ASSESSING ALTERNATIVE IRPEF REFORMS USING MICROSIMULATION METHODS

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1. *Introduction*

In the never-ending debate about reforms of Italian personal income taxation, radical reforms of the current taxation system based on changing the tax unit or reducing the progressivity of statutory tax rates often emerge. Recently the Study Commission on personal income tax and family income support published a White Paper (De Vincenti and Paladini 2008) suggesting a reform of current personal income tax (IRPEF) system within the IRPEF's main framework based on an individual-unit tax system with progressive statutory tax rates.

In this paper some alternative reforms of present Italian current personal income taxation will be studied using a microsimulation (MSM) model built on a representative sample of the Italian household population, holding as a benchmark for *status quo* comparisons the IRPEF paid on incomes earned in year 2007. The comparison will be performed discussing efficiency and equity of each system. Efficiency will be discussed looking at the effective marginal tax rates of taxpayers whose labour supply elasticity is typically the most elastic, namely married women, with and without children. Equity will be analysed by estimating some common equity, redistribution and progres-

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sivity indices and providing an estimate of losers and gainers by levels of BT family and equivalent incomes.

As for the structure of the paper, Section 2 will briefly present the methodology adopted for assessing efficiency and equity of alternative reforms, Section 3 will present the MSM used and Section 4 the benchmark model (IRPEF for incomes earned in 2007), discussing some of its most critical points. In Section 5 some hypothetical reforms of 2007 IRPEF are described, clarifying the main assumptions adopted. Finally, in Section 6 results are discussed and conclusions are drawn in Section 7.

2. *Assessing efficiency, equity and losses of tax reforms*

An analysis of efficiency of taxation requires the evaluation of marginal tax rates and the elasticity of labour supply. The higher they are, the larger is the tax distortion and the efficiency loss. At present, the MSM used in this paper does not include a module for estimating the labour supply elasticity, hence it is not possible to provide an accurate estimate of the effects generated by a change in the marginal tax rate. However, the available empirical evidence for Italy, and similar countries, allows the discussion of some likely consequences of tax system changes on labour supply. Descriptive analyses of the Italian case show that the female labour force participation in Italy is particularly low when women are mothers or wives, while it is not much different with respect to the males for single women. Aaberge *et al.* (2004) provide estimates of labour supply elasticity in Italy, showing that the highest direct elasticity of labour supply with respect to earned income is among married women with family income in the first decile and it is the lowest among men with family income in the top deciles. Aaberge *et al.* (1999) and Colombino and Del Boca (1990) for Italy, Blomquist and Hansson-Brusewitz (1990) for Sweden, Steiner and Wrohlich (2006) for Germany, Blundell (1992) for the UK, Gruber and Saez (2002) for the United States find similar results, although point estimates among different studies are characterised by large variability.

The equity of a tax system can be analysed using some measures of the effects of taxation and the Gini coefficient, before and after taxes. The Kakwani index is a very popular index of progressivity: it measures the departure from proportionality as the difference between the concentration coefficient of tax t and the Gini index of before-tax income, G_y:

$$K_t = C_t - G_y \tag{1}$$

For large samples the minimum value of the Kakwani index is $-(1+G_y)$ and the maximum value is $1-G_y$. The first case happens when the poorest person pays all the tax ($C_t=-1$), the second when all the tax is paid by the richest person, leading to maximal progressivity (Kakwani 1977).

The redistributive effect looks at the shift from before-tax to after-tax income. With no re-ranking, the after-tax Lorenz curve coincides with the after-tax income concentration curve. The Reynolds-Smolensky index (*RS*) is equal to the difference between the Gini coefficient of before-tax income (G_y) and the concentration coefficient of after-tax income (C_{y-t}) (Reynolds and Smolensky 1977). In the absence of reranking it is the reduction of the Gini coefficient achieved by the tax. It is also equal to the product of a progressivity index (e.g. K_t) and the average tax on net income ($t/1-t$):

$$RS=G_y-C_{y-t}=\frac{t}{1-t}K_t \tag{2}$$

Hence the redistributive effect is determined by disproportionality and tax incidence. However, as the re-ranking effects are likely to occur with the tax system, the Reynolds-Smolonsky index, which is an indicator of vertical equity, should be written as the sum of a redistributive effect (RE) and a re-ranking effect (RR) (Lambert 1993, p. 185):

$$RS=RE+RR=(G_y-C_{y-t}-G_{y-t}+C_{y-t})+(G_{y-t}-C_{y-t}) \tag{3}$$

Often one is interested to know what happens if a tax reform is introduced, i.e. who are losers and gainers. The analysis of average losses and gains due to tax reforms is here performed using nonlinear regression analysis as the distribution of losses and gains are nonlinear on before-tax income. Let X be the before-tax income and Y the relative loss of income caused by a tax reform. Given the size-n sample of observations (x,y), and assuming additive errors, the relationship between Y and X can be estimated as:

$$y_i=m(x_i)+\varepsilon_i \quad \text{with } i = 1, 2, \ldots n \tag{4}$$

where ε_i is a random error with mean 0 and variance σ^2. While histograms of losers and gainers show the average loss (or gain) for households whose income belong to the same quantile interval, the estimated nonparametric regressions, $\hat{m}(x)$, defines the average loss or gain at any possible value that X can take, showing whether the distribution of losses (or gains) are indeed uniformly distributed within a quantile interval. This nonparametric methodology provides an informative and straightforward complement to

detect effects not always captured by measures often used to present MSM results, such as histograms (for more details on the methodology, see Fiorio 2008).

3. *TABEITA: the MSM in a nutshell*

The MSM used in this paper is TABEITA04, a TAx BEnefit model for ITAlian personal income taxation, built on data collected in 2004 by the Bank of Italy and published in the Survey of Household Income and Wealth (SHIW)[1]. TABEITA04 belongs to the family of microsimulation models developed and maintained at Econpubblica (see also D'Amuri and Fiorio 2006; Cavalli and Fiorio 2006).

