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From housewives to independent earners: Can the tax system help Italian women to work?

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Non-technical summary

A key issue in the design of the tax-benefit system is how to balance the redistribution of resources to those with low income and the promotion of stronger incentives to work.

In this paper I analyse the extent to which it is possible to enhance both the redistributive and the incentive effects of the Italian tax-benefit system, by means of simulating two alternative marginal reforms to the tax system. The first reform introduces a family based in-work benefit while the second reform introduces an individual in-work benefit. Both reforms are financed by the simultaneous abolition of the existing tax credit targeted at inactive adult people within the family.

In-work benefits are means-tested transfers given to individuals conditional on their employment status. They are intended to enhance the incentives to accept work and redistribute resources to low income groups. The likely effects on labour supply of women in couples and lone mothers are taken into account by estimating the individual preferences over income and leisure by a static structural model of labour supply.

The results show that the abolition of the existing tax credit for dependent adults and the introduction of a new family in-work benefit lead to an average increase of female labour supply of 3 percentage points. The individual in-work benefit has stronger effects than the family based in-work benefit for women in couples, who see their labour supply rise by 5 percentage points. Most of the labour supply reactions induced by the in-work benefits take place at the bottom of the income distribution where potential gainers are concentrated, with important redistributive effects. Regardless of the limited amount of resources involved in the simulated reforms, the analysis reveals the possibility of enhancing both the redistributive and the incentive effects of the Italian tax-benefit system.

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Francesco Figari

Abstract

The paper analyses the incentive and the redistributive effects of introducing either a family based or an individual in-work benefit in Italy. The reforms are financed through the abolition of the existing tax credit targeted at inactive people. In-work benefits are means-tested transfers given to individuals conditional on their employment status. The results show an increase in the labour supply of both women in couples (with larger responses to the individual in-work benefit than the family based benefit) and lone mothers. Most of the behavioural changes take place among the poorest individuals with important redistributive effects.

Keywords: in-work benefits, women labour market participation, microsimulation, labour supply, Italy

JEL classification: H53, I32, I38

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1. Introduction

A key issue in the design of the tax-benefit system is how to balance the redistribution of resources to those with low income and the promotion of stronger incentives to work. Although the idea that "… the conflict between equality and economic efficiency is inescapable" (Okun, 1975) has influenced economists since the middle of 1970s, the enhancement of both the redistributive and the incentive effects of the tax-benefit system can inspire policy reforms. For example, Blank (2002) suggests policy situations in which equity and efficiency complement each other, as in the case of income transfers that impose behavioural requirements such as welfare-to-work programmes and in-work benefits. Recent research shows that there can be positive outcomes from closer links between redistributive subsidies and transfers aimed at enhancing work incentives without the loss of efficiency usually associated to redistributive programs, which usually induce reductions in the labour supply of the recipients (Immervoll *et al.*, 2007). In-work benefits reduce the inefficiencies associated with a traditional income-based transfer because they are conditional on the behavioural response of the recipients (Pearson and Scarpetta, 2000; Blundell, 2006). Transfers conditional on the employment status might have higher administrative costs due to their complexity but this overcomes the income loss associated to more traditional transfer programs (Blank, 2002).

The design of policies aimed at increasing the financial return of having a job and at redistributing resources to the most vulnerable individuals (Blundell, 2006) has not yet been investigated in the Italian context although the need to reform the welfare system is widely recognised (Boeri and Perotti, 2002).

This paper aims at filling this gap, analysing the possibility of enhancing both the redistributive and the incentive effects of the Italian tax-benefit system by means of simulating two alternative reforms to the tax system. The first reform introduces a family

based in-work benefit while the second reform introduces an individual in-work benefit. Both reforms are financed by the simultaneous abolition of the existing tax credit targeted at inactive adult people within the family, as explained in section 2.

The analysis provides a prospective evaluation of the effects of policy reforms on income distribution and labour supply (Creedy and Kalb, 2006) rather than a retrospective evaluation of the effects of policies after they have been implemented (Eissa and Hoynes, 2006; Brewer *et al.*, 2006). The focus is on women in couples and lone mothers separately, taking into account their behavioural reactions by means of a static structural discrete choice model of labour supply, presented in section 3.

The methodological insight of the paper is the full integration of the detailed simulation of the tax-benefit system into the econometric model of labour supply (Creedy and Duncan, 2002), which is an aspect often neglected in the evaluations of labour supply reactions to policy reforms. Such approach, described in section 4, allows me to take into account the likely impacts of marginal tax-benefit reforms (i.e. reforms which affect specific elements of the tax-benefit system) on the labour supply of individuals, guaranteeing revenue neutrality when the behavioural reactions are taken into account. In a period characterised by the need to reduce public deficits, with increasing pressures on public expenditures, the minimum requirement for tax-benefit reforms is that they do not imply any extra costs for the government (Owens, 2006).

Since the 1990s, a greater link between policies aimed at encouraging people to take a paid job and the tax system has emerged in many European countries (Eichhorst *et al.*, 2008) inspired by the Nordic model of the active labour market policies and the US workfare design (Daguerre and Taylor-Gooby, 2004). In the United Kingdom, welfare-to-work programmes have been complemented by a number of substantial reforms to the in-work benefits which are targeted at low income people and aim to raise their incentives to

work. Such reforms made moving into work more attractive and increased the take-home pay of the low-wage workers, inspiring a number of European countries to follow the route towards implementing in-work benefits (Immervoll and Pearson, 2009). In-work benefits aim to promote economic inclusion by increasing take-home pay, enhancing the incentives to accept a job and redistributing resources to low income groups. In-work benefits are politically attractive because they combine both employment and redistributive objectives at the same time (Owens, 2006).

A reduction of the tax burden faced by employers (by reducing the cost of hiring workers) and employees (by increasing the net remuneration of work) is a major tool to stimulate both labour demand and labour supply. The decrease of the overall tax wedge on labour has always been part of the OECD jobs strategy (OECD, 2006) and it is one of the central goals of recent tax and welfare reforms in Europe to reduce the level of reliance on social benefits and to increase the financial returns to work (Carone *et al.*, 2009; OECD, 2009). The success of these policies depends heavily on their design and the extent to which they do not induce income effects (a reduced labour supply accompanied by an increase in income due to the benefit) or deadweight losses (incentives given to individuals that would have behaved in the same way without the benefit). The severity of the trade-off between redistributive and incentive effects inherent in the tax-benefit systems can be minimised by an appropriate tax design (Mirrlees, 2010).

The analysis of the equity-efficiency trade-off is widely investigated in the optimal taxation theory literature which aims to define the tax structure that achieves equity goals without distortions in the labour market. Up to the late 1990s, most of the studies on the optimality of the tax-benefit rules converged to an optimal scenario characterised by a basic income transfer and an almost flat income tax. However, more

recent contributions in the optimal tax literature, more directly focused on the policy implementation, agree on the superiority of in-work benefits rather than basic income transfers combined with flat taxes (Blundell *et al.*, 2009; Brewer *et al.*, 2010; De Mooij, 2008; Immervoll *et al.*, 2007; Saez, 2002). In particular, Saez (2002) shows that in-work benefits might be optimal income transfers and more efficient than guaranteed income support schemes when the individual is facing the choice to enter the labour market or not rather than the choice about how many hours to work. De Mooij (2008) shows that selective in-work benefits for secondary earners have the potential to increase their employment without sacrificing equality.

To improve female labour market participation and reduce the disincentive effects for second earners, there is an international consensus supporting individual taxation. Nevertheless, in many countries elements of jointness still persist in the tax design. One of the most notable examples in the Italian tax-benefit system is the tax credit for dependent person paid to the main earner of the family due to the presence of adults without own income.

The need to enhance incentives to take a paid job and to redistribute income towards the working poor can make in-work benefits particularly suitable to be part of a tax-benefit reformed system in Italy (Baldini *et al.*, 2002; Boeri and Perotti, 2002; Owens, 2006). Although the Italian labour market has performed relatively well over the recent years before the economic crisis, the employment rate for women in 2010 has not reached the Lisbon employment target of 60% (Council of the European Union, 2000). In 2007, the percentage of low educated women – with at most lower secondary education – was around 47%, against an average level in the EU-15 fewer than 34%. Moreover, the employment rate of low educated women was much lower than elsewhere: around 34% were in paid employment. In this context, much has to be done to achieve the targets of

the "Europe 2020" strategy, i.e. 75% of the population aged 20-64 being employed, through a greater involvement of women (European Commission, 2010). Poverty rates and inequality in Italy are among the highest in the EU-15 (Eurostat, 2007). In 2007, the proportion of people with an equivalised household income less than 60% of the median was around 20% against an EU-15 average of 17%. Inequality measured by the Gini index was equal to 0.32 compared to an EU-15 average of 0.30. Low earnings, temporary contracts and high incidence of one-earner families mean that 10% of individuals with a job were in poverty. Due to the absence of generous income support schemes and relatively generous public pensions, the working poor are at the very bottom of the income distribution.

The reforms analysed in this paper are expected to influence women's labour supply behaviour through income and substitution effects. On the one hand, the increase in the take-home pay associated with the in-work benefits can lead to a reduction of the number of hours worked in order to guarantee the same level of resources. This is the income effect. On the other hand, the additional resources channelled through the in-work benefits give more reward to any additional hour of work supplied, encouraging women to work more. This is the substitution effect. In the case of revenue-neutral reforms[1], as proposed in this paper, the income effect tends to balance out across the population, while the substitution effect does not necessarily balance out. It is usually larger than the income effect especially for low earners who mainly react at the extensive margin, when the choice is whether to work or not (Meghir and Phillips, 2010).

In-work benefits emerged in a period of increasing earnings inequality which occurred in many industrialised countries including Italy, although to a smaller extent compared with the UK and the US (Machin and Van Reenen, 2008). In-work benefits

[1] The abolition of the existing tax credit for dependent persons embodies income and substitution effects as well.

should be then an integral part of the tax-benefit system which aims at generating tax revenue from higher tax payers and redistributing to those with low-earning capacity who have fallen further behind in the last two decades.

The empirical contributions of this paper are twofold. First, it analyses how women decisions to work respond to marginal tax reforms and their redistributive effects. Second, by exploiting the economic modelling used in the analysis (section 5), it provides an evaluation of the effects of the reforms on individual welfare, considering both income and leisure time. The results presented in section 6 show that the abolition of the existing tax credit for dependent adults and the introduction of a new family in-work benefit lead to an average increase of women working of 3 percentage points. The individual in-work benefit has stronger effects than the family based in-work benefit for women in couples who enhance their labour market participation by 5 percentage points. Most of the labour supply reactions induced by the in-work benefits take place at the bottom of the income distribution where potential gainers are concentrated. Regardless of the limited amount of resources involved in the simulated reforms, the analysis reveals the possibility of enhancing both the redistributive and the incentive effects of the Italian tax-benefit system.

