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[6]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 the increase in labor force participation and to reduce 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 most European countries. In Table 1, we can see that, on average, about 73 percent of women aged 26-54 years old are employed. The number is over 90 percent for men.

Table 1: Employment Rates for 26-54 years old, by gender, 2007-2008

	Men			Women		
	Total	Full-time	Part-time	Total	Full-time	Part-time
Average	93.21	89.75	3.46	73.88	50.51	23.37
Italy	**94.77**	**91.60**	**3.17**	**67.28**	**52.10**	**15.18**
France	96.04	92.25	3.80	83.47	55.89	27.58
Spain	95.16	92.25	2.91	73.40	58.64	14.76
U.K.	79.83	76.36	3.47	75.44	46.38	30.06
Germany	96.43	91.79	4.64	88.98	38.97	42.01

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

There are large cross-country differences in the gender gap, which is lower than 5 percentage points in U.K. Italy stands out for a gender employment gap of almost 30 percentage points, and for the lowest employment rate of women, which is about 7 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 23 percent for women, and only 3 percent for men. While both full- and part-time employment rates of Italian men are in line with the European average, the low part-time rate of Italian women seems to depress their total rate.[7]

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 25 percentage points against an average gap of 20 percentage points.

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[7] In 2003, the Italian government approved a law (*Decreto Legge 10/09/2003 n.276, Legge Biagi*) that aimed to increase the flexibility of the existing part-time legislation, with unsuccessful results.

Table 2: Labor Force Participation for 26-54 years old, 2007-2008

	Women	Men	Married women		Unmarried women	
			w/children	w/o children	w/children	w/o children
Average	75.69	94.04	68.81	74.63	82.54	87.71
Italy	**69.95**	**95.06**	**62.46**	**66.06**	**81.13**	**85.41**
France	84.03	96.14	80.68	85.14	86.91	92.74
Spain	75.25	95.78	69.14	68.63	86.06	90.89
U.K.	74.72	78.01	75.43	81.68	71.50	77.40
Germany	82.35	96.86	71.95	86.69	90.16	94.52

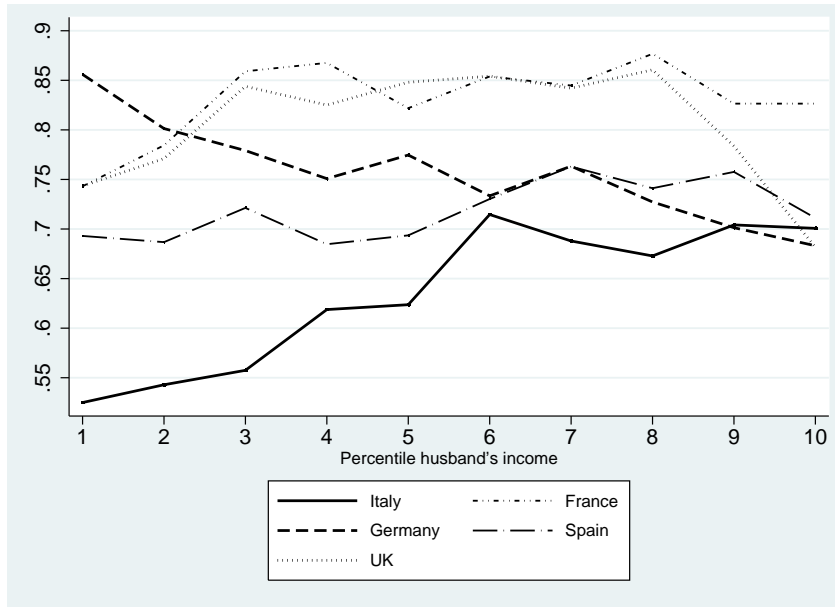Source: Authors' computations from EU-SILC data (2007-2008)

The marital status considerably affects the decision to participate, with married women having a participation rate that is about 13 percentage points lower than unmarried women. This gap is particulary strong in Italy, where it reaches about 20 percentage points. Moreover, participation rates tend to be lower for mothers. On average, 69 percent of married mothers are in the labor force, but only 62 percent in Italy.[8]

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 below 55 percent for husband's yearly gross labor earnings lower than 20,000 euros (second percentile); it increases up to about 70 percent at husbands' earnings of 30,000 euros (sixth percentile), 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. In particular, we argue that the Italian taxation system provides a system of disincentives that makes low income households to choose to remain out of the labor force to receive tax credits and cash transfers.

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[8]From panel a) of Figure 4, we can see that the gap in participation of married and unmarried Italian women persists for women of different ages, especially for those who have children.

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

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

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,[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.

We allow the propensity scores to depend on the woman's marital status, on the husband's employment status, and his yearly gross earnings if she is married. Moreover, we control for some demographic characteristics such as the presence of children, age, education level, and household non-labor income. 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]

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

[10]Table 7 and Table 8 in the Appendix report the coefficients and the marginal effects of the control variables, respectively.

The signs of the marginal effects on the usual demographics variables are consistent across countries. Italy, however, behaves differently than other countries in the correlation between husband's earnings and labor force participation: a significative positive marginal effect of $4.21e-07$ characterizes Italian data, versus a negative value which ranges from $7.49e-07$ (in France) to $1.23e-06$ (in Germany) for the remaining countries. Such result is particularly surprising, because we would expect household income pooling to discourage women to participate in the labor market, especially of those married to high income husbands. Interestingly, this anomaly is not observed for the non-labor household income, which negatively impacts the probability to participate in all of the countries.[11]

Table 3: Probit - Marginal Effects

$Y = 1$ (in labor force)	**Italy**	France	Spain	U.K.	Germany
Husband's Earnings	**4.21e-07***	-7.49e-07**	5.54e-08	-5.52e-07***	-1.23e-06***
	(2.17e-07)	(3.09e-07)	(2.68e-07)	(1.16e-07)	(1.48e-07)
Household Non-Labor Income	**-6.94e-07*****	-2.70e-06***	-1.34e-06***	-1.82e-06***	-2.37e-06***
	(1.78e-07)	(3.31e-07)	(3.06e-07)	(1.99e-07)	(2.37e-07)
Controls	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-9316.05	-1529.787	-5565.040	-3287.689	-4191.827
Obs.	17644	4228	12207	7597	10158

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$
Source: Authors' computations from EU-SILC data (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 much less likely to have a part-time (and hence, low earnings) job than in other European countries. In what follows, we bridge these facts to the Italian tax system.

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[11]A particularly strong assortative matching effect in Italy could generate this positive correlation. However, it remains to explain why assortative matching is not relevant in other countries.

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 in 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.[12]

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

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

following way:

$$SET = \frac{Tax(y_f)}{y_f} + distortion(TaxCred, UnivCash)$$

$$= \frac{Tax(y_f)}{y_f} + \frac{TaxCred(y_m,0) - TaxCred(y_m,y_f)}{y_f} + \frac{UnivCash(y_m,0) - UnivCash(y_m,y_f)}{y_f}$$