The main challenge of MSMs built using SHIW data is the simulation of the before-tax (BT) income using data which are recorded net of direct taxation and social contributions, with few exceptions[2]. In theory, the problem could be solved by inverting a personal tax function. However, as tax deductions and tax credits depend on each taxpayer's individual and family characteristics, a closed form solution of such a problem is not feasible. Hence, TABEITA04 adopts a mixed approach, based partly on the analytic inversion of the tax function, and partly on numerical simulations. The structure of TABEITA04 can be described in seven steps: 1) an initial level of BT income is arbitrarily set equal to the declared after-tax (AT) income; 2) all intra-household relationship are analysed to identify taxpayers and fiscally dependent household members given the vector of individual BT income defined in the previous step; 3) all tax deductions and tax credits for each taxpayer are computed; 4) assuming that all households allocate tax deductions and tax credits among family members to minimise total tax liability, an optimal allocation of tax deductions and tax credits entitlements is defined; 5) a first approximation of the net and gross tax is computed; 6) BT income is computed adding to net-of-tax income the net tax and gross-of-tax income components (e.g. buildings and real estates income); 7) an exit condition is tested on the vector of BT incomes of previous step: if the vector of income passes the exit condition the simulation process is terminated and BT income is defined as the one simulated in step 6, if it does not pass the exit condition,

[1] The 2004 SHIW data set provides a representative sample of the national population and is made of 8,012 households and 20,581 individuals (for details on the data set, see Banca d'Italia 2006).

[2] In SHIW most of incomes are net of all direct taxes and social contributions, except for rents on building properties.

the vector of BT income obtained in step 6 replaces the vector of income in step 1 and the whole process starts again. The exit condition requires that the sum across all taxpayers in the sample of the difference of BT income simulated in step 6 and the one defined in step 1 is smaller than 0.001% of the sum of all AT incomes in the sample (for details on the model, see Cavalli and Fiorio 2006).

As the SHIW dataset collects information about households only and tax units can be different from households, TABEITA04 considers all cohabiting couples as legally married and all householder's children as children of the couple and defines as separate tax units all adult household's members with taxable income over € 2,840.51.

TABEITA04 model is validated using data from the Ministry of Finance's Inland Revenue Office (*Agenzia delle Entrate*, henceforth AE) for year 2004 (MEF 2004). The validation process is performed using the sampling weights provided in the SHIW. As aggregate income data in the SHIW are larger than what recorded by the AE, similarly to other MSMs using sample data[3], TABEITA04 is calibrated using the AE data assuming different levels of tax evasion on employment, self-employment, capital and building and real estate income[4]. Fringe benefits have been excluded from taxable income and no difference is made between tax evasion and tax avoidance. Familiy benefits are not explicitly determined, which are probably hidden among employment income and cannot be easily singled out. Figure 1 shows the cumulative distribution of taxpayers by BT income using the actual AE and simulated TABEITA04 data. The two curves are rather close, with some overestimation of frequencies of taxpayers with incomes between € 10,330 and € 60,000, and a consequent underestimation of taxpayers' frequencies at higher incomes.

4. *The benchmark model: 2007 IRPEF*

The use of TABEITA04 allows one to simulate the 2004 BT income and to use it for analysing the personal income tax (IRPEF) for incomes earned in 2007, upon indexation of income variables using the consumer price index

[3] Similarly, see Baldini (1998); Atella *et al.* (2001). The calibration procedure was applied to validate TABEITA04 using aggregate 2004 AE data, however this does not guarantee that the data are also consistent with aggregate 2007 AE data. At present, no official figures about tax revenues from 2007 IRPEF have been released by the AE: the latest figures, referring to year 2006 only, show a total revenue from IRPEF equal to 136.7 billion euro.

[4] For a discussion of the methodology, see also Fiorio and D'Amuri (2005).

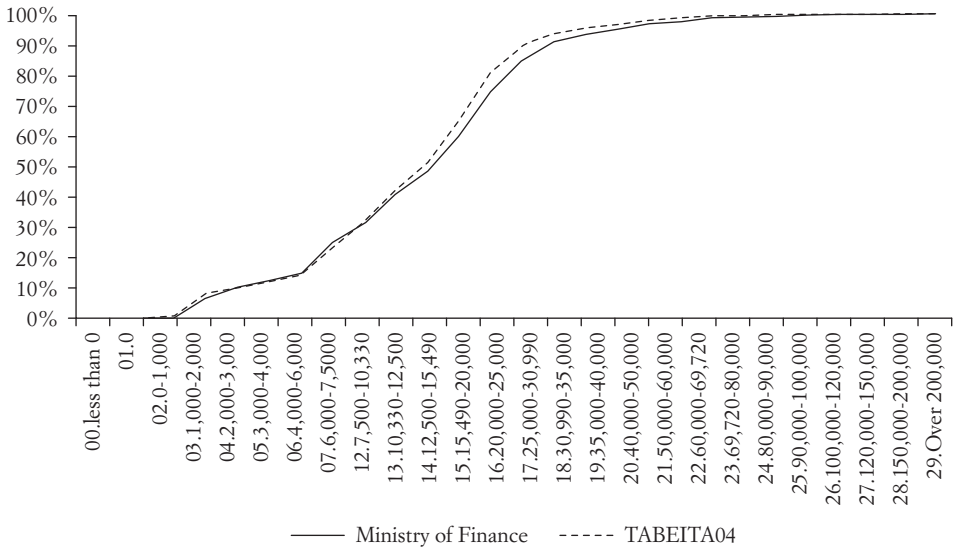

FIG. 1. Comparison of frequency distributions of before-tax incomes using MEF (2004) and TABEITA04.

(CPI)[5]. Although the use of the CPI index to project incomes to a different year introduces a bias as not all monetary variables increased of the same proportion, this bias was here kept to a minimum by using the most recent version TABEITA models[6].