2. Italy's tax-benefit system and the design of the two reforms

Despite frequent periodic adjustments to the tax structure (i.e. deductions converted in tax credits, tax concessions with different generosity, changes to the tax schedule), the overall redistributive and incentive effects of the Italian tax system have been quite stable since the early 2000s (Baldini and Pacifico, 2009).[2] The changes in the tax system have not provided a more competitive fiscal environment and increased work incentives. They

[2] From now on I refer to the institutional features of the 2003 fiscal system, the year used in the simulations, unless otherwise stated.

have not contributed to adapting the tax-benefit system to the changing economic and social circumstances (Owens, 2006).

Working-age individuals receive limited support through the tax-benefit system. Considering both income tax and social insurance contributions they face quite a high levy compared to other European countries. The average tax wedge (the average income taxes plus employee and employer social security contributions minus cash transfers as a percentage of total labour costs) in Italy is about 10 percentage points higher than the OECD average (OECD, 2009), with a one-earner couple with two children facing a tax wedge of 36% (compared with an OECD average of 26%) and a lone parent with two children facing a tax wedge of 25% (compared with an OECD average of 17%).

Social insurance contributions are paid by employees (around 9% of the gross labour income), self-employed (17%) and employers (32%).[3] The national personal income tax (*IRPEF, Imposta sul reddito delle persone fisiche*) is based on a progressive schedule on individual income with tax rates ranging from 23% to 45%. Moreover, each region applies a surcharge of the personal income tax with rates ranging from 0.9% to 1.4% of the taxable income.[4] Despite its individual basis, the income tax has elements of jointness at family level with the final tax liability of each individual depending on the family composition. This has direct effects on individual effective marginal tax rates. Personal tax allowance and tax deductions related to the income source are available to all individuals in the family with positive taxable income. Moreover, the main earner(s) can benefit from a number of non refundable tax credits which depend on the number of dependent persons in the family. The amount of such tax concessions is quite relevant and they represent almost half of the public support to families with children. However,

[3] The existence of minimum and maximum amounts of contribution makes the final levy far from being proportional.

[4] Italy is divided in twenty regions. The regional surcharge is computed on the same tax base as the national personal income tax. The tax rate is 0,9% but each region can increase it of at most another 0,5%.

the poorest families are not always entitled to receive such a support because their tax liability is smaller than the amount of the non-refundable tax credits (Figari *et al.*, 2011a).

Capital incomes are taxed separately, at the source, with two different tax rates according to the income source (12.5% on income from bonds and dividends and 27% on interest from deposits).

On the benefits side, Italy has an ungenerous benefit system, by contrast with most of the European countries, with the exception of its pension schemes (Boeri and Perotti, 2002). Italy is characterised by the absence of a national guaranteed minimum income scheme (Figari *et al.*, 2010) and quite limited categorical public transfers (Schubert, 2009). Families with children younger than 18 years may receive the Family Allowances, an income-based transfer mainly for employees and pensioners depending on the family composition (with a maximum of 130 euro per month per child). Elderly people, aged 65 years or more, with low income are entitled to the Social Pension which guarantees a minimum income of 360 euro per month.

As mentioned, one of the most notable elements of jointness of the income tax is the tax credit for the dependent spouse (worth €546 per year) and for other adults (€303 per year). Such a tax credit has disincentive effects on the labour supply of secondary earners in a family because it is received by the individual with higher income conditional on other people not working. It might cause horizontal inequity, because a one-earner couple may pay lower taxes than a two-earner couple with the same gross income. Moreover it is a form of support not always well targeted since also rich individuals can benefit from the tax credit related to dependent persons in their family. Actually 20% of people entitled to the tax credit are in the top 40% of the income distribution. It acts as a disincentive to a second earner taking a paid job and it is not a subsidy for the family but an indiscriminate support to people living with inactive adults at home irrespective of

their circumstances. In terms of tax design the main question behind such a tax credit is why the tax system should encourage dependency relationships (Wilkinson, 1982). At the time of the shift to individual taxation in the UK and other countries (Spencer, 1986), the prevailing consideration was that if a partner or an adult in the family does not work due to caring responsibilities there should be a tax concession explicitly related to such a responsibility (Hills, 1990; Kay and Sandler, 1982). Families with children or disabled have greater needs than families without children where an adult has higher preferences to remain at home. Indeed, a tax concession payable regardless of caring responsibilities is poorly targeted and has disincentive effects (Blundell *et al.*, 1984).

As most of the EU tax systems, the Italian one is the result of historical compromises, designed under a given set of social and economic circumstances. However, the Italian tax system does still have elements oriented towards a model of a (predominantly man) breadwinner couple which was the case at the time of the major reform of the personal income tax in the early 1970s. The changes in the social and economic reality, in particular related to the rise in the labour supply of women, have not been accompanied by reforms of the tax system in order to be neutral in its effects on partners' decision to take up paid employment outside home.

In this paper I suggest two reforms in which the tax credit for dependent persons is abolished and replaced by two different – and alternative – in-work benefits.

The abolition of the existing tax credit for dependent persons does not affect the other tax concessions targeted at families with children. Once the behavioural reactions of individuals included in the analysis are taken into account, the potential reforms are revenue neutral without any additional cost for the government: the in-work benefits are financed by the increased fiscal revenue corresponding to the abolished tax credit and the additional taxes (and reduced means-tested Family Allowances) paid by those who

supply more work.[5] By construction, the reforms imply a redistribution from one-earner couples to families with low-earning individuals and lone mothers.

The two types of in-work benefits emerged in the last decade in many industrialised countries (OECD, 2003; Immervoll and Pearson, 2009). First, family based in-work benefits appeared in the UK and other Anglo-Saxon countries. More recently individual in-work benefits have become more popular in the continental Europe where the potential disincentive effects of the benefits assessed at family level on the second earner encouraged towards the individualisation of the benefits (Immervoll and Pearson, 2009). The British scheme of in-work benefit is recently considered as a potential model to be imported in the Southern European countries (Owens, 2006; Figari 2010). In the Italian public debate the British scheme is often proposed as a way to support labour market participation of women and poor families (Boeri and Del Boca, 2007; Saraceno, 2007) but also the individual scheme received attention (Boeri and Perotti, 2002).

Given the pioneer role of the British experience in in-work benefits and the recent developments of these policies I simulate the family based in-work benefit using the UK Working Tax Credit (WTC) as an exemplar and borrowing its structure.[6]

The individual in-work benefit takes the form of an earning supplement for all individuals working 16 or more hours a week. Beneficiaries of this policy are individuals characterized by low hourly wages and not simply low earnings due to a small number of hours worked per week. It provides an incentive to work at least part-time. One of the

[5] The tax credit for dependent person values €3.3 billion per year, corresponding to the 2.7% of the Personal Income Tax revenue (Agenzia delle Entrate, 2004). Restricting the sample to the one used in the analysis (see section 4) the tax credit values €1 billion per year (Author's analysis based on EUROMOD). The simulated reforms are revenue neutral for the sample used in the analysis but in reality the abolition of the tax credit for dependent persons would affect the tax payments of those not included in the sample as well.

[6] The main eligibility condition for the Working Tax Credit is that at least one person in the family works 16 or more hours a week (30 or more if there are no children). The amount of the tax credit depends on family gross income (all main sources of income with the exception of children's earnings and a disregarded amount for pensions, capital and property income) and it varies according to the composition of the family. Above the given thresholds the tax credit is tapered out at the rate of 37% (Brewer, 2003).

first individual in-work benefits has been implemented in Canada in 1992. As part of the Self-Sufficiency Project (SSP) an earning supplement was given to individuals, randomly selected, conditional on them working at least 30 hours per week. Evaluations of the program show an estimated income gain of $1.95 per recipient for each dollar of transfer (Michalopoulos *et al.*, 2005).

The different assessment unit of the two types of in-work benefits has important consequences on the incentive effects. The phasing-out region of the family based in-work benefit might create implicit high taxes on secondary earners. Following the argument that individual taxation is closer to the optimal tax scheme, it can be argued that a purely individual-based system should be favoured (Brewer *et al.*, 2010).

The parameters of the simulated in-work benefits have been calibrated in order to guarantee revenue neutrality once the existing tax credit for dependent persons has been abolished. They are presented in section 6. In Figari (2010) I discuss the main assumptions underlying the swapping of such transfers from other countries, in particular referring to the administrative procedures and the necessity of a binding minimum wage whenever in-work benefits are implemented.

3. Behavioural responses: empirical methodology

In order to simulate the behavioural responses of women to the changes in the tax system, I follow the growing literature of static structural discrete choice models of labour supply (Aaberge *et al.*, 1995; Van Soest, 1995; Blundell *et al.*, 2000).[7] The models are structural because they provide direct estimations of preferences over income and hours of work, through the specification of the functional form of the utility function. The discrete choice character of the models is because the possible alternatives an individual faces are limited

[7] See Creedy and Kalb (2005) for an extensive review of discrete choice modelling in the analysis of labour supply. Train (2003) provides an analytical description of the different model specifications.

to a discrete choice set. Discrete choice models belong to the family of random utility maximisation models (McFadden, 1974) which allow the utility function to be random and use a convenient specification of the random component (usually the extreme value distribution) to determine the optimal alternative in terms of utility level associated to each choice.

The assumption behind the discrete choice models is that utility-maximising individuals and couples choose from a discrete set of alternatives in terms of working hours. Indeed the choice of working hours is also restricted in practice due to demand side constraints, labour market institutions (e.g. common part-time arrangement at 20 hours per week) and limited flexibility, in particular in Italy. At each point in the choice set corresponds a given budget on the basis of the earnings of each individual and the tax-benefit system rules simulated by means of a fiscal microsimulation model. The discrete choice model takes into account the nonlinear and nonconvex budget sets determined by complex tax-benefit systems.

In my model I assume that women (in couples and lone mothers separately) can vary their labour supply while the hours worked by men are fixed (equal to those observed in the data). This is a standard approach in the literature which assumes that male labour supply is inelastic while women are more flexible in their working alternatives given their traditional involvement in caring responsibilities and housework. Nevertheless, the utility maximisation takes place at the family level considering the income of both partners subject to a pooled income constraint, in line with the unitary model of household behaviour. The literature on collective model of family behaviour is better developed theoretically than empirically. To the best of my knowledge, Blundell *et al.* (2007) is the only example of structural model of labour supply in a collective setting but it does not include the effects of taxes.