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 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 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 19,000 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 11,000 euros.[13] 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
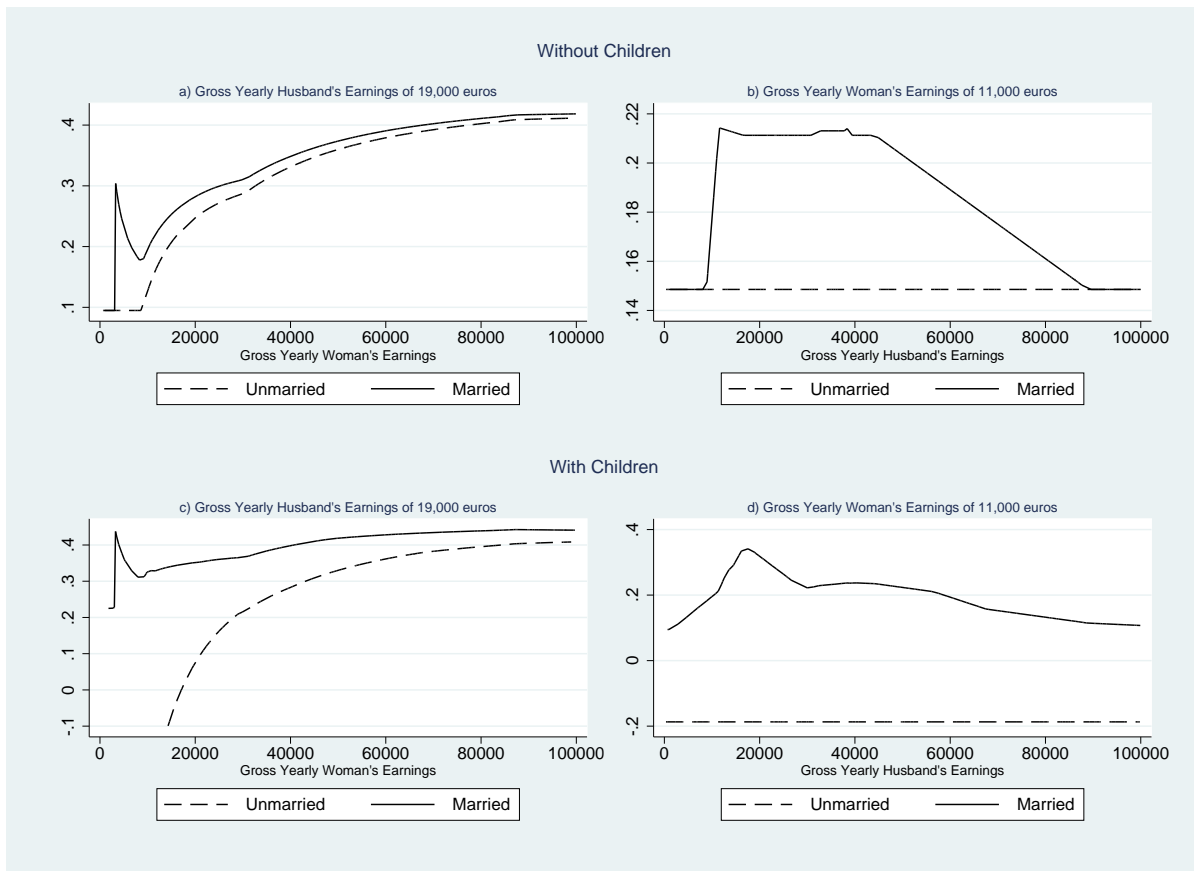
Source: Authors' simulations

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[13]The gross yearly earnings are chosen to represent the sample average, from Table 6.

In panel a), we can see that the married-unmarried difference in SET is particularly relevant for low women's earnings (less than 4,000 euros), and dies down as the income increases. The pick of the SET of married women occurs in correspondence of yearly earnings of about 3,500 euros. At that point, husbands are not entitled to receive a tax credit for dependent spouse, and the SET jumps from 9 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 20 percent. It is worth noting that the SET remains high for medium levels of household 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. 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. The SET reaches a pick of 44 percent for wife's earnings of about 3,200 euros. As in panel a), the difference between the tax paid by married and unmarried women decreases with their earnings. 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 gross husband's earnings of about 19,000 euros. After that point, the decreasing cash transfers for dependent children and spouse diminish the difference between taxes to pay if working or not working.

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

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children. On the contrary, for married women (panel b)), the presence of children negatively affects 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.

Figure 3: Second Earner Tax Rate by Marital Status and Presence of Children
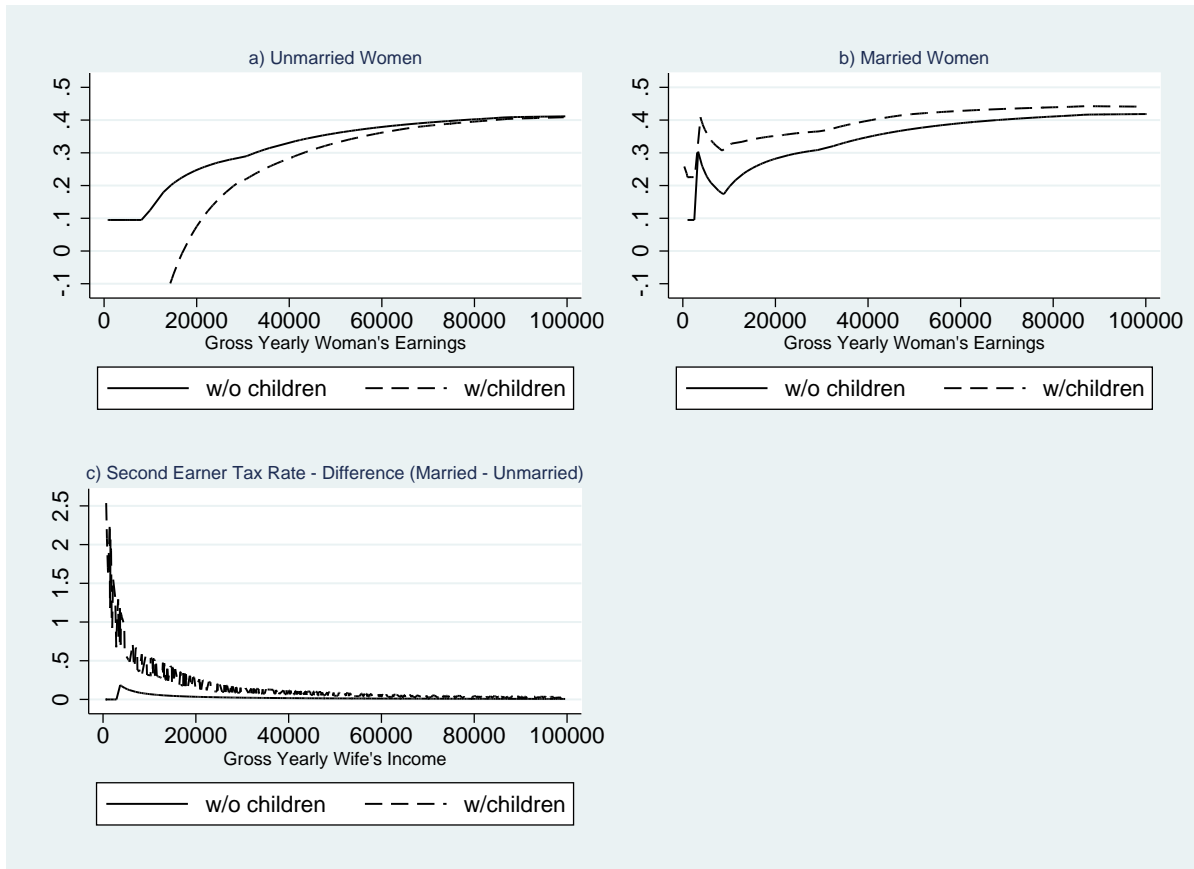
In summary, the Italian tax system, even if based on individuals and not on households, generates a set of negative incentives to female labor force participation. This is due to universal cash transfers and tax credits for dependent children and spouse that increase the second earner tax rate of married relative to unmarried women. The distortion is increasing in the number of children, and reaches a maximum at a level of husband's gross yearly earnings of about $8,000$ euros for childless couples,

and 19,000 euros for couples with children.

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

In our dataset (EU-SILC) each individual is observed for at most four years, not generating enough variation to provide a robust estimation of a dynamic model. We therefore rely on a simple static model, assuming that yearly wages are a sufficient statistic for the life cycle earnings profile.

We build a two-stage static 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 enters the second stage and receives, for each possible amount of working time $h \in H \subset \Re^+$, a job offer characterized by a level of gross yearly earnings $w_f(h)$. She can accept one of them or reject them all and stay unemployed ($h = 0$). We assume that the household preferences are described by a stochastic utility function $U^{mar}(h, D(\cdot), Z)$, where D denotes the household disposable income, and Z is a set of exogenous characteristics. The superscript mar is an indicator of the marital status of the woman, and the utility function is allowed to be different for married and unmarried women.