The main novelty of the 2007 IRPEF was the re-introduction of tax credits to replace tax deductions by type of income introduced in 2003. Tax credits were introduced as a continuously decreasing function of gross income, net of home property cadastral income, phasing-out as income exceeds € 55,000 (Agenzia delle Entrate 2008). Before 2003 tax allowances by income type were defined according to a decreasing step-wise tax credit function of taxable income.

The difference between the two structures of tax credits is particularly evident in terms of marginal taxation. In the case of step-wise tax credits, effective marginal tax rate is equal to the statutory tax rate with the only exception of step points, where the marginal tax rate is extremely large[7]. At these points a marginal increase of the gross income has the effect of reduc-

[5] According to the CPI index on the whole population used, prices increased by 6.02% between 2004 and 2007.

[6] The TABEITA06 version is still under process and is not available as yet. For a discussion of the bias introduced using CPI indices see Sutherland (1991).

[7] It is actually infinite if an infinitesimal increase of the tax base is considered.

ing by much more the disposable income because of the tax credit drop, introducing a clear disincentive to increase income. In the case of continuously decreasing tax credits, the effective marginal tax rate does not present strong discontinuities, but it is larger than the statutory tax rate as for each additional earned euro, the taxpayer's effective marginal tax rate is equal to the sum of the statutory tax rate and the tax credit taper rate.

In the case of 2007 IRPEF, all step-wise tax credits have been removed, except for rental expenditure tax credits and for some corrections in tax credits for employment income and for dependent spouse. However, the introduction of different taper rates depending on the type of income earned caused effective marginal tax rates to differ depending on the type of income earned, which might be difficult to justify on economic grounds. As shown in Figure 2, the differential taper rates of tax credits by types of income make the effective tax rate for pensioners larger by roughly 4% with respect to that for self-employment income in the income interval between € 7,500 and € 15,000 and for employees larger by 5% in the interval between € 8,000 and € 15,000, besides other minor differences for incomes over € 15,000 and below € 55,000. The effective average tax of self-employed taxpayers is instead consistently higher than that of employed and pensioner taxpayers for taxable income below € 55,000 (Figure 3).

Statutory and effective tax rates also differ due to 2007 IRPEF's tax credits for family burdens, while a negative tax is not allowed and is to be set at zero. Although the statutory tax credits have a small positive trend, which would contribute to have a low inefficiency increase of taxation (for instance see the type of families in Figure 4, upper panel), the effective tax credits show a clearly increasing trend, up to the point where the taxpayer is due to pay a positive tax and are continuously reduced as earned income increases (Figure 4, lower panel), with a large taper rate which increases the inefficiency of taxation.

Although a crucial requirement of a good tax system is simplicity, the differential effects of tax credits on due tax makes the taxpayer's understanding of the taxation system uneasy.

Finally, a comment on the additional benefit for taxpayers with zero due tax in the previous fiscal year (*bonus fiscale*)[8]. The *bonus fiscale* is a one-off transfer equal to € 150 for taxpayers with zero due tax for incomes earned in 2006, which could be larger in case the taxpayer supports some dependent relative. In case this benefit was made permanent, it would make the effective marginal tax rate equal infinite for taxpayers who moved from a zero due tax to a marginally positive due tax, with a loss of disposable income

[8] In Figures 2-4 the «bonus fiscale» and step-wise tax credits have been ignored for increasing pictures' clarity.

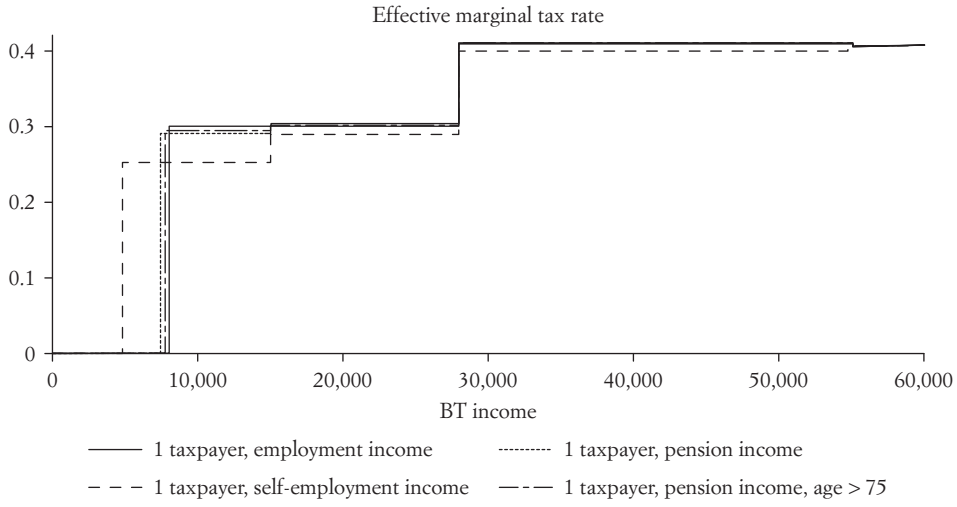

FIG. 2. The effective marginal taxation by type of earned income and with no family burden.

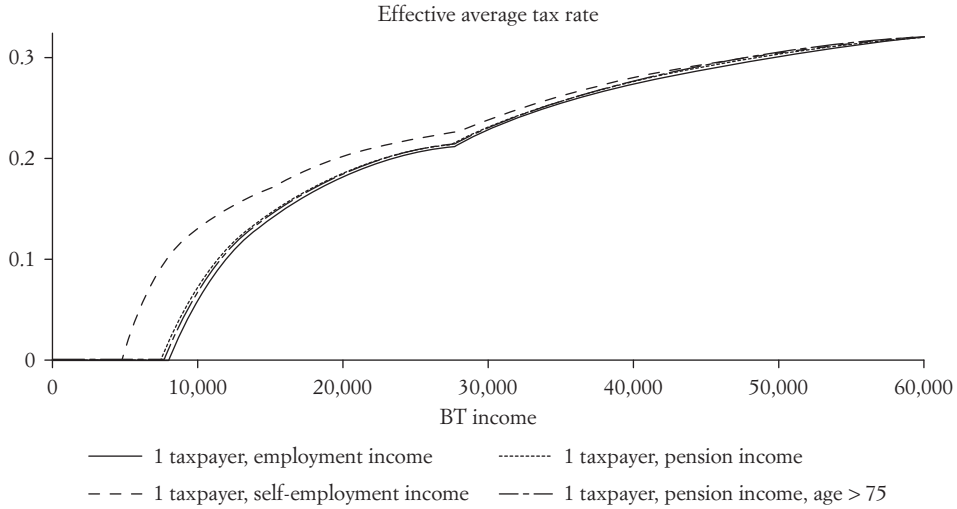

FIG. 3. The net taxation by type of earned income and with no family burden.