The choice of alternatives to be included in the choice set and their availability to individuals are two important issues in the discrete choice setting. Aaberge *et al.* (2009) show that choosing the alternatives sampled from the observed distribution, rather than imposed by the researcher, reduces the prediction errors. It is a way to account for different opportunities and constraints a woman might face when deciding her working choices.

I group the possible working hours for women into five intervals (0–7, 8–19, 20–30, 31–40, 41+) and the choice set of each woman is made up of five $j = 0, \ldots, J$ alternatives: the actual choice (i.e. observed number of worked hours) plus other four potential alternatives. Within each interval, the potential alternative is sampled from the empirical density function of the observed hours of work conditional on the educational level of the woman. The distribution of the potential alternatives respects the proportion of women observed to work a specific number of hours within each interval. Suppose that in the interval 20–30 hours 80% of the women are observed working 20 hours per week, reflecting the most common part-time arrangement in Italy: 80% of the women in my sample will be assigned 20 hours as the relevant point in the third interval. See Table 1 for an example.

Table 1: Example of a choice set faced by a woman

Choice	Interval	Working hours observed	Working hours predicted
1	0 – 7	- - -	0
2	8 – 19	16	16
3	20 – 30	- - -	20
4	31 – 40	- - -	36
5	41+	- - -	48

Notes: For each woman one choice is observed corresponding to a given interval of working hours. "- - -" means non-observed choice.

This approach (inspired by McFadden 1978 and adapted by Aaberge *et al.* 1995) allows me to define the different alternatives considering the relative constraints (within

each interval) imposed by the labour market institutions (i.e. prevalence of a given number of hours for the part-time arrangements). Moreover, this approach introduces more variability in the budget set (Table 2), with income for different women varying not only due to different wage rates and tax liability (due to family characteristics) but also due to different hours of work within the same interval.

Table 2: Examples of household budget sets

Household identifier	Hours observed for the woman	Hours predicted for the woman	Observed choice of the woman	Household disposable income
1	40	0	0	1,588
1	40	9	0	2,040
1	40	20	0	2,471
1	40	40	1	2,961
1	40	50	0	3,173
3	19	0	0	1,820
3	19	19	1	2,326
3	19	30	0	2,565
3	19	36	0	2,673
3	19	51	0	2,975
6	0	0	1	5,286
6	0	19	0	6,115
6	0	23	0	6,258
6	0	40	0	6,832
6	0	52	0	7,228

Suppose the utility function for a household is given by

$$U = U(H_f, Y \mid H_m) \tag{1}$$

where the utility depends on the woman's hours of work H_f and the household disposable income Y, given the observed hours of work of the male partner m taken as exogenous. Of course, there might be other individuals living in the household and their behaviour is taken as exogenous as well. A woman f chooses the number of hours of work in order to

maximise the utility of the household subject to the resources available to the household (i.e. household budget constraint) represented by

$$Y(H_f) = E_f(w_f, H_f) + E_m + N + B(E_f, E_m \mid X) - t(E_f, E_m, B \mid X) \quad (2)$$

where the disposable income Y depends on the woman's earnings (E_f) and the earnings of the partner (E_m), other incomes (N), benefits (B) and taxes (t), which both depend on family characteristics (X).

The utility function can be decomposed in a deterministic and a stochastic part:

$$U = V + \varepsilon \qquad \forall j \in J \quad (3)$$

where V is the portion of utility given by the observable characteristics while the error term ε captures the portion from unobservable characteristics.

At each alternative j, the realisation of the deterministic part of the utility function (i.e. V_j) is given by the following quadratic functional form (Stern, 1986) linear in the parameters:

$$V_j = \alpha Y_j + \beta Y_j^2 + \gamma H_{fj} + \delta H_{fj}^2 + \lambda Y_j H_{fj} \quad (4)$$

where income (Y) and woman's hours of work (H_f) enter in both level and square. Observed heterogeneity, captured by observable characteristics, cannot be identified directly because these characteristics do not vary across alternatives and would be ruled out in the estimation. It enters through the linear utility parameters:

$$\alpha = \alpha_0 + \alpha_1' X \quad (5)$$

$$\gamma = \gamma_0 + \gamma_1' X \quad (6)$$

allowing marginal utilities of income (Y) and woman's hours of work (H_f) to depend on a vector of family characteristics (X) including age, education level, number of children and presence of children younger than three years.

When a woman decides to work less than full-time she faces at least part of the same costs related to the full-time work (i.e. transportation costs, caring services,

expenditures related to the housework) without receiving a full-time salary. For this reason, it is often found that labour supply models overpredict part-time hours of work. To overcome this lack of fit, I take into account the fixed costs of working by adding a dummy variable equal to one when she works more than thirty hours per week. This parameter is interacted with the number of children that can have an impact on the caring costs particularly when the woman works more than part-time.[8]

The choice a woman faces follows this probability rule

$$\begin{aligned} \Pr_{(\text{choice=k})} &= \Pr[U(H_{fk}) > U(H_{fj})] \qquad \forall\ k \neq j,\ j = 1,\dots, J \\ &= \Pr[(V_k + \varepsilon_k) > (V_j + \varepsilon_j)] \qquad \forall\ k \neq j,\ j = 1,\dots, J \\ &= \Pr[(\varepsilon_j - \varepsilon_k) < (V_k - V_j)] \qquad \forall\ k \neq j,\ j = 1,\dots, J \end{aligned} \tag{7}$$

according to which the probability that a woman chooses the alternative *k* is equal to the probability that the utility associated with the choice *k* is larger than the utility associated with any other choice *j*.

If the stochastic component ε_j of the utility function is assumed to be independently and identically distributed across alternatives and households according to the Extreme Value distribution, McFadden (1974) proves that the probability of choosing the alternative *k* becomes

$$\Pr_{(\text{choice=k})} = \frac{\exp(U_k)}{\sum_J \exp(U_k)} \qquad \forall\ k \in J \tag{8}$$

which is a conditional logit specification. The parameters can be estimated using Maximum simulated Likelihood.

[8] An alternative way to take into account unobserved (to the researcher) characteristics of the job correlated with the number of worked hours (costs of working, relative demand side constraints, flexibility) is to introduce an alternative specific constant for each choice in the utility function (Train, 2003; Van Soest, 1995). I tried both specifications and since the main findings of my analysis are robust I opted for the inclusion of only one dummy variable, related to the choice of working more than thirty hours per week, which expresses the fixed costs of working in units of utility.

Conditional logit estimation assumes that independence of irrelevant alternatives (IIA) property holds and there is no correlation between the error terms of the different hours alternatives.[9] However, one way to obviate the limitations of the conditional logit specification is to allow unobserved heterogeneity to enter the utility function through the linear utility parameters. Equations 5 and 6 become:

$$\alpha = \alpha_0 + \alpha_1' X + \nu_\alpha \tag{9}$$

$$\gamma = \gamma_0 + \gamma_1' X + \nu_\gamma \tag{10}$$

where ν_α and ν_γ are assumed to be normally distributed with variances σ_α and σ_γ and are allowed to be correlated. This is a type of mixed logit model (Train, 2003).

In order to simulate the behavioural responses of women to policy changes and to respect the probabilistic form of the discrete choice model, I employ the so-called maximum probability rule (Bargain and Orsini, 2006; Creedy and Duncan, 2002; Haan and Myck, 2007). Such a rule imposes that the optimal choice of each woman, given the observed budget constraint and tax-benefit rules, corresponds to the choice actually made and observed in the data. However, the characteristics included in the deterministic part of the utility function do not guarantee that the maximum utility is associated with the actual choice.[10] Any discrepancy can be interpreted as individual random preference heterogeneity and it is captured by the error term ε_j in equation 3. This term is factored back into the underlying preference structure as an individual-specific parameter, before and after simulating any policy reform.

For each woman I draw a set of 100 random terms from the Extreme Value distribution that maximise the predicted choice probability at the observed state. In such a

[9] IIA means that the odds ratio for two choices is the same irrespective of the total number of choices considered. Despite this restrictive assumption Haan (2006) shows that the conditional logit model provides estimates of labour supply elasticities not significantly different from those obtained taking into account unobserved heterogeneity.

[10] This is the case when dummy variables for each alternative of the choice set are included in the deterministic part of the utility function (Train 2003).

way, there is a perfect match between predicted and observed distribution of working hours. For each error term I keep drawing until I find one error term which maximises the utility at the observed choice. However, if after 200 trials for each error term[11], a successful error term has not been found, the labour supply of the woman is assumed to be inelastic and the observed choice is considered as fixed (Creedy and Duncan, 2002).

Individual random preference heterogeneity as well as the observable preferences are assumed to be the same pre- and post- policy reform. The same draws which maximise the utility at the observed choice are used when predicting labour supply responses after the policy reforms, to derive the preferred choice after the simulated policy change. Individual transition probabilities are approximated by taking the mean of the predicted transitions between states over the repetitions.

4. Simulation: model, data and approach

This paper uses the Italian component of EUROMOD, the multi-country European-wide tax-benefit model. EUROMOD is a static microsimulation model: it combines detailed information on relevant policy rules with representative data on individual and household circumstances drawn from national household income surveys. EUROMOD simulates the main social insurance contributions, income taxes and the non contributory benefits. It takes the amounts of the benefits based on contributory history or personal characteristics not available from input datasets (mainly old age and disability pensions) as recorded in the survey (Sutherland, 2007). EUROMOD outputs have been checked through validation exercises at micro and macro level and they have been used in a number of applications (see Bargain 2007 for an overview).

[11] I have chosen the threshold of 200 trials because it minimises the number of unsuccessful draws without being computationally too intensive.

The underlying input dataset comes from the Italian component of the 2004 European Union Statistics on Income and Living Conditions (EU-SILC) made available by ISTAT. The data contains information on 24,270 households and 60,847 individuals. Monetary values refer to the 2003 while the socioeconomic variables refer to 2004. However, the simulation of the tax-benefit system is mainly based on the demographic characteristics related to the income reference period (i.e. children born after the end of the income reference period have been dropped from the analysis and the labour market status is derived from the income sources received during the income reference period).

Because tax evasion is prevalent in particular among self-employed, recorded self-employment income has been split in two components, assuming that only a part of the total income has been declared to the tax authority. A calibration factor, depending on the level of income and region of residence of the tax payer, has been applied in order to obtain an aggregate amount of the declared income corresponding to that reported in the fiscal data (Fiorio and D'Amuri, 2006). Table 3 reports the validation of the main income sources and the social contributions and personal income tax simulated by EUROMOD, showing a generally good match with the external statistics provided by the fiscal authorities.