The complex structure of the tax system implies that the disposable income is a function of the total household income, and on the household composition. Extensively, the disposable income can be computed as

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

where $T(\cdot)$ denotes net transfers from the government, given by the difference between taxes and benefits; w_m is the husband gross earnings (which is 0 if the woman is not married); y is the household gross income from other (non-labor) sources; mar and chi are the marital status and the number

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of dependent children, respectively. As the paper's focus is on female labor supply, both $w_m(h)$ and y are taken as given as in Kleven et al. [2009]. Implicitly, we assume a negligible elasticity of male labor supply.

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

$$V^{mar}(w_m, y, Z) = \max_h U^{mar}(h, D(w_f(h), w_m, y, mar, chi), Z). \tag{3}$$

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. To make her choice, she compares the utility from not participating and the expected utility from entering the labor market. The problem is the following:

$$\max\{U^{mar}(0, D(0, w_m, y, mar, chi), Z), E\left[V^{mar}(w_m, y, Z)\right] - c\}, \tag{4}$$

where c is the cost of entering the labor market, and $E\left[V(w_m, y, Z)\right]$ is the expected utility generated by the maximization problem in stage 2. We assume a quadratic utility function

$$U^{mar}(h, D(\cdot), Z) = \alpha_h^{mar} + \beta^{mar}D + \beta_2^{mar}D^2 + \gamma_h^{mar}Z + \epsilon_h^{mar}. \tag{5}$$

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

The difference $(\alpha_h^{mar} - \alpha_0^{mar}) + (\gamma_h^{mar} - \gamma_0^{mar})Z$ captures the disutility of working (utility of leisure) of an amount of time h. Finally, ϵ_h^{mar} 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

$$Pr_k = Pr(h = k) = \frac{e^{U^{mar}(k, D(w_f(k), w_m, y, mar, chi), Z)}}{\sum_h e^{U^{mar}(h, D(w_f(h), w_m, y, mar, chi), Z))}}. \tag{6}$$

Similarly, the probability of being in the labor market is

$$Pr(s = 1) = \frac{e^{E[V(w_m, y, Z)] - c}}{e^{U^{mar}(0, D(0, w_m, y, mar, chi), Z)} + e^{E[V(w_m, y, Z)] - c}}, \tag{7}$$

where s indicates the labor market status. Finally, for a given observation sample $\{z_i\}_{i \in I} = \{w_{mi}, w_{fi}(h_i), y_i, h_i, Z_i\}_{i \in I}$, we can compute the log-likelihood function:

$$L(\{z_i\}_{i \in I}) = \sum_i \left\{ (1 - s_i) \left[\log(1 - Pr(s_i = 1)) \right] + s_i \left[\log(Pr(s_i = 1)) + \sum_k \mathbf{1}_k(h_i) \log(Pr(h = k)) \right] \right\} \tag{8}$$

where $\mathbf{1}_k(h_i)$ is a binary variable which equals 1 if individual i chooses $h = k$ and 0 otherwise. The coefficients are in Tables 12 and 13.

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 information of 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.[14] We restrict the sample to women aged 26-54 years, to avoid the modeling of schooling and retirement decisions. Moreover, we exclude self-employed men and women, and individuals that are coded as disabled or unfitted to work. Descriptive statistics are in Table 6 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 the non-labor income (y). Nevertheless, it is necessary to compute the *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.

Let's consider a standard Mincerian equation

$$\log(w_f|X) = \beta X + \mu + \epsilon, \tag{9}$$

where X is a vector of observed characteristics, μ is an individual characteristic component (e.g. skill or ability), and ϵ is a specific job component. It is well known that if either μ or ϵ are correlated with the probability of observing w_f, simple least squares estimation are biased. In particular, wages are observed only if the worker decides to (i) enter the labor market, and (ii) accept a given job offer. Both choices are presumably affected by μ or ϵ. Workers with high ability (μ) are more likely to enter the labor market, and to accept better offers (high ϵ). Let $s = 1$ and $e = 1$ denote the events of a worker being in the labor market and employed, respectively. A worker enters the labor market, i.e. $s = 1$, if $(\gamma_s X + u_s) > 0$. Next, he accepts a job offer, i.e. $s = 1$ and $e = 1$, if $(\gamma_e X + u_e) > 0$. Observed earnings can be expressed as

$$E(\log(w_f)|X, s = 1, e = 1) = \beta X + E(\mu|X, s = 1) + E(\epsilon|X, s = 1, e = 1). \tag{10}$$

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[14]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.

Since the dataset does not provide us with a strong instrument, we perform a non-linear selection procedure with

$$E(\mu|s=1,e=1) \;=\; E(\mu|s=1) = f(Pr(s=1|X)) \tag{11}$$

$$E(\epsilon|s=1,e=1) \;=\; g(Pr(e=1|s=1,X), Pr(s=1|X)), \tag{12}$$

where $f(\cdot)$ and $g(\cdot,\cdot)$ are generic functions.

In the first stage, the propensity scores $q(X) = Pr(s = 1|X), p(X) = Pr(e = 1|s = 1, X)$ are estimated by a standard probit procedure, with variables X including: age, dummy variables for geographical regions, presence of dependent children, education, and net income from other sources (both husbands income, if any, and non-labor income). Moreover, we distinguish between married and unmarried women. The marginal effects obtained from the probit regressions are in Tables 9 and 10 in the Appendix.

In the second stage, we estimate the wage equation assuming that both $f(\cdot)$ and $g(\cdot,\cdot)$ are step functions, constant within decile intervals, and report the coefficients in Table 11 in the Appendix. We use the residuals of the wage equation estimation to compute the predicted wages. Finally, we assume three possible levels of labor supply, $h \in [0, 1, 2]$, denoting respectively unemployment, part-time and full-time employment.

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, and presence of children.

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.

Figure 4: Labor Force Participation of Italian Women by Age
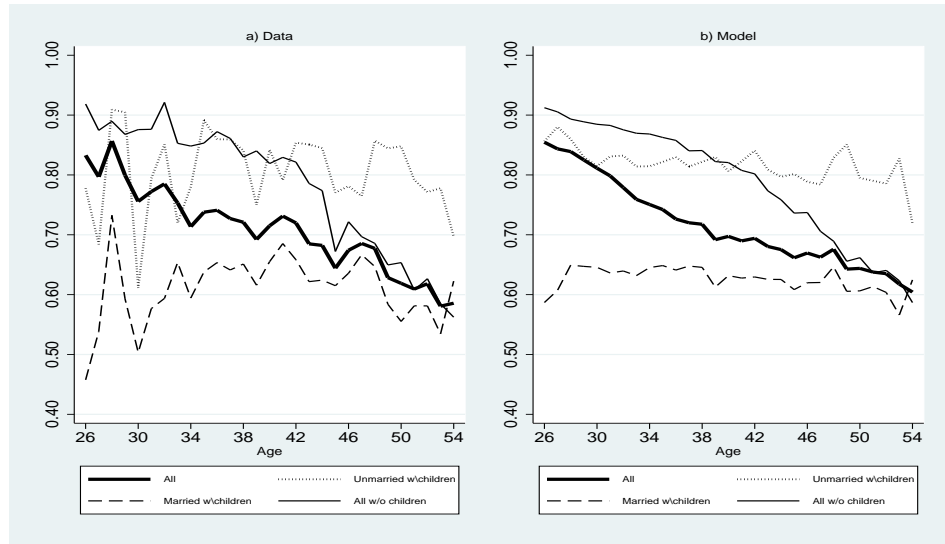
Source: Authors' computations from EU-SILC data (2007-2008)

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.