largely superior to the marginal increase of earned income. This situation would be particularly undesirable being a neat example of «poverty trap», i.e. a situation in which the tax system provides and disincentive to increase one's own earnings.

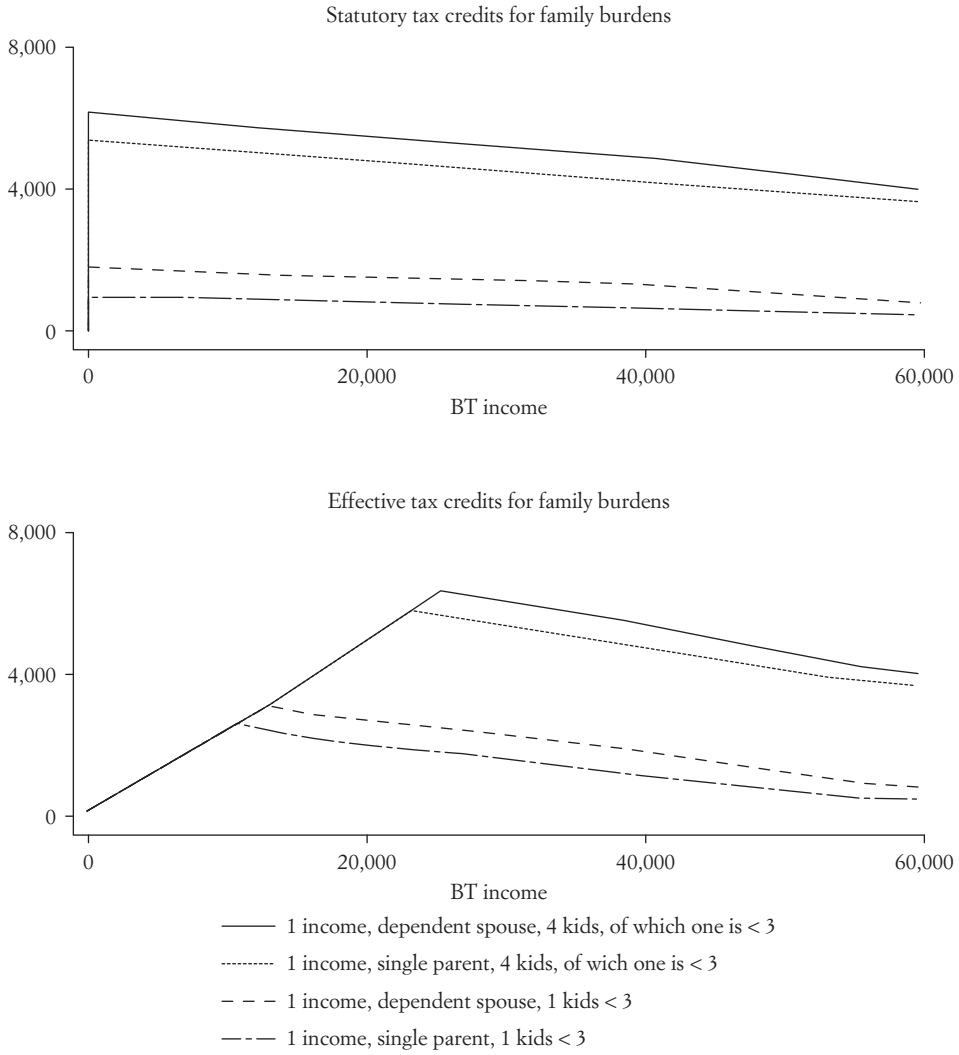

FIG. 4. The effective marginal tax rate by different types of income and no family burdens.

5. *Hypothetical reforms of IRPEF*

As discussed in the previous section, 2007 IRPEF presents various flaws, which might be corrected by adequate reforms. Here three different reforms are defined and simulated using TABEITA04. The first reform is aimed at correcting the main limitations of IRPEF, within the framework of a personal income taxation with progressive tax structure and individual tax unit. The second is characterised by the change of the tax unit, from an individual to

a family-based one. The third by the replacement of a progressive tax structure with a simple proportional tax system (flat tax). In all cases, the starting point of all simulations is the 2007 BT income, simulated by TABEITA04 and updated to year 2007 using the CPI, as described in Section 4. The three simulations are described separately in the following subsections.

5.1. *The first simulation*

The first simulated reform was inspired by the White Paper on personal income tax and family support (De Vincenti and Paladini 2008) and is aimed at reducing the differences of marginal tax rates by income types, reducing inefficiencies and increasing the simplicity of the tax system and its understanding by the taxpayer. As in the White Paper there is not enough detail for a complete simulation, this exercise cannot be used for a full assessment of the effects of the White Paper reform proposal. The simulation performed here, which will simple be named the «first simulation», is characterised by the following features:

- zero tax rate for taxable incomes below € 4,800 holding constant the bracket structure and tax rates;
- abolition of tax credits by type of income received and introduction of tax credits for income-producing expenditures only for employment income (proportional to the number of months worked in the tax year) equal to € 736 for incomes below € 8,000, linearly phasing-out as income exceeds € 55,000;
- introduction of a tax credit for pensioners by age:

– below 65 years of age: € 621 for incomes below € 7,500, then linearly phasing-out as income exceeds € 55,000;

– between 65 and 75 years of age: € 679 for incomes below € 7,750, then linearly phasing-out as income exceeds € 55,000;

– over 75 years of age: € 736 for incomes below € 8,000, then linearly phasing-out as income exceeds € 55,000.