Table 3: EUROMOD validation: comparison of aggregates with external statistics

Income source or simulated policies	% variation versus external statistics
Employment income	3.29
Self-employment income	1.56
Pensions	4.74
Unemployment benefits	-1.82
Employee Social Insurance Contribution	4.39
Self-employed Social Insurance Contribution	-6.93
Total taxable income	2.96
Gross tax (*IRPEF*)	1.22
Family tax credits	7.02
Net tax (*IRPEF*)	2.61

Source: Author's analysis using EUROMOD. External statistics: Agenzia delle Entrate (2004).

One of the main features of a static microsimulation model is to compute the disposable income of individuals and their families under different scenarios, taking into account the tax-benefit policies and the way they depend on the level of individual market income and personal/household characteristics (Bourguignon and Spadaro, 2006).

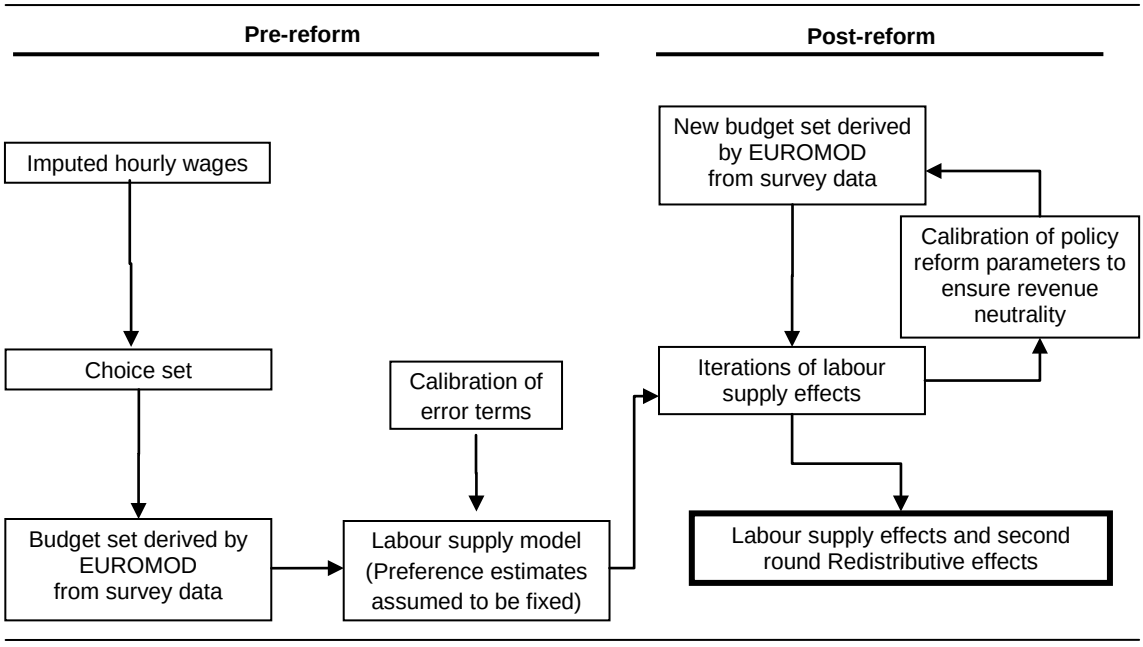
Figure 1 depicts the main components of the behavioural tax-benefit model developed in this paper which uses the static tax-benefit algorithm to feed the labour supply estimates and to evaluate the labour supply reactions to policy reforms. Behavioural tax-benefit models are a crucial economic tool for *ex-ante* evaluation of policy reforms to analyse not only the redistributive and fiscal effects but also the behavioural responses of the economic agents (Creedy and Duncan, 2002).

In the discrete choice setting, outlined in the previous section, each individual faces a discrete number of alternative options characterised by different working hours which form the personal choice set. At each choice, the total amount of gross earning is given by the number of working hours multiplied by the gross hourly wage. Considering the gross earning of the woman and any other source of income of the family and its characteristics, EUROMOD derives the budget set of each family computing the net disposable income at each alternative of the choice set.

The sample is composed of women in couples and lone mothers, restricted to those aged between 18 and 65 years, without any pension and self-employment incomes and not in education. The same restrictions apply to the partner of women in couples. The final sample includes 4,820 women in couples and 682 lone mothers. The restriction of the sample to the "labour market flexible" individuals is common in the literature on behavioural evaluation of tax reforms and is motivated by the aim to exclude individuals whose labour choices are affected by factors that are not or cannot be controlled for in the labour supply model. Examples of these factors include disability status, educational

choices, early retirement, self-employment and professional activities. Moreover, it is reasonable to assume that for the women included in the sample, the employment decision and the number of hours worked per week are the channels through which they respond to tax reforms, while for self-employed hours of work and employment are not the important margin of response.

Figure 1: Behavioural tax-benefit model and underlying data



For women not working, hourly wages are predicted on the basis of a wage equation estimated on all women in the sample and corrected for sample selection by means of an Heckman regression. The dependent variable is the logarithm of the gross hourly wage. In the outcome equation I include three dummies for education (lower secondary, higher secondary and tertiary), age and its square, a variable capturing previous working experience and the regional unemployment rate for women.

In the selection equation the identification comes through additional characteristics, namely whether a woman is in a couple, the number of children she has

Table 4: Wage equation (Heckman regression)

	Coef.		Std. Err.
Hourly wage (ln)			
Lower Secondary education	0.147	***	0.019
Higher Secondary education	0.411	***	0.020
Tertiary education and more	0.717	***	0.024
Age (/10)	0.282	***	0.031
Age (/10) square	-0.035	***	0.004
Work experience (years)	0.017	***	0.001
Female regional unemployment rate	-0.211	***	0.060
Constant	1.043	***	0.063
Selection equation			
Lower Secondary education	0.305	***	0.048
Higher Secondary education	0.884	***	0.047
Tertiary education and more	1.293	***	0.062
Age (/10)	0.829	***	0.102
Age (/10) square	-0.185	***	0.013
Work experience (years)	0.106	***	0.002
Female regional unemployment rate	-1.985	***	0.160
Couple	-0.361	***	0.037
Number of children < 3 years	-0.281	***	0.043
Number of children >= 3 and < 6 years	-0.251	***	0.045
Number of children >= 6 years	-0.048	*	0.019
Household non labour income (/1000)	-0.252	***	0.052
Household non labour income (/1000) square	0.026		0.018
Other household member earnings (/1000)	-0.069	**	0.024
Other household member earnings (/1000) square	-0.001		0.003
Constant	-1.316	***	0.190
Number of observations	13,054		
Censored observations	6,502		
Uncensored observations	6,552		
Log likelihood	-7,706		
Wald chi2(7)	2,192		
Prob > chi2	0.000		
rho	0.215		0.055
LR test of indep. Eqns (rho = 0): chi2(1)	13.550		
Prob > chi2	0.000		

Notes: * p<0.10, ** p<0.05, *** p<0.01. Estimates are based on all women aged between 18 and 64 years, excluding those in education, receiving self-employment or pension incomes. Excluded category is primary education. “Household non labour income” and “Other household member earnings” are monthly amounts equivalised using the modified OECD equivalence scale. Source: author's analysis based on EUROMOD.

(grouped into three age categories), household non labour income (and its square) and other household member earnings (and its square). See Table 4 for the estimates which are in line with the expectations. The likelihood ratio test of independent equations (i.e. rho = 0) indicates that the selection bias is statistically significant, justifying the Heckman procedure.

In this paper I follow the assumption commonly applied in the discrete choice models that the gross hourly wage of each individual is kept fixed in the different alternatives of the choice set. Ilmakunnas and Pudney (1990) are one of the few exceptions in the literature because they allow the wage to be different according to the number of hours offered by each individual.

In the pre-reform scenario (left panel of Figure 1), the labour supply model, outlined in the previous section, is estimated on the budget set providing a direct estimate of the preferences over income and hours of work for each woman plus the selected draws of the error term ε_j included in equation 3. In the post-reform scenario (right panel of Figure 1) a new budget set for each family is derived by EUROMOD applying the new tax-benefit rule following the simulated reform. Assuming that the individual preferences do not vary over time, labour supply estimates and error terms from the pre-reform scenario are used to predict the labour supply effects and the second round redistributive effects (i.e. when labour supply reactions are taken into account) of the simulated policy reforms. Such effects come out of a iterative procedure in order to calibrate the policy parameters to ensure revenue neutrality once the labour supply reactions and their effects on tax revenue and benefit expenditure are taken into account.

5. Model estimates

Tables 5 and 6 report the estimated coefficients of the two different specifications of the labour supply model outlined in section 3, a conditional logit model and a mixed logit model respectively.

The estimated parameters determine the marginal utility (disutility) of income (hours of work) taking into account the preference heterogeneity captured by the demographic characteristics (age, education, number of children and presence of children younger than three years) and the fixed costs of working. In the mixed logit specification the standard deviation of the random coefficients related to income and hours of work are always significantly different from zero, revealing an important role of unobserved heterogeneity. Moreover, the correlation term between the random coefficients is significant for women in couples. From now on, I refer to the mixed logit specification, unless otherwise stated.

Table 5: Estimates of labour supply model – Conditional logit specification

	Women in couples		Lone mothers	
	Coef.	Std. Err.	Coef.	Std. Err.
Income (/1000)	3.368***	0.829	5.396**	2.466
× Aged over 40	0.009	0.015	0.044	0.038
× Lower Secondary education	0.113	0.623	-2.007	1.442
× Higher Secondary education	-1.772***	0.574	-3.411**	1.353
× Tertiary education	-3.104***	0.612	-4.705***	1.39
× Number of children	0.142	0.111	-0.494	0.395
× Presence of at least a child < 3 years	-0.078	0.325	3.021**	1.215
Income (/1000) square	-0.036	0.043	-0.08	0.134
Hours	-0.124***	0.02	-0.133*	0.069
× Aged over 40	-0.001	0.000	-0.003**	0.001
× Lower Secondary education	0.010	0.013	0.060*	0.036
× Higher Secondary education	0.070***	0.013	0.110***	0.035
× Tertiary education	0.119***	0.016	0.180***	0.04
× Number of children	-0.014***	0.004	0.005	0.014
× Presence of at least a child < 3 years	-0.004	0.009	-0.111***	0.036
Hours square	-0.000	0.000	0.001***	0.000
Income × Hours	-0.001	0.003	-0.045***	0.012
Fixed cost of work	1.612***	0.123	1.955***	0.426
× Number of children	-0.017	0.076	0.007	0.266
Number of observations	24,100		3,410	
Log-Likelihood	-6564.154		-956.097	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Income expressed in monthly amounts. Source: author's analysis based on EUROMOD.