Figure 5: Results by Education Level - Data vs Model
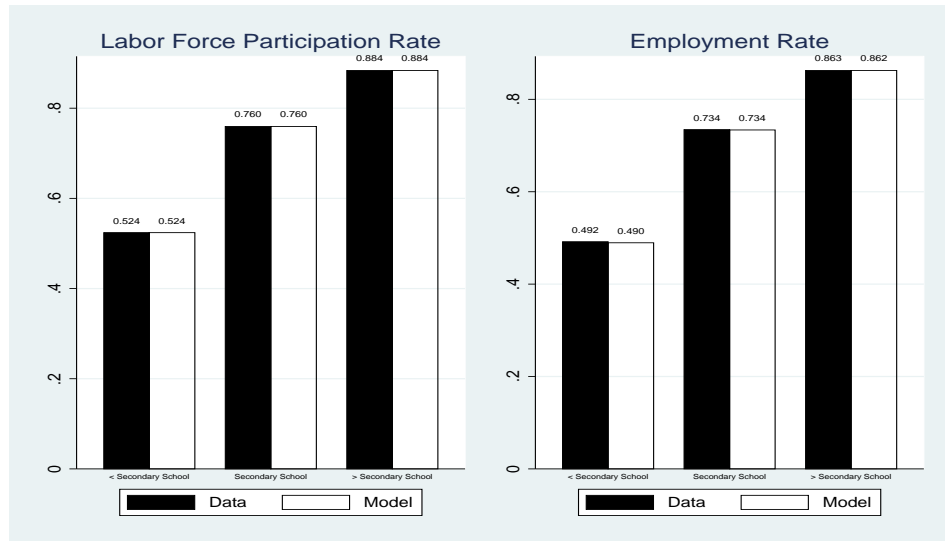
Source: Authors' computations from EU-SILC data (2007-2008)

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 15 in the Appendix, we summarize the results of the estimation of the labor force participation and employment rates (part-time and full-time).[15] It is worth noting that these are results of a partial equilibrium model where the individuals' labor choices do not affect labor earnings.
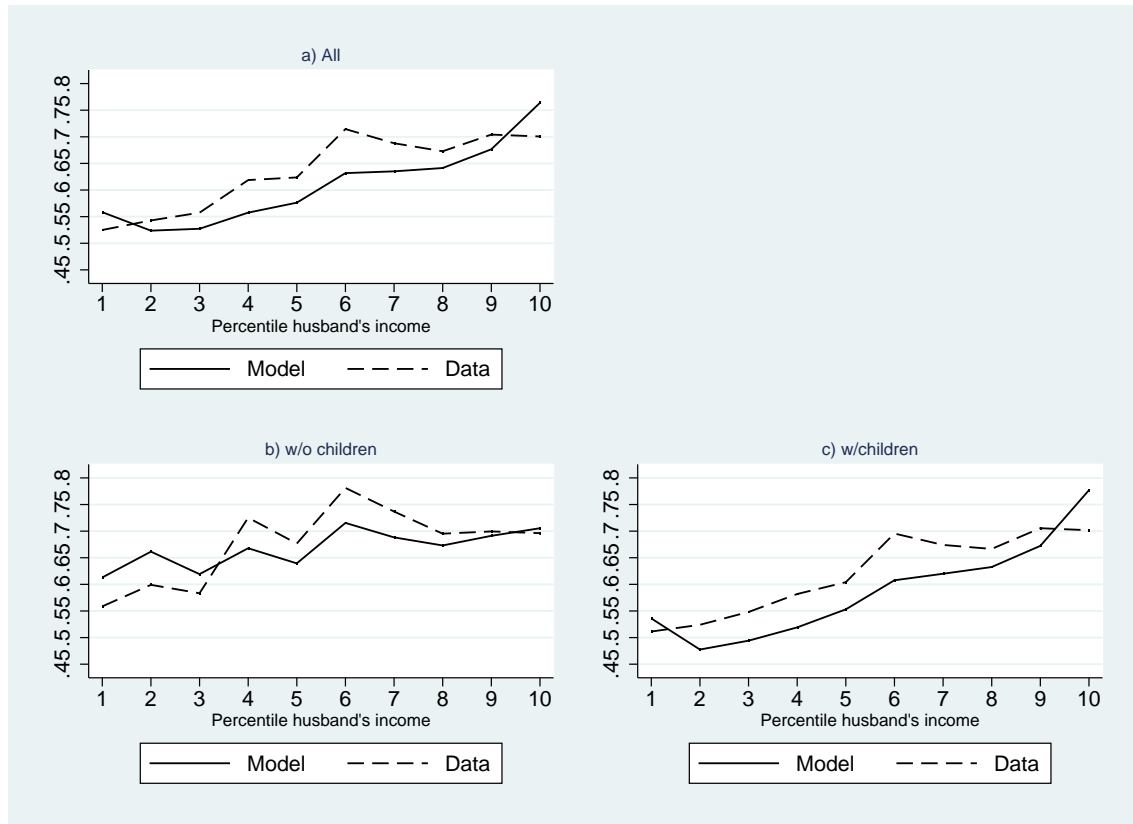
Figure 6: Labor Force Participation by Percentile of Husband's Earnings - Data vs Model

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

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[15]We also relegate Figure 11 and Figure 12 to the Appendix. Figure 11 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 12).

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.

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 Table 14 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 are in Table 15 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

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

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 17 to 19 percent, and a 15 percent increase in the SET. The increase concerns all marital status, regardless of the presence of children (Table 15 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 5 percentage points, and married women with children decrease it by 6 percentage points.

As shown in Figure 7, the SET of married women increases in husband's income (panels b) and 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 15 in the Appendix).

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.

Figure 7: Second Earner Tax Rate by Marital Status and Presence of Children - Joint Taxation
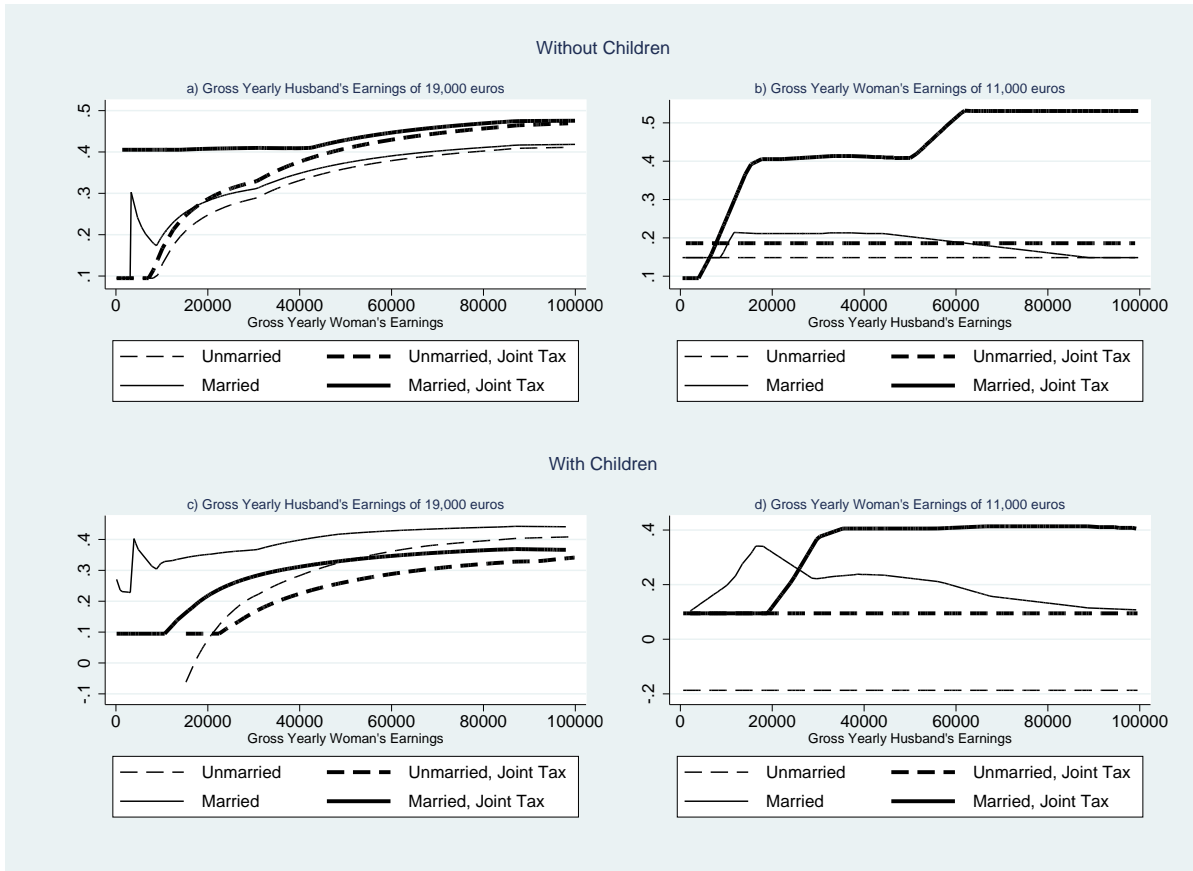
Source: Authors' simulations

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.