While traditionally in the Italian tax system a negative tax (arising from tax credits larger than the due tax) is not allowed, in this simulated reform tax credits related to income-producing expenditures can be returned as a net transfer if larger than the due tax. For simplicity, in this simulation all other tax credits are left unchanged.

This personal income tax would increase the simplicity of the system, as it would make clear that no tax is due for incomes below € 4,800, it would reduce the differences of effective marginal tax rates by types of income received, holding the difference between self-employment and employment or pension income within a reasonable range between 1.5% e 1.3%, it would completely replace the step-wise effective marginal tax credits function with

TAB. 1. *An hypothesis of IRPEF reform*

	N	Mean	Std. Dev.	Min	Max	Grossed-up figures[b]
			2007 IRPEF			
Gross IRPEF	9,996	6,029.32	13,616.78	1,119.28	809,488.30	189,740
Effective tax credits	9,996	1,470.92	650.68	0.00	6,302.17	51,943
Net IRPEF	9,996	4,558.40	13,807.95	0.04	809,488.30	137,797
			Simulated IRPEF			
Gross IRPEF	9,740	5,016.38	13,782.11	15.28	808,384.30	150,748
Effective tax credits	9,740	802.25	549.44	0.00	5,588.07	28,953
Net IRPEF	9,740	4,214.14	13,871.11	0.81	808,384.30	121,795
Tax revenue loss						*11.61%*
			Simulated IRPEF with modified tax bracket structure[a]			
Gross IRPEF	9,865	5,540.60	13,776.99	15.28	809,214.30	166,645
Effective tax credits	9,865	822.42	579.42	0.00	5,747.66	29,077
Net IRPEF	9,865	4,718.17	13,869.63	0.81	809,214.30	137,568
Tax revenue loss						*0.17%*

Notes: Monetary values in thousands of euro except for the last column where values are in millions of euro. N is the number of observations.

[a] This was obtained by reducing the minimum threshold of the third bracket from € 15.000 to € 10.000 and increasing its tax rate from 27% to 32%.

[b] Statistics obtained using the weights allowing for grossing-up to population total provided in SHIW04.

Source: Author's calculations using TABEITA04.

a smooth one. Such a reform would remain with two main weaknesses: it would not remove the present effective tax credit structure for family burdens as discussed with reference to Figure 4 and would cause a loss of tax revenues around 13% due to the large decrease of taxpayers with positive gross tax. The first problem could be effectively tackled with the introduction of the fiscal endowment (*dote fiscale*) as suggested in the White Paper (De Vincenti and Paladini 2008, Ch. 5). The second modifying the tax structure. The simulation of the *dote fiscale* is left for future research, while the revenue loss is tackled modifying the tax system structure by reducing the minimum threshold of the third bracket from € 15,000 to € 10,000 and increasing its tax rate from 27 to 32% (Table 1).

5.2. *Changing the tax unit: the family-quotient*

Given the large number of possible simulations to analyse the change of the tax unit, a simulation was performed adopting the family-based tax system of a country with economic development similar to Italy's. Various alternative could be chosen. For instance, a family-unit tax system is adopted in Germany, in the United States (family splitting) and in France (family-quotient). In this work the French tax system was chosen as it presents the ad-

vantage of taking family burdens into account by using an equivalence scale, which avoids the use of tax deductions or tax credits to correct the due tax for family burdens increasing the simplicity of the tax system.

The application of the French tax system required the definition of a tax unit which is different from the definition of household used in the SHIW data set. In general, the French tax system limits the definition of a family to parents and their children, with some special cases for disabled people. Moreover, it provides a transfer to adult children upon leaving their parents' home. Hence, in the simulation performed the fiscal family was defined as the unit made of a householder and his partner and by the householder's children below 18. As in the data set there is no information on the nature of the relationship between the householder and his partner, neither whether children are of both spouses, it was assumed that spouses (if both are present) are legally married and children are of both. Remaining individuals are defined as separate tax units.

The French tax structure adopted here is that of year 2004, which is characterised by a more pronounced tax progressivity than the Italian one, with a minimum zero tax rate for equivalent incomes lower than € 4,334 and a maximum tax rate over 48% for equivalent incomes over € 48,737 (see Table 2).

The taxable income is defined as the sum of BT income of all individuals belonging to the same tax unit, net of all tax deductions that can be simulated using TABEITA04 (i.e., allowances for social contributions paid and for home property cadastral income) equivalised by the family-quotient. The family-quotient is defined as the sum of the number of spouses, the number of children multiplied by 0.5 for the first two and by 1 from the third onward. When possible with SHIW data, some cases of family-quotient increase have been included, such as cases of single parents with adult children and of single parents with children below 18. All tax credits of IRPEF 2007 have been cancelled. Only home property income tax and income-producing expenditure tax credits, set at € 736 (i.e. 23% of € 3,200) remain, and only for employment and pension income receivers, summed over all members of the tax unit. Finally, no upper bound to the family-quotient was introduced. Once the taxable income is computed and the gross tax is obtained applying the tax structure of Table 2, the result is multiplied by the family-quotient finally obtaining the family's due tax.

The simulation of such a reform would cause an important revenue loss, equal to about half of the total revenue with IRPEF 2007. The revenue-neutral simulation using TABEITA04 might be performed in various ways, including an increase of the tax bracket thresholds or the tax rates, proportionally to their initial values. In this exercise, the revenue neutrality is obtained by increasing the tax rates by the same percentage in all income brackets, as the proportional

TAB. 2. *The French tax bracket structure*

Upper bound limit of tax bracket (in €)						
4,334	8,524	15,004	24,294	39,529	48,737	∞
Tax rate (in %)						
0	6.83	19.14	28.26	37.38	42.62	48.09

Source: Ministère de l'Économie des Finances et de l'Industrie (2005).

increase of tax brackets would cause the increase of higher tax rates at undesirable levels from an economic point of view, with little political feasibility. In the simulation performed, the revenue neutrality is obtained by increasing the tax rates of all brackets by 16.08%, which, given the highly progressive structure of the tax function in France, brings the top tax rate to 64.17%.