As expected from the economic theory, the coefficients of income and its square (significant only for women in couples) indicate increasing and diminishing marginal utility of income. The coefficients of number of hours worked show decreasing marginal utility of time spent in work (diminishing as hours increase for women in a couple, the opposite for lone mothers). On average, households value disposable income and leisure positively.

Table 6: Estimates of labour supply model – Mixed logit specification

	Women in couples		Lone mothers	
	Coef.	Std. Err.	Coef.	Std. Err.
Income (/1000)	7.201***	1.502	5.717**	2.79
× Aged over 40	0.011	0.027	0.058	0.043
× Lower Secondary education	-0.271	1.08	-2.198	1.647
× Higher Secondary education	-4.616***	0.998	-4.185***	1.587
× Tertiary education	-6.621***	1.082	-5.756***	1.668
× Number of children	0.623***	0.207	-0.535	0.44
× Presence of at least a child < 3 years	-0.169	0.585	3.189**	1.333
Income (/1000) square	-0.171**	0.084	-0.077	0.171
Hours	-0.163***	0.042	-0.117	0.08
× Aged over 40	-0.001	0.001	-0.003**	0.001
× Lower Secondary education	0.047*	0.026	0.066	0.042
× Higher Secondary education	0.196***	0.027	0.133***	0.042
× Tertiary education	0.271***	0.034	0.216***	0.051
× Number of children	-0.043***	0.008	0.002	0.016
× Presence of at least a child < 3 years	-0.009	0.019	-0.119***	0.041
Hours square	-0.002***	0.000	0.001***	0.000
Income × Hours	0.009	0.006	-0.044***	0.014
Fixed cost of work	1.818***	0.138	1.949***	0.436
× Number of children	-0.06	0.084	0.067	0.275
Std. Dev. Income	4.480***	0.404	1.013**	0.512
Std. Dev. Hours	0.220***	0.018	0.057***	0.021
Corr. Income Hours	0.048***	0.008	0.003	0.002
Number of observations	24,100		3,410	
Log-Likelihood	-6443.188		-953.632	

Notes: * p<0.10, ** p<0.05, *** p<0.01. Income expressed in monthly amounts. Source: author's analysis based on EUROMOD.

While the age of the woman (identified by means of a dummy if age is over 40 years) does have a significant impact on the preference for working only for lone mothers, I find significant preference heterogeneity related to education level and presence of children. For women in couples utility of income decreases with education level while it increases with the number of children. The disutility associated to the number of hours worked decreases with education level (those who invested more in

education are more likely to have a more interesting and less tiring job) while it increases with the number of children. The presence of at least one child younger than three years does not have a significant impact on the preference structure. For lone mothers the preferences show the same pattern but the estimated parameters related to the number of children are not significant due to the small variability in the sample. However, the presence of a small baby increases the marginal utility of income and the disutility of working. Other things being constant, higher educated women have a higher preference for work and a lower preference for income.

The parameter capturing the fixed costs of working has always a positive and statistical significant coefficient. Given the fixed costs of working that an individual faces (e.g. commuting, clothes, caring services, housework), it captures the marginal positive utility that a woman gets when she works at least 30 hours per week.

According to the economic theory, the utility function should respect monotonicity and quasi-concavity with respect to income. Such conditions are checked *ex-post* rather than being imposed in the model specification.

The monotonicity condition is checked through the first derivative of the utility function with respect to income:

$$\frac{\partial U_j}{\partial Y_j} = \alpha + 2\beta Y_j + \lambda Y_j H_j > 0 \qquad (11)$$

which is respected by 99% of women in couples and 96% of lone mothers, revealing a very good performance of the model (Creedy and Kalb, 2005) and providing the requirement for the consistency of the simulations of the policy reforms.

The quasi-concavity check is given by the second derivative

$$\frac{\partial^2 U_j}{\partial Y^2_j} = 2\beta \leq 0 \Leftrightarrow \beta < 0 \qquad (12)$$

which is satisfied given that the coefficients of the income square term are negative.

In order to understand how women labour supply reacts to changes in financial incentives, in Table 7 I report the participation rates and labour supply elasticities. Elasticities are obtained by increasing the gross hourly wage of women by 1% under the pre-reform tax-benefit system, simulating the changes in the participation rate and in the average number of working hours. The change in the participation rate gives an indication of the responsiveness of labour supply of the non-active women who decide to enter the labour market or of those who are working and decide to leave the labour market (i.e. the extensive margin). The change in working hours is the cumulative effect of the reactions of those who are working and might decide to modify their behaviour (i.e. intensive margin) and those who are out of the labour market.

The participation rate of women in couples is around 57% whereas 72% of lone mothers are working. The pattern of participation is clearly increasing with income. 90% of the women in the richest quintile group are in work.

An increase in the hourly gross wage by 1% causes the participation rate to increase on average by 0.6%. In line with the literature (Meghir and Phillips, 2010), the average elasticities are quite small suggesting a modest change in the average behaviour. However, the distribution of such elasticities reveals the huge variation across quintile groups (very often ignored in the literature with the exception of Aaberge *et al.* (1999) and Roed and Strom (2002)) with percentage variations in the first quintile group close to 5.5% for women in couples and 2.66% for lone mothers pointing out the potential responsiveness of the women in the bottom of the income distribution.

Elasticities of working hours are slightly smaller in magnitude when looking at the full sample of women in couples (0.55%) and lone mothers (0.49%) but they follow the same pattern across the income distribution being much larger for the women in the poorest quintile group.

Table 7: Participation rates and labour supply elasticities

	Quintile groups of income distribution					
	All	Poorest	2	3	4	Richest
Women in couples						
Participation rate (%)	57.24	14.37	24.39	55.38	80.72	89.73
Change in participation rate (in %)	0.65	5.51	2.51	0.58	0.16	0.01
Change in working hours (in %)	0.55	4.17	2.02	0.71	0.27	0.04
Lone mothers						
Participation rate (%)	72.29	33.51	78.32	89.86	93.75	88.89
Change in participation rate (in %)	0.57	2.66	0.6	0.13	0.04	0.08
Change in working hours (in %)	0.49	2.76	0.46	0.12	-0.03	0.03

Notes: Labour supply elasticities obtained by increasing hourly gross wage of women by 1%. Income quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Source: author's analysis based on EUROMOD.

When labour supply elasticities are large, earning subsidies to low-earning people as the in-work benefits can be optimal transfers (Brewer *et al.*, 2010). This lesson from the optimal taxation literature seems to be encouraging with such estimated elasticities.

6. What does it change under the new policy scenarios?

The evidence presented in this section refers to the effects of the abolition of the existing tax credit for dependent persons and the contemporary alternative introduction of the family based or the individual in-work benefit. The analysis focuses on women in couples and lone mothers separately. I concentrate on the efficiency and equity effects in turn. The efficiency effects are presented by means of behavioural reactions, focussing on the number of hours worked (by hours range) by women. Regarding equity, I present the effects on poverty rates (and poverty gaps) and the distribution of gainers and losers. A summarising measure of changes in individual welfare due to the reforms, considering both income and leisure, follows.

The parameters of the new in-work benefits have been calibrated (see Figure 2) to achieve revenue neutrality considering the changes in labour supply and all the

interactions with the existing tax-benefit policies. Indeed, the additional cost of in-work benefits is compensated by the abolition of the existing tax credit for dependent persons and the increase in tax revenue (and the decrease in income-tested benefit expenditures) due to the enhanced labour supply. Individuals receiving the new in-work benefit and increasing their labour supply might receive a smaller amount of the Family Allowances due to their higher available income.

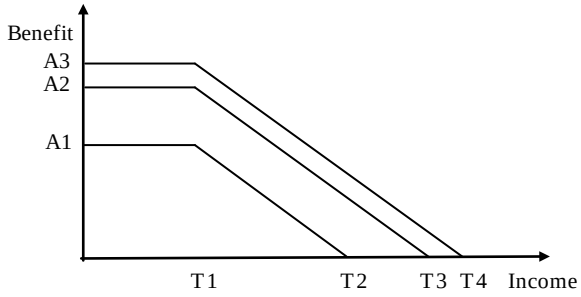
The maximum amount of the simulated transfers ranges from €70 per month for the individual in-work benefit to €317 per month for the family based in-work benefit (for couples or lone mothers working full-time).

As expected, given the higher level of income at which the individual in-work benefit is exhausted, the number of household beneficiaries of the individual in-work benefit (40% of households included in the analysis) is much higher than those in receipt of the family based in-work benefit (17% households), when behavioural reactions are taken into account.[12] In some cases, more than one recipient of the individual in-work benefit belongs to the same household and this increases the potential redistributive effect of the individual in-work benefit. However looking at the average value of the in-work benefits received by the entitled individuals, it emerges that the family based in-work benefit is more generous than the individual in-work benefit with monthly family based (individual) in-work benefit around €105 (€35) for women in couples and € 78 (€ 40) for lone mothers.

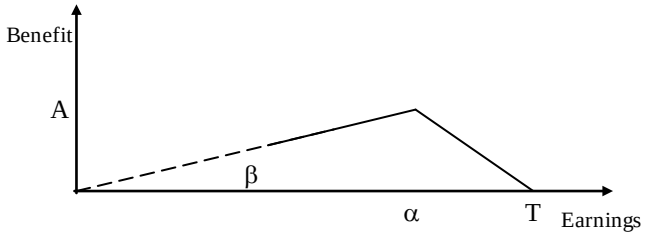
[12] Due to the positive labour supply reactions, the proportions of households in receipt of the in-work benefits are smaller when behavioural changes are not take into account (25% (11%) of households included in the analysis are in receipt of the individual (family based) in-work benefit).

Figure 2: Parameters of the simulated in-work benefits (€ per month)

Reform I: Family based in-work benefit	
Threshold corresponding to the maximum benefit amount (T1)	439
Maximum benefit amount for a single, working full-time (A1)	186
Threshold at which benefit exhausts for a single, working full-time (T2)	943
Maximum benefit amount for a lone/couple, working part-time (A2)	263
Threshold at which benefit exhausts for a lone/couple, working part-time (T3)	1,149
Maximum benefit amount for a lone/couple, working full-time (A3)	317
Threshold at which benefit exhausts for a lone/couple, working full-time (T4)	1,295



Reform II: Individual in-work benefit	
Threshold corresponding to the maximum benefit amount (α)	804
Phase-in rate, % (β)	8.7
Threshold at which benefit exhausts (T)	993
Maximum benefit amount (A)	70



Notes: Amount of in-work benefit in vertical axes. Family gross income on horizontal axis for the family based in-work benefit. Individual earnings on horizontal axis for the individual in-work benefit. See Figari (2010) for a detailed explanation of the structure of the simulated in-work benefits. "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Source: author's analysis based on EUROMOD.