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

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 amount to 1,840 euros, regardless of the individual or household income. 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 the marital status.

This is shown in Figure 8, panels b) and d), where the SET is constant at about 15 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 8 (panels a) and c)), the SET is particularly low (and even negative) at low levels of earnings. Additionally, as reported in Table 15, the working

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[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.

tax credit is the only alternative system that generates an increase in part-time employment.

Figure 8: Second Earner Tax Rate by Marital Status and Presence of Children - Working Tax Credit
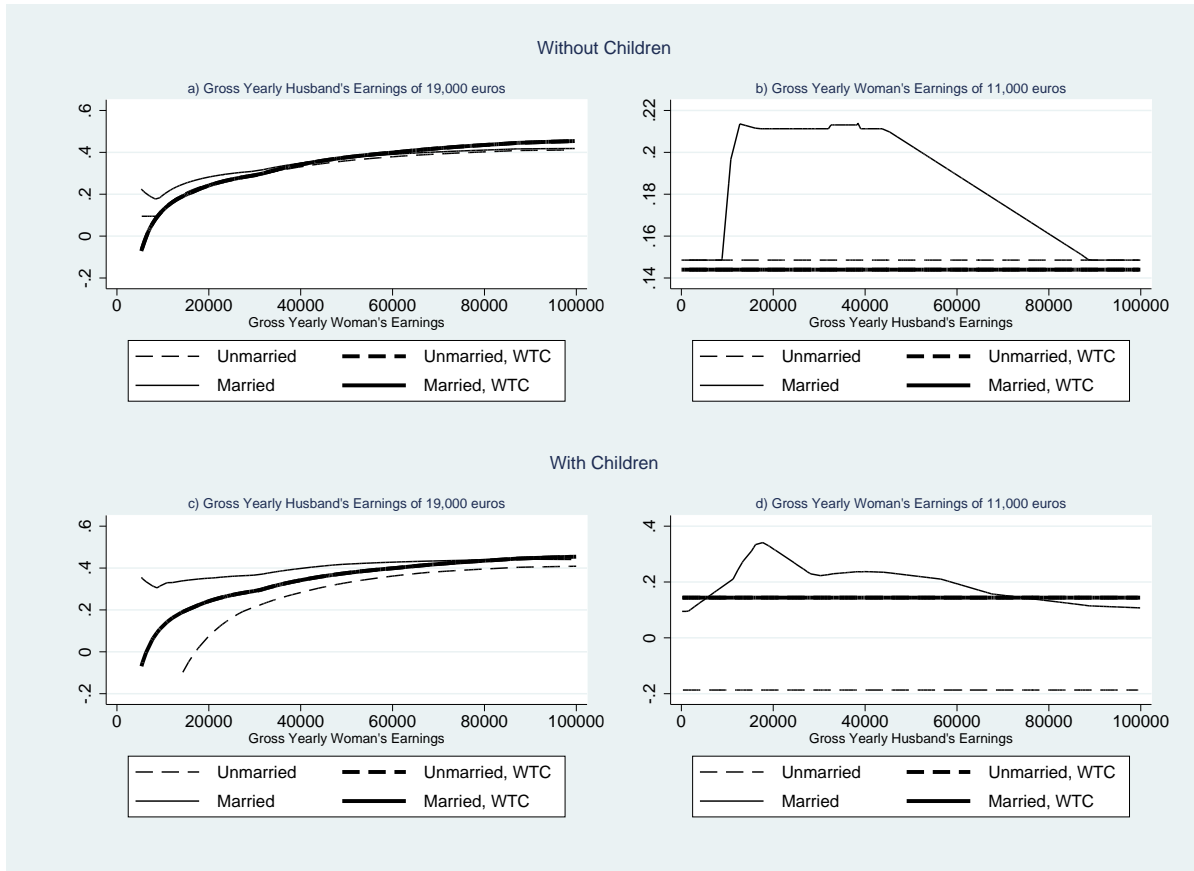
Source: Authors' simulations

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.

Figure 9: Second Earner Tax Rate by Marital Status and Presence of Children - Gender-Based Taxation
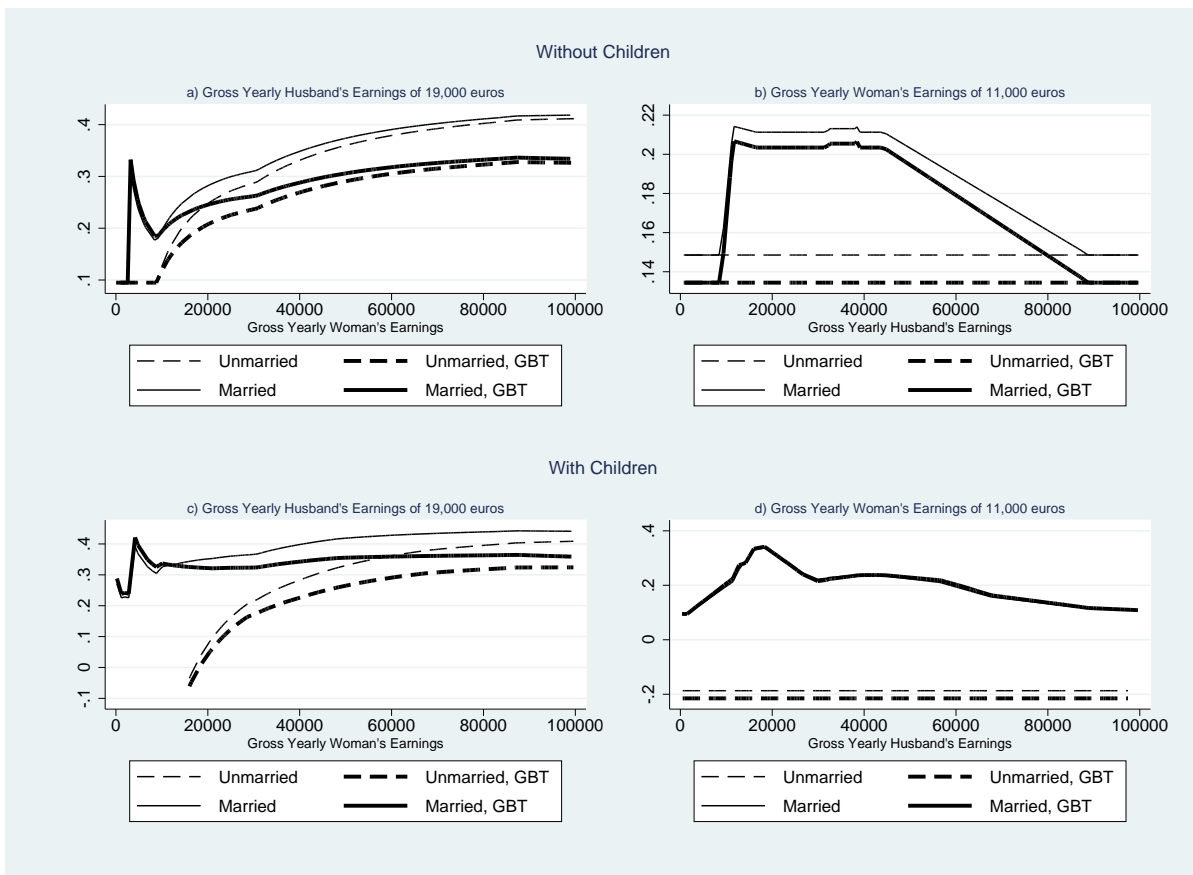
Source: Authors' simulations

In the simulation, we apply the same tax rates for men and women. But, women only pay a 67% of their total tax net of standard tax credits, as suggested by Alesina et al. [2011]. The lower taxation boosts the participation and the (full-time) employment rate of all women. In particular, it increases

both participation and (full-time) 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 9, 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. A similar regime is in act in the U.S., where married couples can choose between joint and individual filing. 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

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 10, 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 closely to the Italian system. Moreover, the SET of unmarried women is lower than the benchmark only if they have children.