5.3. *Reducing the gross tax progressivity: the flat tax*

For investigating the hypothesis of progressivity reduction of the gross tax, the structure of IRPEF 2007 tax brackets is replaced with a proportional tax for all levels of income (flat tax). Tax credits for family burdens and rental expenditures remains as in IRPEF 2007, while tax credits by types of income is removed.

As for family tax credits, the flat tax was simulated with and without tax credit for family burdens, allowing for different effective marginal tax rates similarly to 2007 IRPEF.

In both cases, the revenue neutrality constraint was imposed. In the case of no tax credits for family burdens, the tax neutrality is obtained with a tax rate equal to 19.93%, in the case of tax credits for family burdens, the revenue-neutral tax rate is equal to 22.97%.

6. *Analysis of results*

Equity, progressivity and redistribution of 2007 IRPEF have been analysed and compared with the simulated alternative taxation systems. All BT incomes, net tax and AT incomes have been equivalised conventionally using the square-root equivalent scale, i.e. dividing the sum of incomes among all members of the same household by the square root of the household size. Results, presented in Table 3, show that 2007 IRPEF reduced inequality by roughly 13.7%, from 0.467 to 0.4108, is characterised by a tax incidence of average taxation on AT income equal to 19.5%, with a progressivity index of 20% and

a redistribution of 4.7%. These indices would be roughly unchanged with the first simulation, comprising the elimination of tax credits by types of income, the introduction of a tax credit for income-producing expenditure for employees only, and a change of the tax structure for assuring revenue-neutrality as outlined in Section 5. In case the tax unit was changed roughly following the French family-quotient, the tax system would be much less effective in reducing the level of inequality of after tax incomes. The inequality index of AT income would be even higher with proportional taxation, especially without family-related tax credits. In the latter case, progressivity and redistribution indices would face a dramatic decrease reducing by over 75%.

To provide a rough idea of the tax distortion, effective marginal tax rates for female spouses have been computed. The choice of wives is motivated by the fact that the empirical evidence shows that elasticity of labour supply is particularly large for women in couples, as was briefly discussed in Section 2. In fact, while single women have a labour force participation and an elasticity of supplied hours of work to disposable income similar to that of men's, married women in Italy often decide to devote themselves to child and home care activities, living on their partner's earnings.

The estimates of effective marginal tax rates are obtained using TABEITA04, assuming that the BT income of each woman in the selected sample was increased by a limited amount (here € 100) and computing the percentage variation of the due tax for all tax reforms simulated. For analysing results, the average of effective marginal tax rates by deciles of individual income of wives, distinguishing by women in a couple with and without children are presented in Table 4. They clearly show that 2007 IRPEF and the first reform simulation with revenue-neutrality would assure a zero effective marginal tax rate up to the fifth decile and a limited one also for the sixth. On the contrary, female spouses who wished to enter the labour market with an income below the first decile would face an effective marginal tax rate equal to 13% if the tax system was the family-quotient, and over 17% if it was either one of the flat tax systems simulated. The effective average tax rate is on average higher for women without children, who do not enjoy any tax allowance for family-related tax credits or for the equivalence scale which acts in the family-quotient case. Only above the eight decile the effective marginal tax rate is relatively similar among different hypothesis of reforms simulated. In the last two decile intervals the two flat tax simulations show a lower level of effective marginal tax rate than in all other cases.

Finally, an analysis of losers and gainers is performed computing total BT income in the benchmark model as well as in all other simulations. Hence, a relative gain or loss is computed as the difference between the simulated and the benchmark BT income divided by the benchmark BT income. Clearly, if

TAB. 3. *Equity, progressivity and redistribution indices for 2007 IRPEF and the three simulations performed in Section 5*

Redistribution (*RS*)	Progressivity (K_t)	Re-ranking (*RR*)	Incidence ($t/(1-t)$)	BT Gini (G_y)	AT Gini (G_{y-t})
		2007 IRPEF			
0.0471	0.1967	0.0006	0.1953	0.4670	0.4108
		The first reform proposal			
0.0520	0.2182	0.0008	0.1949	0.4670	0.4094
		Family-quotient			
0.0355	0.1993	0.0017	0.1575	0.4670	0.4340
		Flat tax with no family-related tax credits			
0.0132	0.0562	0.0002	0.1930	0.4670	0.4537
		Flat tax with family-related tax credits			
0.0190	0.0795	0.0004	0.1965	0.4670	0.4413

Notes: All figures are obtained using equivalised income data using the square-root equivalence scale.
Source: Author's calculations using TABEITA04.

the difference is positive it means that the simulated reform delivers gains, if it is negative it delivers losses. Results are presented in Figure 5 overlaying the average gains and losses, their distribution by quintiles, and the distribution of average losses or gains at different levels of incomes using nonparametric methods as outlined in Section 2. The horizontal line shows that the average total family income gains the most (over 2%) if a family-quotient was in place and would face the largest loss (nearly 5%) with a flat tax with no family-related tax credit system[9]. However, distributions of losses and gains are important. The family-quotient tax system clearly favours mostly families with total incomes belonging to higher quantiles, and flat tax systems concentrate losses in the first deciles. In contrast, the first hypothesis of tax reform produces on average a gain of total family income of about 1% but relative gains are the highest for families with total income belonging to the first quintile of total family income and negligible after the third.