6.1 Behavioural reactions

Table 8 reports the labour supply effects for women in couples, first abolishing the existing tax credit for dependent persons and then introducing alternatively the family based or the individual in-work benefits.

Confirming the disincentive effect embodied in the current structure of the Italian tax-benefit system, the abolition of the existing tax credit for dependent persons shows a positive incentive effect on labour supply for 2.5% of women in couples, previously not working. Most of them offer to work up to 19 hours per week.

Table 8: Labour supply (column %): women in couples

Hours range	Pre-reform	Existing tax credit abolished	Reform I (Family based in-work benefit)	Reform II (Individual in-work benefit)
0 – 7	42.76	40.25	40.17	37.97
8 – 19	5.46	7.17	7.26	8.78
20 – 30	19.00	19.61	19.66	20.91
31 – 40	26.49	26.67	26.64	26.09
41+	6.29	6.30	6.27	6.24

Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Source: author's analysis based on EUROMOD.

Once the tax credit for dependent persons has been abolished, the further introduction of the family based in-work benefit does not increase significantly the labour supply of women in couple. On the one hand, the average incentive effects on the labour supply are very similar to those observed after the abolition of the existing tax credit without any further reactions due to the family based in-work benefit. On the other hand, the expected disincentive effects of the family based in-work benefit on the second earner in the family do not seem to be relevant in the Italian case as it is in other contexts (Bargain and Orsini, 2006; Haan and Myck, 2007)

The individual based in-work benefit has a stronger incentive effect with 4.8% of women, currently not working, starting a job, an increase of 3.3 percentage points of women working up to 19 hours and an increase of 1.9 percentage points of those working between 20 and 30 hours. However, a positive participation effect is combined with a slight reduction of the number of hours worked by those already in employment.

Some women working full-time reduce their labour supply due to the disincentive effect embodied in the benefit: women with earnings above the maximum threshold prefer reducing their labour supply. Otherwise, they are not entitled to receive the transfer.

The results for lone mothers are reported in Table 9. They show that the abolition of the existing tax credit itself does not have any impact on the labour supply of lone mothers because they are not entitled to the existing tax credit. The labour supply of those currently not working increases significantly more after the provision of the family based in-work benefit (+2.7 percentage points) than the individual in-work benefit (+1.7 percentage points). This is because lone mothers are generally entitled to both the in-work benefits and the family based in-work benefit for them is much more generous. In both scenarios the labour supply slightly decreases for women currently working more than 31 hours per week and this is because such women have fewer incentives to work long hours because by doing so they lose the entitlement to receive the benefits.

Table 9: Labour supply (column %): lone mothers

Hours range	Pre-reform	Existing tax credit abolished	Reform I (Family based in-work benefit)	Reform II (Individual in-work benefit)
0 – 7	27.71	27.71	24.96	26.00
8 – 19	5.72	5.72	7.56	7.19
20 – 30	19.35	19.35	21.78	20.88
31 – 40	36.95	36.95	35.98	36.00
41+	10.26	10.26	9.72	9.93

Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Source: author's analysis based on EUROMOD.

In order to evaluate the impact of the reforms, it is also relevant to analyse the changes in the distribution of the number of hours worked pre- and post- reform and to understand where the behavioural reactions take place along the income distribution. This is what emerges from the transition matrixes presented in Tables 10 and 11 for women in couples and lone mothers, respectively. The diagonal elements show the proportion of women with unaffected labour supply behaviour. The off-diagonal elements show the proportions of women predicted to move to higher hour ranges (above the diagonal) or lower hours ranges (below the diagonal) in the post-reform scenario.

The positive effects in the labour supply of women in couples after the new in-work benefits are focused among those who did not work before the reform. With the new benefits, most of them start working in short part-time arrangements (i.e. above the threshold of 16 hours per week which entitles them to receive the new benefits and up to 30 hours per week). Looking at the distribution of women in couples by income quintile groups it emerges that most of the positive behavioural reactions are faced by those in the first quintile group where 86% of the women did not work before the reform.

Even if those who decrease the number of hours worked are usually in the phase-out region of the benefit which discourages work through the income effect, the

disincentive effects of the two types of in-work benefits have an impact on women at a different position in the income distribution. The family based in-work benefit shows a disincentive effect among the poorest families who are entitled to the benefit only if the second earner (usually the woman) does not earn above a given threshold. The disincentive effect is not marked for families at the top of the income distribution also because most of the richest families are not entitled at all to the benefit. On the contrary, the individual in-work benefit shows a more pronounced disincentive effect among the richest women, who might reduce the number of hours worked in order to be entitled to the benefit.

Overall, it emerges that most of the reactions are at the extensive margin of the labour supply – where the choice is whether to work or not – rather than at the intensive margin – where the choice is how much to work. This confirms the pattern found in the evaluation of the in-work benefits in the UK and US: a positive impact of these transfers on the participation margin without a significant adverse effect on the number of hours worked (Blundell *et al.*, 2000; Meyer, 2002).

Table 10: Simulated labour supply transitions – Women in couples

Reform I Family based in-work benefit						Reform II Individual in-work benefit					
All women in couples											
Pre-reform hours range	Post-reform hours range					Pre-reform hours range	Post-reform hours range				
	0–7	8–19	20–30	31–40	41+		0–7	8–19	20–30	31–40	41+
0–7	**39.7**	1.9	0.9	0.3	0.0	0–7	**37.9**	2.9	1.7	0.3	0.0
8–19	0.2	**5.2**	0.0	0.0	0.0	8–19	0.0	**5.3**	0.2	0.0	0.0
20–30	0.2	0.1	**18.7**	0.0	0.0	20–30	0.0	0.3	**18.7**	0.0	0.0
31–40	0.1	0.1	0.0	**26.3**	0.0	31–40	0.0	0.4	0.3	**25.8**	0.0
41+	0.0	0.0	0.0	0.0	**6.2**	41+	0.0	0.0	0.0	0.0	**6.2**
Poorest quintile group											
Pre-reform hours range	Post-reform hours range					Pre-reform hours range	Post-reform hours range				
	0–7	8–19	20–30	31–40	41+		0–7	8–19	20–30	31–40	41+
0–7	**79.7**	2.9	2.4	0.5	0.0	0–7	**78.4**	4.0	2.8	0.4	0.0
8–19	0.5	**3.2**	0.3	0.1	0.0	8–19	0.0	**3.8**	0.2	0.0	0.0
20–30	0.4	0.2	**4.1**	0.1	0.0	20–30	0.0	0.1	**4.6**	0.0	0.0
31–40	0.1	0.1	0.1	**3.4**	0.0	31–40	0.0	0.1	0.1	**3.4**	0.0
41+	0.0	0.0	0.0	0.1	**1.8**	41+	0.0	0.0	0.0	0.0	**1.9**
Richest quintile group											
Pre-reform hours range	Post-reform hours range					Pre-reform hours range	Post-reform hours range				
	0–7	8–19	20–30	31–40	41+		0–7	8–19	20–30	31–40	41+
0–7	**9.5**	0.5	0.2	0.1	0.0	0–7	**9.1**	0.8	0.4	0.1	0.0
8–19	0.1	**5.1**	0.0	0.0	0.0	8–19	0.1	**5.1**	0.0	0.0	0.0
20–30	0.1	0.0	**22.8**	0.0	0.0	20–30	0.1	0.2	**22.6**	0.0	0.0
31–40	0.0	0.0	0.0	**46.9**	0.0	31–40	0.0	0.5	0.4	**46.0**	0.0
41+	0.0	0.0	0.0	0.0	**14.7**	41+	0.0	0.0	0.1	0.0	**14.5**

Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Matrix %, representing the proportion of women working in a given hours (per week) range in the pre- and post-reform scenarios. Quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Source: author's analysis based on EUROMOD.

Table 11: Simulated labour supply transitions – Lone mothers

Reform I Family based in-work benefit						Reform II Individual in-work benefit					
All women in couples											
Pre-reform hours range	Post-reform hours range					Pre-reform hours range	Post-reform hours range				
	0–7	8–19	20–30	31–40	41+		0–7	8–19	20–30	31–40	41+
0–7	**24.9**	0.8	1.4	0.5	0.0	0–7	**26.0**	0.7	0.8	0.2	0.0
8–19	0.0	**5.4**	0.2	0.1	0.0	8–19	0.0	**5.6**	0.1	0.0	0.0
20–30	0.1	0.3	**18.9**	0.1	0.0	20–30	0.0	0.2	**19.2**	0.0	0.0
31–40	0.0	0.9	0.9	**35.2**	0.0	31–40	0.0	0.6	0.6	**35.7**	0.0
41+	0.0	0.2	0.3	0.1	**9.6**	41+	0.0	0.1	0.2	0.1	**9.9**
Poorest quintile group											
Pre-reform hours range	Post-reform hours range					Pre-reform hours range	Post-reform hours range				
	0–7	8–19	20–30	31–40	41+		0–7	8–19	20–30	31–40	41+
0–7	**57.9**	2.7	4.1	1.5	0.2	0–7	**62.0**	1.7	2.1	0.7	0.1
8–19	0.0	**6.9**	0.3	0.2	0.0	8–19	0.0	**7.2**	0.1	0.0	0.0
20–30	0.0	0.4	**10.8**	0.3	0.1	20–30	0.0	0.1	**11.4**	0.0	0.0
31–40	0.0	0.1	0.5	**8.8**	0.0	31–40	0.0	0.1	0.3	**9.0**	0.0
41+	0.0	0.1	0.1	0.1	**5.0**	41+	0.0	0.0	0.0	0.0	**5.2**
Richest quintile group											
Pre-reform hours range	Post-reform hours range					Pre-reform hours range	Post-reform hours range				
	0–7	8–19	20–30	31–40	41+		0–7	8–19	20–30	31–40	41+
0–7	**10.7**	0.0	0.1	0.3	0.0	0–7	**10.7**	0.1	0.2	0.1	0.0
8–19	0.0	**6.9**	0.0	0.0	0.0	8–19	0.0	**6.9**	0.0	0.0	0.0
20–30	0.6	0.2	**11.7**	0.0	0.0	20–30	0.0	0.1	**12.4**	0.0	0.0
31–40	0.0	0.4	0.8	**46.0**	0.0	31–40	0.0	0.7	0.3	**46.2**	0.0
41+	0.0	0.2	0.8	0.1	**21.1**	41+	0.0	0.2	0.8	0.1	**21.2**

Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Matrix %, representing the proportion of women working in a given hours (per week) range in the pre- and post-reform scenarios. Quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Source: author's analysis based on EUROMOD.