Figure 10: Second Earner Tax Rate by Marital Status and Presence of Children - Mixture Taxation
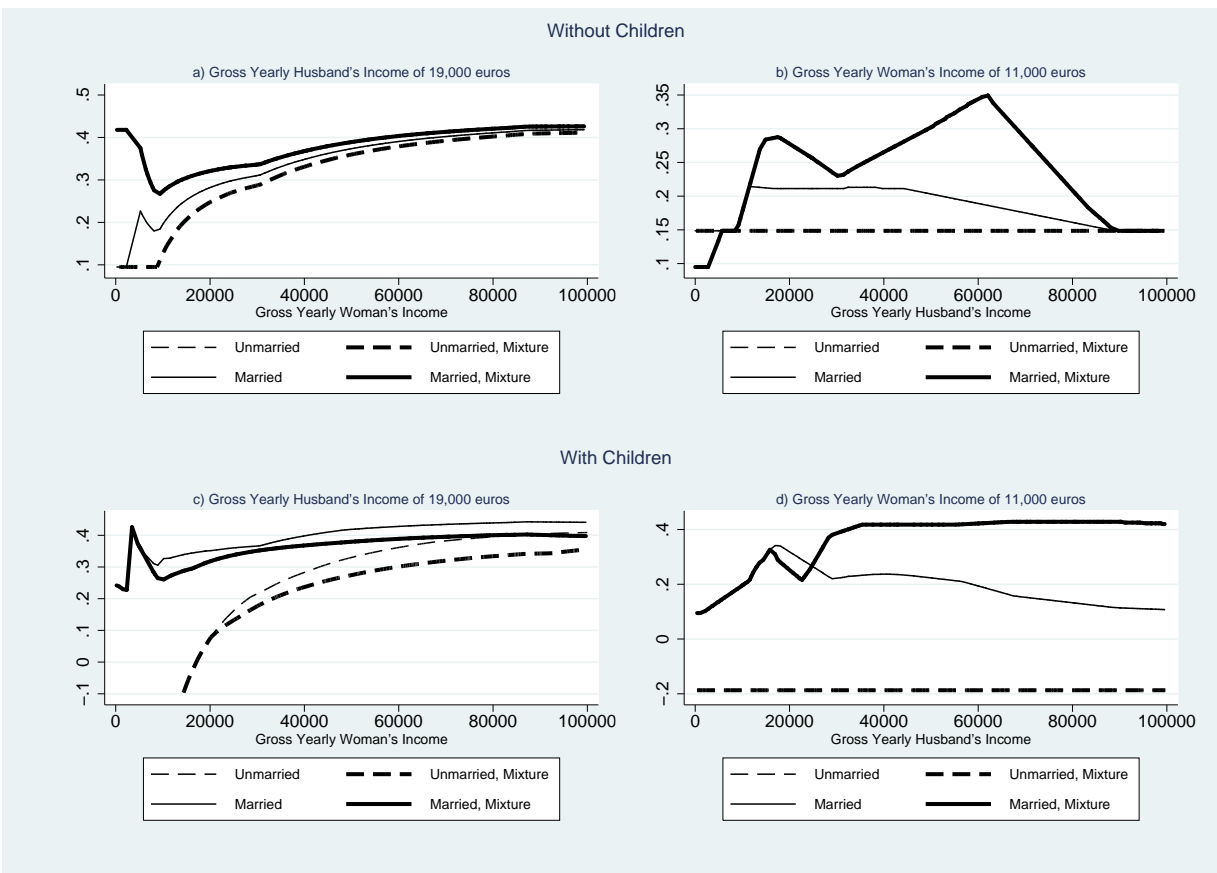
Source: Authors' simulations

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.[21]

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.[22] 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.[23] 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

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

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[21] 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.

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

[23] 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.

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 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 16 in the Appendix.

The benchmark 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 2 percentage points, and by 0.75 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 1.6 percentage points for women with children, and 0.12 for those without children.[24]

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[24]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,

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 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 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.

changes in participation rates reflect the directions of changes in welfare, as computed directly from the model.

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 4 and 5, 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 4: 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 5: 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 6: Descriptive statistics, EU-SILC 2007-2008

Variable	Women			
	Unmarried		Married	
	Mean	Std.dev.	Mean	Std.dev.
Number of observation	5,926		13,081	
Age	38.47	8.19	42.30	7.15
With children (%)	24.23		73.29	
Activity Rate (%)	84.37		63.42	
Experience (years)	18.12	10.47	23.37	9.78
Unemployment Rate (%)	2.73		2.65	
Incidence of Part-time (%)	13.96		15.73	
Average annual earnings (euros)	14,054.90	13,373.15	10,312.30	12,829.53
Household Non-Labor Income (euros)	22,931.56	30,769.47	9,928.55	16,516.17
Average husband's earnings (euros)			19,611.62	19,150.48
Region				
North-West	25.19		21.19	
North-East	25.51		23.72	
Center	24.81		23.88	
South	18.24		22.67	
Islands	6.24		8.53	
Education				
<Secondary Education	28.23		39.62	
Secondary Education	41.14		39.56	
> Secondary Education	30.63		20.82	

C   Figures

Figure 11: Labor Force Participation Rate by Marital Status, Presence of Children, and Education Level - Data vs Model
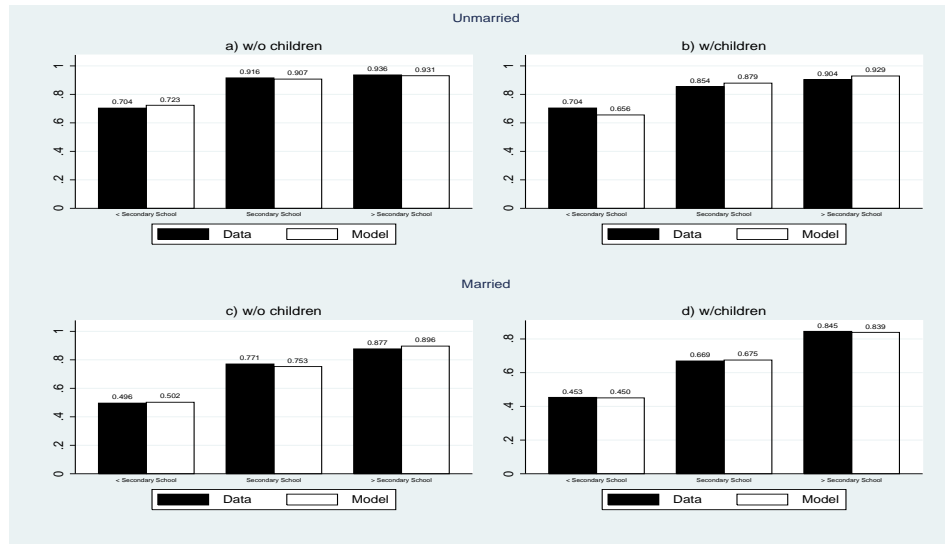
Source: Authors' computations from EU-SILC data (2007-2008)

Figure 12: 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 7: Probit - Coefficients