As a robustness check on gains and losses results the square-root-equivalent gains and losses were computed using the sum of all BT and tax liabilities normalised by the square root of the family size. Using equivalent household measures the differences in distributions of gains an losses are confirmed and even magnified: holding revenue-neutrality, family-quotient and flat tax reforms produce a gain that increases with household income, while

[9] Note that the average loss or gain can be different from zero as the revenue-neutrality constraint was imposed on individual incomes while here individual incomes and tax liabilities are aggregated within each family.

TAB. 4. *Average of effective marginal tax rates by deciles of BT income and types of families for female spouses*

Decile interval	1		2		3		4		5		6		7		8		9		10	
	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*	EMTR %	*N*
in a couple, no kids	0.00	*377*	0.00	*139*	0.00	*376*	0.00	*295*	0.00	*287*	0.42	*303*	1.61	*370*	23.68	*302*	29.93	*266*	31.42	*279*
in a couple, with kids	0.00	*354*	0.00	*54*	0.00	*153*	0.00	*124*	0.00	*130*	0.00	*155*	1.74	*71*	12.82	*153*	37.47	*189*	34.76	*176*
in a couple	0.00	*731*	0.00	*193*	0.00	*529*	0.00	*419*	0.00	*417*	0.28	*458*	1.63	*441*	20.03	*455*	33.06	*455*	32.71	*455*
The first simulation																				
in a couple, no kids	0.00	*377*	0.00	*139*	0.00	*376*	0.00	*295*	0.00	*287*	4.58	*303*	22.44	*370*	27.05	*302*	33.08	*266*	33.71	*279*
in a couple, with kids	0.00	*354*	0.00	*54*	0.00	*153*	0.00	*124*	0.00	*130*	0.15	*155*	4.49	*71*	21.49	*153*	33.55	*189*	36.55	*176*
in a couple	0.00	*731*	0.00	*193*	0.00	*529*	0.00	*419*	0.00	*417*	3.08	*458*	19.55	*441*	25.18	*455*	33.28	*455*	34.81	*455*
Family-quotient																				
in a couple, no kids	16.14	*377*	14.19	*139*	19.14	*376*	19.13	*295*	20.99	*287*	20.97	*303*	22.35	*370*	29.37	*302*	31.17	*266*	35.58	*279*
in a couple, with kids	10.16	*354*	12.12	*54*	14.59	*153*	14.00	*124*	16.12	*130*	34.75	*155*	21.84	*71*	24.42	*153*	32.95	*189*	37.08	*176*
in a couple	13.24	*731*	13.61	*193*	17.83	*529*	17.61	*419*	19.47	*417*	25.63	*458*	22.27	*441*	27.71	*455*	31.91	*455*	36.16	*455*
Flat tax with no family-related tax credits																				
in a couple, no kids	17.58	*377*	20.54	*139*	20.69	*376*	20.56	*295*	20.56	*287*	17.59	*303*	20.84	*370*	20.84	*302*	20.84	*266*	20.84	*279*
in a couple, with kids	16.60	*354*	20.05	*54*	20.75	*153*	20.51	*124*	20.40	*130*	17.05	*155*	20.84	*71*	20.84	*153*	24.73	*189*	20.84	*176*
in a couple	17.11	*731*	20.40	*193*	20.70	*529*	20.54	*419*	20.51	*417*	17.41	*458*	20.84	*441*	20.84	*455*	22.45	*455*	20.84	*455*
Flat tax with family-related tax credits																				
in a couple, no kids	19.32	*377*	22.64	*139*	22.82	*376*	22.66	*295*	22.59	*287*	18.94	*303*	24.73	*370*	23.00	*302*	23.11	*266*	23.14	*279*
in a couple, with kids	18.04	*354*	22.11	*54*	22.42	*153*	22.61	*124*	22.32	*130*	4.04	*155*	14.66	*71*	21.57	*153*	27.50	*189*	25.57	*176*
in a couple	18.70	*731*	22.49	*193*	22.70	*529*	22.65	*419*	22.50	*417*	13.90	*458*	23.11	*441*	22.52	*455*	24.94	*455*	24.08	*455*

Notes: EMTR stands for average of effective marginal tax rate within the decile interval. N is the number of observations.

Source: Author's calculations using TABEITA04.

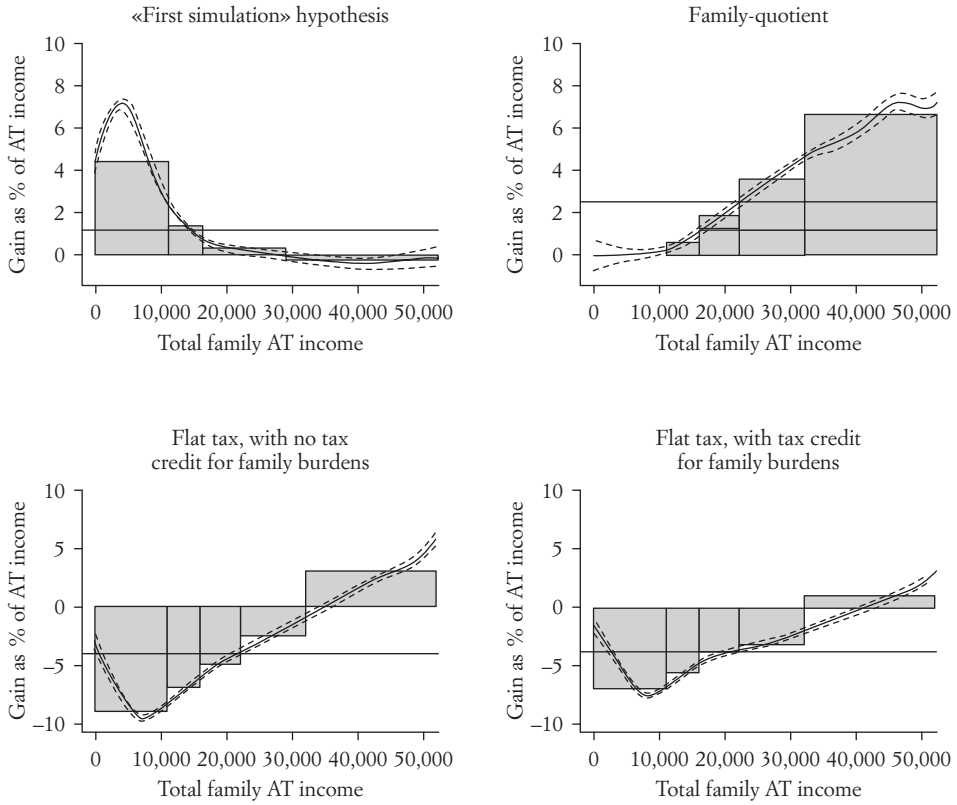

FIG. 5. Losers and gainers by total family income with different hypothesis of personal income tax reform. Dashed lines show 90% confidence bands.

the first reform, inspired by the White Paper proposal, distributes main gains in the first quintile with no large change on higher incomes (Figure 6).

