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Individual vs family taxation:

an analysis using TABEITA04

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Abstract

In this paper we analyze whether Italian families, and especially those with children, would benefit from a tax system defined on a family rather than an individual tax unit. This analysis is performed using TABEITA04, the tax-benefit microsimulation model developed at Econpubblica on a representative sample of 2004 Italian households. Results show that families with kids would, on average, lose from such a reform as they are better off with the actual individual tax system, which provides generous tax credits for family burdens. The simulated reform could also be extremely costly in terms of labour force participation of spouses: in our sample, over 80% of spouses are not working and nearly 40% of them would face an increased marginal tax rate if the family tax unit was introduced. Those benefiting the most would be couples without children where both spouses are working, who are not enjoying any tax credit in the current tax system.

JEL codes: C15, C81, H24,

Keywords: Tax unit, Italian taxation, tax reform, quotient familial, tax progressivity.

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1 Introduction

Italian income taxation is based on an individual tax unit. However, a never ending debate occasionally comes out regarding whether Italian income taxation should move towards a system where family income is considered instead of personal income. In very general terms, those supporting such a change suggest that it would be an effective way to provide a more convenient tax treatment to families. On the other hand, opposers point out the fact that a family taxation would increase the marginal tax rate of the second earner (typically the wife) hence providing a disincentive effect to labour force participation. This second drawbacks is considered particularly serious as average female labour force participation is rather low, even for European standards (for instance, see OECD, 2004).

In this paper we analyze whether it is true that Italian families, and especially those with children, would benefit more from a tax system defined on a family rather than an individual tax unit. This analysis is performed using TABEITA04, the tax-benefit microsimulation model developed at Econpubblica on a 2004 representative sample of Italian households. Although TABEITA04 is not a behavioural model and it does not provide estimates of elasticity of labour supply to changes in the due tax, it can provide some hints on the number of people who would face an increased marginal tax rate if Italian personal income taxation was replaced by a family unit taxation system.

The structure of the paper is as follows. In Section 2 we briefly describe the 2004 Italian personal income tax (IRPEF) and in Section 3 we analyze the 2004 Survey of Household Income and Wealth, which is typically used for microsimulation modelling. Section 4 describes the structure of TABEITA04 and how the limitations of the data have been tackled and solved. Section 5 presents the simulation exercise where we introduced a family tax unit system analogous to the French *quotient familial* to replace the tax credits for family burdens of the IRPEF, both with constant tax structure and constant tax burden. Section 6 concludes.

2 The Italian personal income tax (IRPEF)

In this paper we focus only on the Italian personal income tax (IRPEF), which accounts for over 71% of all direct taxation current receipts in 2004. The tax base of IRPEF is personal income, which includes employment and self-employment earnings, pension, building, real estates, and capital income.

The tax is personal as taxpayers are allowed to claim tax allowances (or deductions) and tax credits, which depend on the personal characteristics of the single taxpayer and his family. Among tax allowances, the most relevant one is the so-called “no-tax area” tax allowance, which depends on the type of income earned (typically it is more generous for employment than for self-employment income) and decreases with the taxable income. Others tax allowances include the deduction for home owners, voluntary deductions for pension funds, contributions to non-governamental organizations and others. Taxable income is net of social contribution, which are either not included in wages or deductible in case of self-employment workers. Self-employment workers are also allowed to partly deduct the cost of income production, such as travel expenses, office rents, etc.

IRPEF gross tax is progressive as it comes from the application of a progressive tax bracket structure where bottom taxable incomes have a marginal tax rates equal to 23% and top incomes are taxed at 45% (see Table 1 below). However, not all incomes enter the tax base of the progressive tax schedule. For instance, severance payments and capital gains from financial assets are taxed with a flat and low tax rate (in 2004 the tax rate on capital gains was at 12.5%).

The peculiarity of IRPEF with respect to personal income taxes of some other countries is that the tax unit is the individual taxpayer, not the family. However, this does not mean that the family characteristics are not taken into account. IRPEF allows taxpayers to reduce their due tax by tax credits in case they have some family burdens, i.e. dependent relatives. Tax credits for family burdens can significantly reduce the due tax, especially at low levels of gross incomes. The main limitations of IRPEF tax credits is

that they do not give rise to a negative tax (i.e. a subsidy) but at most reduce taxable income to zero. Some additional details of the tax system are provided in the Appendix.