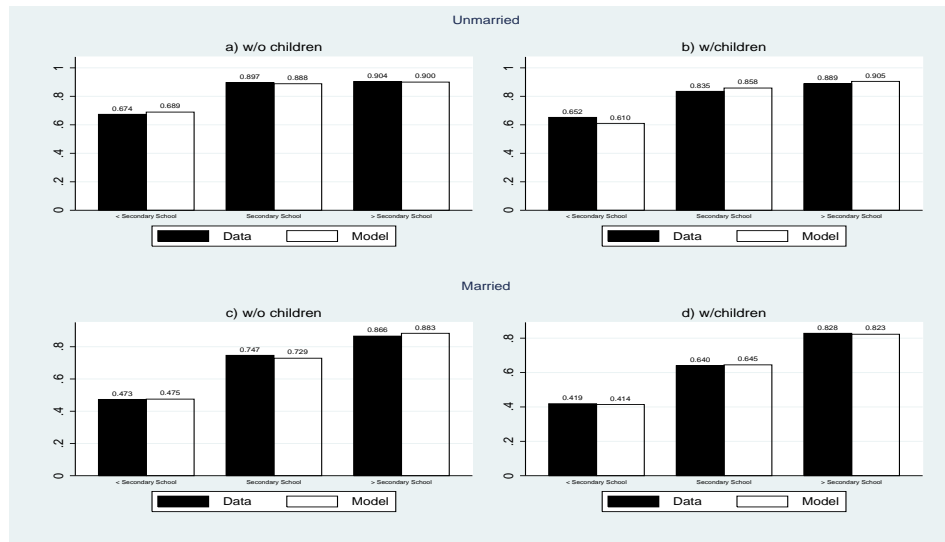| $Y = 1$ (in labor force)	Italy	France	Spain	UK	Germany
Husband's Earnings	1.29e-06*	-3.88e06**	2.09e-07	-2.21e-06***	-5.42e-06***
	(6.67e-07)	(1.60e-06)	(1.01e-06)	(4.64e-07)	(6.50e-07)
Household Non-Labor Income	-2.13e-06***	-0.000***	-5.05e-06***	-7.31e-06***	-0.000***
	(5.47e-07)	(1.72e-06)	(1.15e-06)	(7.99e-07)	(1.05e-06)
Married	-0.763***	-0.372***	-0.682***	-0.330***	-0.315***
	(0.073)	(0.164)	(0.088)	(0.058)	(0.112)
Employed Husband	0.190***	0.178	-0.002	0.614***	-0.141
	(0.071)	(0.166)	(0.086)	(0.054)	(0.112)
Children	-0.243***	-0.312***	-0.165***	-0.493***	-0.532***
	(0.026)	(0.164)	(0.033)	(0.041)	(0.038)
Age	0.054***	0.050	0.010	0.092***	0.130***
	(0.016)	(0.038)	(0.021)	(0.025)	(0.024)
Age^2	-0.001***	-0.000	-0.000	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education:					
Secondary Education	0.609***	0.561***	0.405***	0.788***	0.390***
	(0.031)	(0.060)	(0.034)	(0.052)	(0.057)
> Secondary Education	1.046***	1.072***	0.952***	1.079***	0.711***
	(0.030)	(0.075)	(0.035)	(0.057)	(0.058)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-9316.05	-1529.876	-5565.040	-3287.689	-4191.827
Obs.	17644	4228	12207	7597	10158

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

Table 8: Probit - Marginal Effects

$Y = 1$ (in labor force)	Italy	France	Spain	UK	Germany
Husband's Earnings	4.21e-07*	-7.49e-07**	5.54e-08	-5.52e-07***	-1.23e-06***
	(2.17e-07)	(3.09e-07)	(2.68e-07)	(1.16e-07)	(1.48e-07)
Household Non-Labor Income	-6.94e-07***	-2.70e-06***	-1.34e-06***	-1.82e-06***	-2.37e-06***
	(1.78e-07)	(3.31e-07)	(3.06e-07)	(1.99e-07)	(2.37e-07)
Married	-0.224***	-0.069***	-0.164***	-0.080***	-0.068***
	(0.019)	(0.029)	(0.019)	(0.013)	(0.023)
Employed Husband	0.063***	0.035	-0.006	0.152***	-0.031
	(0.024)	(0.033)	(0.023)	(0.013)	(0.024)
Children	-0.078***	-0.056***	-0.043***	-0.118***	-0.115***
	(0.008)	(0.011)	(0.009)	(0.009)	(0.008)
Age	0.018***	0.009	0.003	0.023***	0.029***
	(0.005)	(0.007)	(0.006)	(0.006)	(0.005)
Age^2	-0.000***	-0.000	-0.000	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education:					
Secondary Education	0.189***	0.104***	0.097***	0.201***	0.086***
	(0.007)	(0.011)	(0.007)	(0.013)	(0.012)
> Secondary Education	0.274***	0.174***	0.224***	0.231***	0.161***
	(0.006)	(0.010)	(0.007)	(0.011)	(0.013)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Log Likelihood	-9316.05	-1529.787	-5565.040	-3287.689	-4191.827
Obs.	17644	4228	12207	7597	10158

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

Table 9: Heckman, Step 1: Marginal Effects for Participation Status

Variable	Unmarried Women		Married Women	
	Coefficient	Std. Err.	Coefficient	Std. Err.
Age	-0.015***	(0.003)	-0.002***	(0.001)
Secondary Education	0.664***	(0.050)	0.188***	(0.009)
> Secondary Education	0.919***	(0.059)	0.330***	(0.008)
1 Child	-0.201***	(0.055)	-0.032**	(0.013)
Two or more Children	-0.719***	(0.102)	-0.093***	(0.013)
Employed Husband			0.031	(0.028)
Household Non-Labor Income	-8.13e-07***	(1.40e-07)	-1.15e-06***	(3.27e-07)
North-East	0.281***	(0.069)	0.047***	(0.014)
Center	-0.021	(0.064)	-0.025*	(0.014)
South	-0.661***	(0.063)	-0.221***	(0.014)
Islands	-0.635***	(0.086)	-0.278***	(0.019)
Year Fixed Effect	yes		yes	
Intercept	1.467***	(0.129)	0.406***	(0.116)
Log Likelihood	-2059.163		-6773.421	
Obs.	5834		11810	

Table 10: Heckman, Step 1: Marginal Effects for Employment Status

Variable	Unmarried Women		Married Women	
	Coefficient	Std. Err.	Coefficient	Std. Err.
Age	-0.002***	(0.000)	-0.000	(0.001)
Secondary Education	0.143***	(0.010)	0.197***	(0.10)
> Secondary Education	0.160***	(0.009)	0.354***	(0.009)
1 Child	-0.050***	(0.013)	-0.035**	(0.013)
Two or more Children	-0.237***	(0.037)	-0.102***	(0.013)
Employed Husband			0.051	(0.028)
Household Non-Labor Income	-9.84e-07***	(1.54e-07)	-1.36e-06***	(3.42e-07)
North-East	0.055***	(0.012)	0.051***	(0.014)
Center	-0.007	(0.014)	-0.034**	(0.014)
South	-0.203***	(0.019)	-0.243***	(0.014)
Islands	-0.199***	(0.029)	-0.288***	(0.019)
Year Fixed Effect	yes		yes	
Intercept	1.120***	(0.123)	0.103	(0.116)
Log Likelihood	-2298.405		-6864.041	
Obs.	5834		11810	

Table 11: Wage Equation - OLS, Coefficients. Dependent Variable: Gross Yearly Labor Income

	Unmarried Women		Married Women	
	Part-time	Full-time	Part-time	Full-time
Age	-150.258**	134.441**	-169.561***	163.276***
	(76.616)	(55.325)	(49.169)	(48.305)
Experience	122.395**	-77.832*	120.150***	-54.428
	(59.410)	(40.544)	(38.656)	(34.061)
Education:				
Secondary Education	820.867	1539.698	3153.235**	2934.701**
	(1438.095)	(1209.770)	(1315.168)	(1353.125)
> Secondary Education	2698.085	3115.146***	1547.573	4936.906*
	(1716.901)	(1377.420)	(2436.604)	(2525.428)
Regions:				
North-East	88.608	-2684.317**	-1379.070**	-2549.304***
	(1078.477)	(693.513)	(503.307)	(600.156)
Center	-1217.879	-916.989	-1739.958***	-1501.198***
	(817.269)	(575.195)	(537.558)	(556.182)
South	-1985.599	-260.393	-2320.914	1318.792
	(1629.258)	(1308.551)	(1461.204)	(1470.745)
Islands	-490.343	353.305	-711.696	3541.31
	(1706.270)	(1483.232)	(1803.351)	(1739.874)
Have children	-222.234	-349.580	1193.983**	1680.826***
	(776.958)	(593.081)	(515.551)	(502.103)
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: Model Estimation results - Step 1: Participation Choice