7. *Conclusions*

This paper studied some possible reforms of personal income taxation in Italy including a modification of the actual tax system within the same IRPEF's framework of individual tax unit and progressive tax structure, which was inspired by the recent «White Paper» on IRPEF, and some more radical reforms including that of French-alike family-quotient system and flat tax reforms, with and without family-related tax credits. These reforms have been studied using TABEITA04, a microsimulation model on 2004 SHIW data, holding revenue-neutrality.

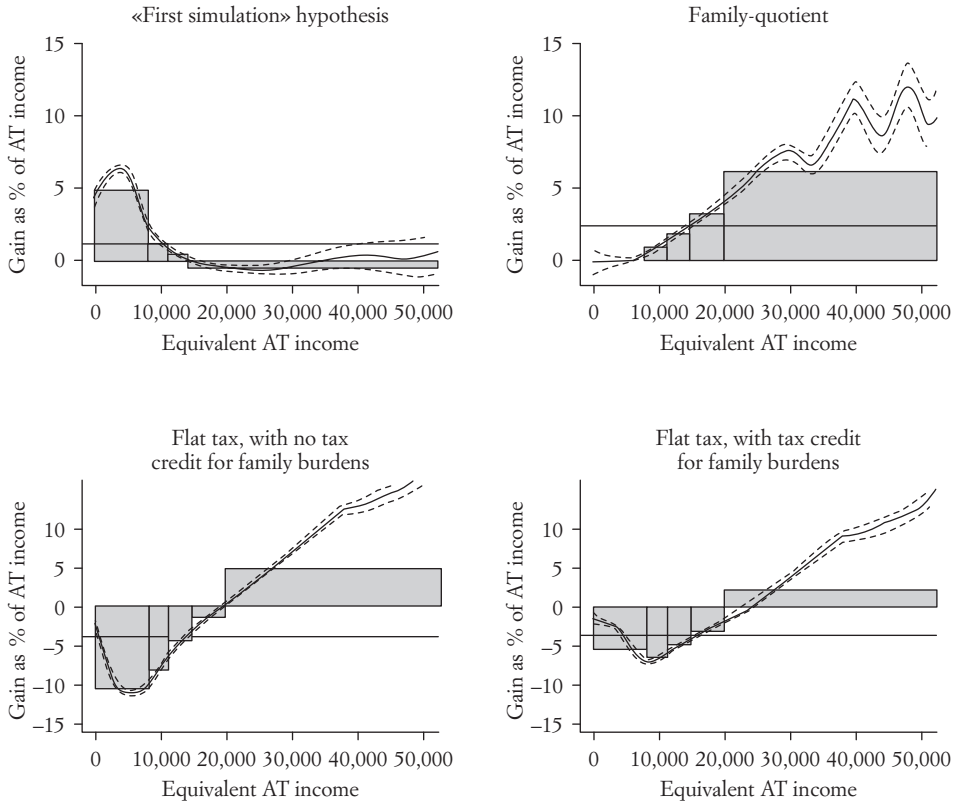

FIG. 6. Losers and gainers by square-root equivalent household income with different hypothesis of personal income tax reform. Dashed lines show 90% confidence bands.

Results suggest that main critical points of a family-quotient reform is the high effective marginal tax rates of low income wives, which would introduce a clear disincentive to enter the labour market, as the marginal tax rate they would face is the same as of their husband's. The flat tax systems would cause no real improvement in terms of effective marginal tax rates for low-income married women causing a dramatic reduction of tax progressivity and redistribution. As female labour participation in Italy is low, and especially for married women, any reform that implied a high entry marginal tax rate for this group of people should be carefully considered.

Finally, the analysis of losers and gainers clearly highlights that with family-quotient and flat tax systems families in the top quintile of incomes would gain the most. Among the simulations performed, only the «White Paper» reform would produce a larger AT income for families in the first quintile, while flat tax systems would even cause large income reductions among

households with income below the median. As Italy is well known to be a country with comparably large levels of inequality (see among others Atkinson *et al.* 1995; Brandolini and Smeeding 2008) a tax system causing a worsening of income distribution should be regarded with great concern.

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Abstract: JEL codes: H24, D31JEL codes: H24, D31Abbreviation used.

In this paper alternative reforms of present Italian personal income taxation, including a change of the tax unit and the introduction of a flat tax, are studied using a microsimulation model built on a representative sample of the Italian household population. The comparison is performed discussing efficiency and equity of each alternative.

Results suggest that main critical points of a family-unit reform include a high effective marginal tax rate for taxpayers with highly elastic labour supply, namely low-income married women. Flat taxation systems would cause no efficiency improvements and a dramatic reduction of tax progressivity and a worsening of redistribution. The analysis of losers and gainers clearly highlights that the distribution of gains with family-unit and flat tax systems would be highly in favour of families in the top quintile of incomes. Among the simulations developed, an adjustment of current IRPEF, roughly along the lines suggested by the White Paper on IRPEF and family income support, would not worsen inefficiency of current personal income taxation and produce more equal distribution of disposable income.

Keywords: tax-benefit microsimulation model, personal income tax reforms, equity, efficiency, losers and gainers.