Among lone mothers the effects on labour supply are clearly differentiated along the income distribution. The poorest lone mothers increase substantially their labour supply after the introduction of the new benefits, with some of them choosing long part-time arrangements after the family in-work benefit due to the additional premium received after 30 hours worked per week. Those belonging to the richest quintile group might find more attractive working a smaller number of hours per week when their earnings are top up by the benefit, rather than working more hours but losing the entitlement to the benefit. In particular, this is true among those who work more than 30 hours per week before the reform.

Overall, the results of the reforms contrast with the clear disincentive effect for secondary earners in a couple that has been assessed in the UK after the introduction of the Working Family Tax Credit (Blundell *et al.*, 2000). On the one hand, the analyses show that there is scope to enhance women's labour supply also with family targeted instruments due to the very low labour market participation of women and high labour supply responsiveness of women at the bottom of the income distribution. However, for women in couples, labour supply responses are larger when in receipt of the individual in-work benefit. On the other hand, the results suggest higher incentives to work for lone mothers after the provision of the family based in-work benefit given the larger generosity of such a benefit compared to the individual in-work benefit.

6.2 Redistributive effects

Whether the labour supply reactions are responsible for important shifts across the poverty line, and also for the disposable income of those who remain poor even after the implementation of the policy reforms, is an empirical question.

When the existing tax credit for dependent persons is abolished, the proportion of women in couples at risk of poverty (defined as women with equivalised household disposable income below 60% of the median in the pre-reform system) slightly increases, even taking into account the positive behavioural reactions. This is mainly due to the higher taxes to be paid when the existing tax credit is abolished.

The family in-work benefit shows a redistributive effect, reducing the proportion of women living at risk of extreme poverty (i.e. women with equivalised household disposable income below 40% of the median) revealing the targeting of the family based in-work benefit at the poorest working family. After taking into account the potential behavioural reactions, the risk of poverty reduces even further.

As expected, due to the larger generosity of the benefit, the redistributive effects are generally larger after the provision of the family based in-work benefit than the individual in-work benefit although the latter implies a slightly larger reduction of poverty risk at 60% of the median when behavioural reaction are taken into account.

For lone mothers the reduction of poverty risk is more pronounced in particular with the more generous family based in-work benefit and taking into account the labour supply reactions which allow them to increase their earning capacity and hence their disposable income.

Table 12: Poverty rates (%) under different policy scenarios

Poverty rates	Pre-reform	Existing tax credit abolished		Reform I (Family based in-work benefit)		Reform II (Individual in-work benefit)	
		Static	Labour supply	Static	Labour supply	Static	Labour supply
Women in couples							
40%	6.3	6.4	6.3	5.4	4.9	6.0	5.8
60%	14.6	15.6	15.3	15.1	15.0	15.4	14.7
Lone mothers							
40%	17.5	17.5	17.5	15.8	14.0	16.4	15.7
60%	29.1	29.1	29.1	26.8	25.7	28.0	27.9

Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. The proportions of poor individuals in the different policy scenarios are based on the same poverty line (respectively 40% and 60% of the median equivalised household income using the OECD modified equivalence scale) as in the pre-reform system in order to disregard changes in median income. "Static" refers to the poverty rates without taking into account any behavioural reactions. "Labour supply" refers to the poverty rates when labour supply reactions are taken into account. Source: author's analysis based on EUROMOD.

The changes in the poverty rates are only informative in case of people crossing the poverty line after the reforms. However, the concern about the living standards of those who are poor requires looking at the poverty gap as well. Table 13 reports the poverty gap index which is the poverty gap (i.e. the average, over all individuals, of the gaps between poor individuals' income and the poverty line) as a percentage of the poverty line. The decrease in the poverty gap index between the static scenario and when labour supply reactions are taken into account is always larger, in relative terms, than that shown for the poverty rates. This reveals that enhanced labour market participation among the poor individuals allows them to improve their living standard even if they do not leave the poverty status.

Table 13: Poverty gap index (%) under different policy scenarios

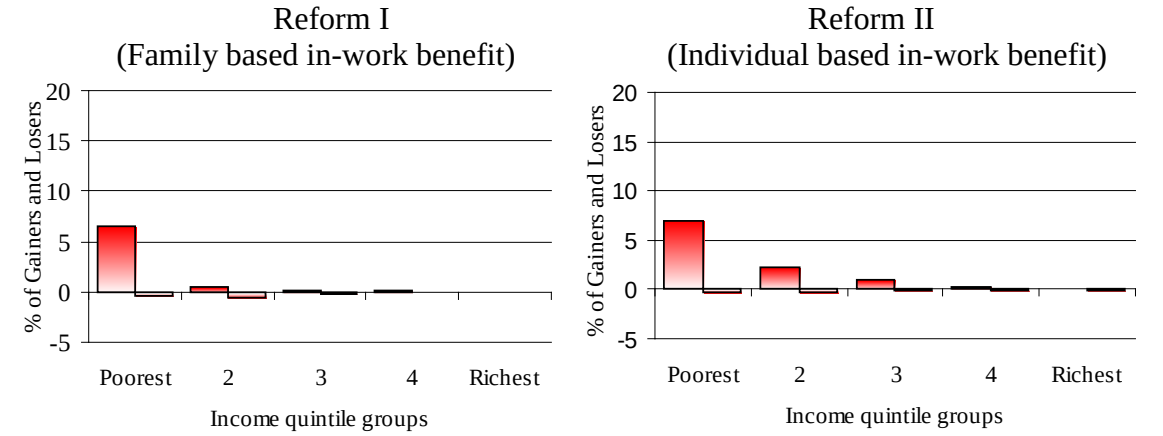
Poverty rates	Pre-reform	Existing tax credit abolished		Reform I (Family based in-work benefit)		Reform II (Individual in-work benefit)	
		Static	Labour supply	Static	Labour supply	Static	Labour supply
Women in couples							
40%	2.9	3.0	3.0	2.7	2.2	2.8	2.6
60%	5.2	5.4	5.3	4.7	4.4	5.2	4.9
Lone mothers							
40%	10.0	10.1	10.1	9.8	8.4	9.9	9.3
60%	14.3	14.4	14.4	13.6	12.2	14.0	13.4

Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. The poverty gap index in the different policy scenarios is based on the same poverty line (respectively 40% and 60% of the median equivalised household income using the OECD modified equivalence scale) as in the pre-reform system in order to disregard changes in median income. "Static" refers to the poverty gap index without taking into account any behavioural reactions. "Labour supply" refers to the poverty gap index when labour supply reactions are taken into account. Source: author's analysis based on EUROMOD.

Being revenue neutral, these reforms are not Pareto optimal. Looking at those who face a variation of at least 5% of their equivalised household disposable income, they are losers when they lose the existing tax credit for dependent persons and they do not receive the new in-work benefits or they do receive a new benefit less generous than the existing tax credit. Vice versa, gainers experience a substantial variation in their income due to a net benefit from the reforms. Figures 3 and 4 show the distribution of gainers and losers (by quintile groups of equivalised disposable income in the pre-reform system) after the two in-work benefits, among women in couples and lone mothers, respectively.

Considering the behavioural reactions, gainers are always more than losers and they are concentrated at the bottom of the income distribution. As observed above, among women in couples the individual in-work benefit leads to a larger number of beneficiaries, diminishing along the income distribution and enhancing their redistributive role irrespective of not being targeted at the poorest families.

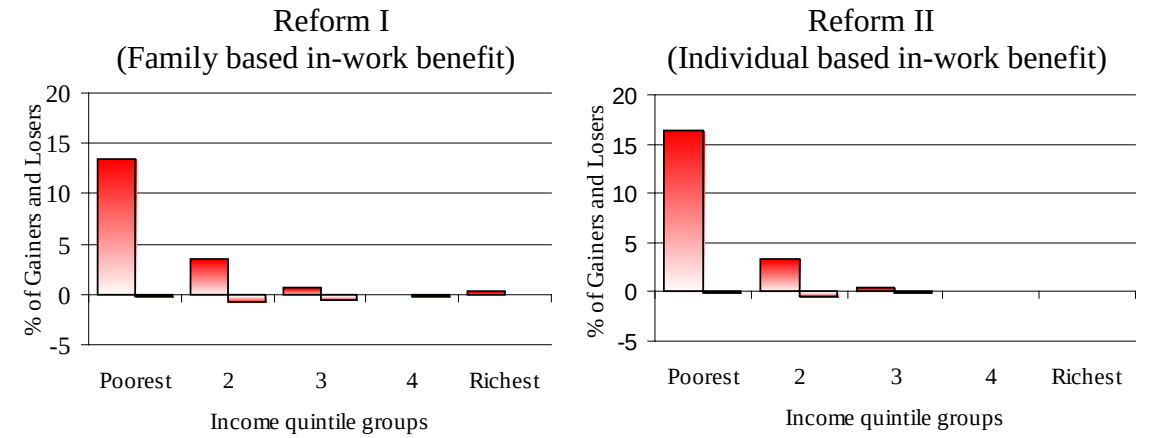
Figure 3: % of income gainers and losers by income quintile groups – Women in couples



Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Labour supply reactions taken into account. Quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Gainers (losers) are women with an increase (decrease) of equivalised household income larger than 5%. Source: author's analysis based on EUROMOD.

Among lone mothers, most of the gainers are concentrated in the first quintile group, with larger shares of lone mothers gaining from both the family based and the individual in-work benefit.

Figure 4: % of income gainers and losers by income quintile groups – Lone mothers



Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Labour supply reactions taken into account. Quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Gainers (losers) are women with an increase (decrease) of equivalised household income larger than 5%. Source: author's analysis based on EUROMOD.

By definition, with revenue neutral reforms, aside from labour supply reactions, some families are better off and others are worse off. However, from the previous figures where gainers are always more than losers, it seems to be clear than those who are negatively affected by the reforms do not lose a substantial share of their total income (i.e. at least 5%).