	Unmarried Women		Married Women	
Variable	Coefficient	Std. Err.	Coefficient	Std. Err.
	Equation 1: α			
Age	-0.051***	(0.014)	-0.001	(0.007)
Experience	-0.004	(0.012)	-0.039***	(0.006)
Children	0.360**	(0.165)	-0.002	(0.084)
Secondary Education	0.187	(0.200)	-0.273***	(0.082)
> Secondary Education	0.550**	(0.259)	-0.260**	(0.125)
Intercept	0.704*	(0.407)	-1.088***	(0.249)
	Equation 2: β			
Age	-0.002	(0.003)	-0.009***	(0.001)
Experience	-0.001	(0.002)	0.003***	(0.001)
Children	-0.029	(0.032)	-0.012*	(0.007)
Secondary Education	-0.030	(0.039)	0.023***	(0.007)
> Secondary Education	0.013	(0.050)	0.011	(0.011)
Intercept	1.123***	(0.100)	1.373***	(0.030)

Table 13: Model Estimation results - Step 2: Employment Choice

Variable	Unmarried Women		Married Women	
	Coefficient	Std. Err.	Coefficient	Std. Err.
Equation 1 - Part-Time: α				
Age	-0.041	(0.035)	-0.081***	(0.023)
Experience	-0.005	(0.031)	-0.032*	(0.018)
Children	-1.398***	(0.547)	-0.682**	(0.271)
Secondary Education	0.081	(0.517)	-0.930***	(0.331)
> Secondary Education	-0.704	(0.629)	0.901**	(0.393)
Intercept	2.665**	(1.185)	3.755***	(0.783)
Equation 2 - Full-Time: α				
Age	-0.111*	(0.057)	-0.174***	(0.036)
Experience	0.021	(0.053)	-0.028	(0.031)
Children	-2.918***	(0.814)	-0.834***	(0.444)
Secondary Education	0.020	(0.776)	-0.834*	(0.444)
> Secondary Education	-0.324	(0.951)	0.799	(0.607)
Intercept	5.999***	(1.727)	7.979***	(1.078)
Equation 3: β				
Age	6.82e-06*	(3.42e-06)	0.000***	(3.00e-06)
Experience	7.35e-07	(3.11e-06)	5.91e-06**	(2.47e-06)
Children	0.000***	(0.000)	0.000	(0.000)
Secondary Education	0.000	(0.000)	0.000***	(0.000)
> Secondary Education	0.000	(0.000)	0.000	(0.000)
Intercept	-0.000*	(0.000)	-0.000***	(0.000)
Equation 4: β^2				
Age	1.51e-11	(2.33e-11)	2.56e-11	(2.67e-11)
Experience	-1.26e-11	(2.11e-11)	-3.89e-11*	(2.08e-11)
Children	-1.28e-10	(4.26e-10)	7.02e-10**	(2.85e-10)
Secondary Education	1.05e-10	(3.36e-10)	-5.93e-10*	(3.93e-10)
> Secondary Education	-1.43e-10	(3.70e-10)	-9.01e-10**	(3.93e-10)
Intercept	-5.96e-10	(6.49e-10)	1.82e-10	(9.60e-10)

Table 14: 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, decreasing in income	between 0 and 800 euros, decreasing in income	800 euros per child, decreasing in income	137.50 euros monthly per child, decreasing in family income
15,000-28,000	27%				
28,000-55,000	38%				
55,000-75,000	41%				
more than 75,000	43%				
			Joint Tax System		
0-15,000	23%	1,840 euros, decreasing in income	0	0	0
15,000-28,000	27%				
28,000-55,000	38%				
55,000-75,000	41%				
more than 75,000	43%				
			British working tax credit		
0-15,000	23%	1,840 euros, independent of income	0	0	137.50 euros monthly per child, independent of income
15,000-28,000	27%				
28,000-55,000	38%				
55,000-75,000	41%				
more than 75,000	43%				
			Gender Based Taxation System Men and Women		
0-15,000	23%	between 0 and 1,840 euros, decreasing in income	between 0 and 800 euros, decreasing in income	800 euros per child, decreasing in income	137.50 euros monthly per child, decreasing in family income
15,000-28,000	27%				
28,000-55,000	38%				
55,000-75,000	41%				
more than 75,000	43%				

Women: the final tax is 67% of the total tax net of the standard tax credits

Mixture Individual and Joint
Agents choose between individual (Italian) and joint tax system

Table 15: Alternative (Revenue Neutral) Taxation Systems - Results (%)

Taxation System	Unmarried Women		Married Women		
	Without children	With children	Without children	With children	All women
Average Tax Rate					
Benchmark Model	22.73	11.61	22.95	12.51	16.67
Joint Tax	27.63	15.06	21.02	15.54	19.25
Working Tax Credit	22.08	12.46	19.82	10.44	15.01
Gender-Based Tax	19.37	8.63	22.37	11.61	15.10
Mixture Benchmark and Joint	27.80	14.84	21.55	15.47	19.31
Second Earner Tax Rate					
Benchmark Model	18.84	8.87	14.00	10.51	13.00
Joint Tax	22.44	11.64	15.57	12.30	15.25
Working Tax Credit	18.16	9.94	11.87	11.01	12.78
Gender-Based Tax	16.10	6.84	12.99	9.71	11.60
Mixture Benchmark and Joint	23.07	11.62	18.46	12.95	16.25
Participation Rate					
Data	85.41	81.13	66.06	62.46	69.95
Benchmark Model	86.65	81.49	66.42	62.68	70.42
Joint Tax	85.69	80.18	60.71	55.99	65.66
Working Tax Credit	86.73	81.46	69.17	64.69	71.96
Gender-Based Tax	87.36	83.28	68.79	65.12	72.41
Mixture Benchmark and Joint	86.65	80.52	67.74	58.80	68.20
Employment Rate: Part-time					
Data	12.09	19.78	11.13	17.41	15.18
Benchmark Model	12.23	18.80	9.93	15.94	14.17
Joint Tax	12.81	16.99	9.53	12.50	12.36
Working Tax Credit	11.78	18.18	11.53	15.93	14.31
Gender-Based Tax	10.94	18.52	10.02	15.45	13.62
Mixture Benchmark and Joint	12.41	19.71	9.62	14.38	13.44
Employment Rate: Full-time					
Data	70.69	58.29	52.83	42.20	52.10
Benchmark Model	70.62	57.59	52.98	42.41	52.16
Joint Tax	68.44	60.31	49.11	39.58	49.72
Working Tax Credit	70.47	61.63	55.72	45.11	54.30
Gender-Based Tax	72.20	60.72	55.50	46.34	55.22
Mixture Benchmark and Joint	70.60	58.57	55.52	40.60	51.79

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

Table 16: Poverty Measures - Women

		Head count Index (%) (1)	Poverty Gap (2)	Aggregate Poverty Gap (3)
	Benchmark Model			
Married	with children	30.624	1215.387	57796.387
	without children	13.678	455.878	16854.265
Unmarried	with children	27.174	1196.735	7292.902
	without children	11.525	362.331	16300.931
	Joint Tax			
Married	with children	29.979	1321.923	62862.739
	without children	13.313	432.019	15972.169
Unmarried	with children	26.846	1157.520	7053.926
	without children	11.752	370.402	16664.015
	Working Tax Credit			
Married	with children	30.254	1228.543	58422.145
	without children	13.551	442.597	16363.241
Unmarried	with children	26.584	1117.315	6808.920
	without children	11.298	352.940	15878.407
	Gender-Based Tax			
Married	with children	28.824	1114.596	53003.478
	without children	13.370	433.603	16030.725
Unmarried	with children	25.599	1143.325	6967.425
	without children	11.294	356.986	16060.461
	Mixture Individual and Joint			
Married	with children	28.601	1137.734	54103.787
	without children	12.924	422.341	15614.385
Unmarried	with children	26.945	1119.132	6819.988
	without children	11.405	354.164	15933.472

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

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