6.3 Welfare gainers and losers

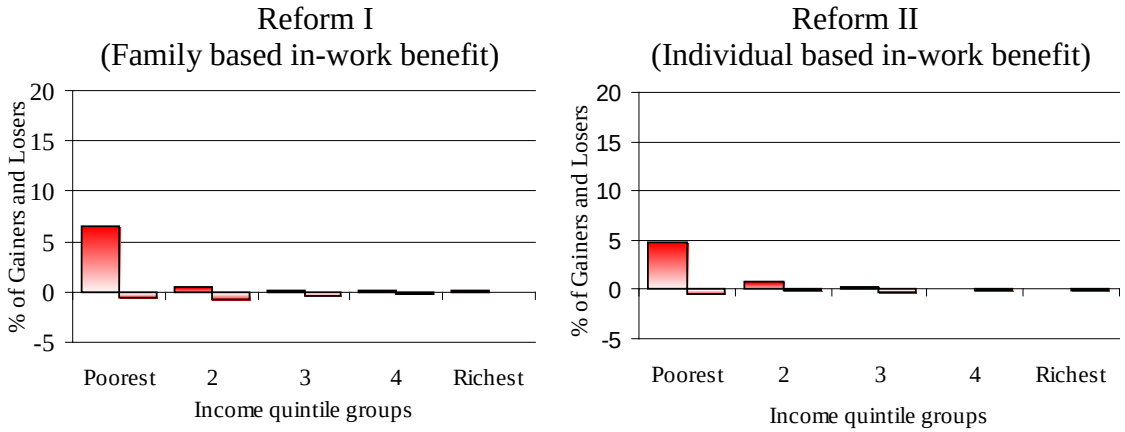
Income based welfare measures, as the reduction of poverty rates and the distribution of income gainers and losers due to a policy reform, are commonly used in the policy debate for the assessment of a tax proposal. In a non-welfarist approach, they summarise the impact on disposable income of a change in the tax-benefit system and give an idea of the political consensus and feasibility of any reform (Creedy and Herault, 2009). However, when behavioural changes do occur net income is not the unique guide to household standards of living. Labour supply models based on the structural specification of preferences can be used to derive a normative interpretation of the reform: the preference for the time spent in work, and hence leisure, must be considered in order to form a judgement value on a specific reform. In applied welfare analysis, individual welfare metrics such as equivalent or compensating variations are usually used (Creedy and Kalb, 2006). However, an increasing literature is emerging on the necessity to take into account the heterogeneity of preferences when deriving any welfare metrics used for normative analysis. The respect of the underlying preference structure of the labour supply models is particularly relevant when deriving a welfare measure at the aggregated level, which implies a comparison of utility between households with heterogeneous preferences (Deaton and Muellbauer, 1980). This relatively new strand of literature suggests evaluating the utility attained by households by imposing the preferences of a reference

household (Aaberge and Colombino, 2010) or by retaining the preference heterogeneity of the population under analysis (Fleurbaey, 2006; Decoster and Haan, 2010). However, when the individual preferences are added up at the population level, different welfare metrics exist depending on the ethical choices and the importance that a social planner should give to income and work. Decoster and Haan (2010) show that the choice of the normative criteria clearly matters when one has to provide a normative interpretation of a reform at the population level.

In this paper, in order to evaluate the extent to which the proposed reforms have an impact on the individual welfare but without imposing a particular welfare metric, I do not add up the individual preferences at the population level. I simply compare the individual welfare levels pre- and post- policy reforms, by looking at their utility attained under each policy scenarios. Such a simplistic approach allows me to enlarge the perspective from which the reforms might be judged without imposing a normative criterion which is out of the scope of this paper.

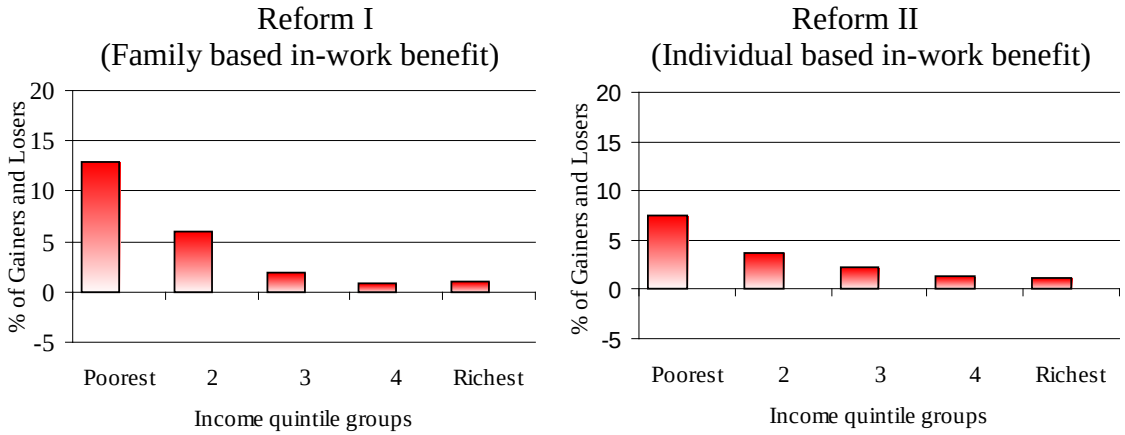
Figures 5 and 6 report the proportion of women who increase (decrease) their expected maximum utility due to the reforms by at least 5%, divided in income quintile groups to make the figures comparable with Figures 3 and 4. It emerges that utility gainers are always more than losers and the welfare gain is at the bottom of the income distribution with most of the women in couples experiencing a relevant change in their utility belonging to the first income quintile group. Most of the lone mothers who experience a positive change in their individual welfare level are in the first income quintile group but some gainers are along the whole income distribution.

Figure 5: % of utility gainers and losers by income quintile groups – Women in couples



Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Labour supply reactions taken into account. Quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Gainers (losers) are women with an increase (decrease) of expected maximum utility due to the reforms larger than 5%. Source: author's analysis based on EUROMOD.

Figure 6: % of utility gainers and losers by income quintile groups – Lone mothers



Notes: "Reform I": Existing tax credit for dependent persons abolished and replaced by the family based in-work benefit. "Reform II": Existing tax credit for dependent persons abolished and replaced by the individual in-work benefit. Labour supply reactions taken into account. Quintile groups defined according to the distribution of household equivalised disposable income (using the OECD modified equivalence scale) of the overall population in the pre-reform system (2003). Gainers (losers) are women with an increase (decrease) of expected maximum utility due to the reforms larger than 5%. Source: author's analysis based on EUROMOD.

As expected, given the generosity of the two in-work benefits and the labour supply reactions, utility gainers after the provision of the individual in-work benefit are generally fewer than gainers after the provision of the family based in-work benefit: to get the same amount of additional income, individuals have to sacrifice more leisure time

and work more. This reveals that taking into account the value of leisure can be an important aspect when assessing a policy reform. This becomes of fundamental importance when the different normative treatment of the preference heterogeneity with respect to the labour-leisure choice is taken into consideration (Decoster and Haan, 2010).

7. Conclusions

In this paper I have simulated the introduction of two in-work benefits in Italy, financed by the simultaneous abolition of the existing tax credit for dependent persons. Such a tax credit embodies disincentive effects on labour supply of the second earner in a couple, might be a cause of horizontal inequity and is not a well targeted way of support through the tax system.

Labour supply reactions are a key aspect in understanding the effects of revenue neutral policy reforms. Labour supply effects of women are modelled through a structural discrete choice model which shows that women at the bottom of the income distribution are characterised by much larger labour supply responsiveness.

Regardless of the limited amount of resources involved in the simulated reforms, the analysis reveals the possibility of enhancing both the redistributive and the incentive effects of the Italian tax-benefit system. Replacing the existing tax credit for dependent persons with a new family in-work benefit leads to an average increase of female labour supply of 3 percentage points. The individual in-work benefit has even stronger incentive effects for women in couples who see their labour supply rise by 5 percentage points. Labour supply of lone mothers increases more with the family based in-work benefit, given the larger generosity of such a benefit compared to the individual in-work benefit. Most of the labour supply reactions induced by the in-work benefits take place among the poorest individuals with important redistributive effects.

Although it is difficult to compare the magnitude of the results with other studies, due to the budgetary constraint and the relatively few resources allocated to these reforms, the main findings are in line with previous estimates of labour supply reaction of lone mothers to in-work benefits (Bargain and Orsini, 2006; Brewer et al., 2006; Meyer, 2002). However, the results contrast with the disincentive effect for secondary earners in a couple that has been assessed in the UK with family based in-work benefits (Blundell *et al.*, 2000; Brewer *et al.*, 2006).

The approach of this paper follows the bulk of the literature and does not take into account the demand side constraints. Even if the labour supply effects are only a proxy of the final employment effects, they give a direction of the likely effects of a policy change which are essential information that ought to be given some weight when discussing a policy reform. However, a couple of issues need to be borne in mind in the interpretation of the results. In the short run there might be significant institutionally determined rigidities in the labour market that prohibit or limit changes in hours of work (Blundell *et al.*, 1984). In the long run a shortfall in demand for work can limit the labour supply reactions and lead to downward pressures on wages (Azmat, 2006; Leigh, 2010), highlighting the importance of introducing a binding minimum wage as it has been the case of the UK where the National Minimum Wage has been introduced in April 1999 at the time of a major reform of the in-work benefit schemes. Nevertheless, relevant to the policy reforms analysed in this paper, Bargain *et al.* (2010) show that the demand side constraints do not affect substantially the labour supply effects of individuals voluntarily unemployed (such most of second earners) but they might have a bigger impact on single men and single women.

From a policy perspective four concluding remarks arise from the analysis presented in this paper.

First, a challenging political issue steams from the evidence that the major incentives effects of the reforms come from the abolition of the existing tax credit. However, given the absence of guaranteed income support schemes, in-work benefits show their potential as a support targeted at the poorest individuals. As for poverty reduction is concerned, even if the labour supply reactions do not lead to substantial changes in the overall poverty rates it is important to consider the social externalities of increased labour market participation (Phelps, 2000).

Second, in-work benefits might be one of the pillars of a redefined welfare system in Italy in order to enhance the economic position of working poor and to increase women's employment. However, they must be complemented by an extension of caring services for both children and elderly, in order to allow women to take paid work outside home if they wish to do so. The current analysis could be extended in order to consider how the low availability of public childcare, the expected childcare costs and the availability of informal childcare from the grandparents could impact on labour supply of women with pre-school children.

Third, the potential impact of the tax reforms on those out of the labour market confirms the importance of the reactions at the extensive margin in particular for low-earning parents as assessed in an application of optimal tax theory by Blundell and Shepard (2008) and also highlighted in a recent analysis of the tax reform in Poland (Morawski and Mych, 2010). Morawski and Mych (2010) show the extent to which the reduction in the taxation of labour can have important effects on the labour market participation of non-employed partners in one-earner couples.

Finally, in a period of economic downturn the in-work benefits can also help protecting the income of the families affected by the crisis (Figari *et al.*, 2011b) in particular when the first earner loses her job. The availability to work of those less

attached to the labour market has in fact increased as the employment opportunities of the main earner in the household deteriorate and family incomes fall (Carone *et al.*, 2009).

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