3 The data set for microsimulaton on Italian data

The data set described and used in this paper runs on the 2004 Survey of Household Income and Wealth (SHIW) data, which collect information on disposable income, consumption, labour market, monetary and financial variables for 20,581 individuals, belonging to 8,012 households. Out of the total sample of people interviewed, 13,341 are income recipients. As the income data recorded refer to disposable income, excluding taxes and social contributions, and as the SHIW is the only data set for tax-benefit analysis at the national level, the first role of any Italian tax-benefit microsimulation model (MSM) is to simulate the before-tax income (see for instance Lugaresi, 1989; Baldini, 2000 and Pellegrino, 2007).

A MSM on SHIW data can be described as a deterministic transformation of a given sample into a new one. More precisely, it may be described as a two steps transformation. The first step deals with the cleaning and adaptation of the original SHIW sample into a sample of after tax incomes (AT) to be fed into a microsimulation model. The second step is the simulation of before-tax (BT) income starting from the AT income vector. This distinction is useful when one considers that the SHIW survey is not primarily collected for microsimulation models. The information provided has to be compared with the information that is required to estimate the effect of the tax legislation on an individual's income.

Unfortunately, although rich and the best in terms of population representativeness and statistical reliability among all available data sets collecting income data, from the point of view of MSM building SHIW data are sometimes incomplete, sometimes aggregated at the family level and sometimes completely missing. For instance, although SHIW earnings data are generally considered to be less affected by underreporting (such as for tax evasion) than those declared to the tax authorities, SHIW data are still underreporting real and financial wealth, partly also for involuntary reasons as many

interviewed people have a very vague idea of the value of their real and financial wealth (see Bank of Italy, 2006).

The first task at hand is then to produce a dataset of variables at the personal level, as the personal income tax in Italy is based on an individual tax unit. This task involves some work to classify SHIW data into aggregates that are meaningful from a fiscal perspective, such as income from employment, self-employment income or taxable and exempt incomes. Building and real estate wealth is reported by householders at the market price value, while only cadastral rent enters the personal income tax base. Moreover some family characteristics that are relevant for the determination of the personal income tax are not surveyed at all: the presence of a disabled child is not surveyed, nor are surveyed particular expenses that allow one to claim tax credits or tax allowances (such as medical expenses, donations to charitable institutions, political parties or foundations, medical and assistance expenses incurred by handicapped persons). In order to overcome this limitation the dataset has to be integrated with some external data to produce estimates of some non surveyed data. In particular, in the MSM model described in the next section, data from the analysis of IRPEF tax forms provided by the Italian Ministry of Finance are used (Ministry of Finance, 2006). In some cases data that enter the individual tax base are surveyed at the family level only and have then to be attributed to each individual according to some arbitrary rule. For instance, data about individual income from the participation in a family run business are collected at the family level but no information about shares in the business is provided. We arbitrarily solve this problem by attributing income from family run business to each family member in proportion to the time he worked for it.

Another important issue with microsimulation modelling is the analysis of the sample weights. The vector of individuals weight used to project the sample into the overall population plays a very important role in the MSM final validation. The SHIW sample design is stratified in two steps and to partially correct some sample bias an ex-post stratification was conducted to correct weights and reconstruct the population distribution by age, gender, location of households and size of the municipality of

residence (Banca d'Italia, 2006). The issue of grossing-up weights is relevant especially when simulation are projected to the whole population.[1]

4 An introduction to TABEITA04

The microsimulation model used in this paper is TABEITA04, a TAx BEnefit model for ITAlian personal income taxation using data on income received in 2004, and belongs to the family of MSM developed and maintained at Econpubblica (see also D'Amuri and Fiorio, 2006). TABEITA04 recovers the gross income using Italian personal income tax rule for income earned in 2004.

The basic problem a static microsimulation model has to tackle is the conversion of net incomes to gross amounts. Theoretically the problem is then reduced to the inversion of the tax function and of all the relevant tax-allowance and tax-credit functions. In practice, since tax allowances and tax credits functions depend on the taxpayer's family income structure (fiscal dependency is defined in terms of gross income being below a given threshold), one should find a closed form solution with respect to the gross income of all the family members. Since finding such a closed form solution is hardly feasible one has to resort to a mixed approach relying on the analytical inversion of the tax function and on numerical simulation.

The operation can be described as follows. Let yg_j be the BT income of an individual *j* belonging to an household of size n. Let yn_j be his AT income, A the tax allowance or deduction, which reduces the taxable income, and D is the tax credit. A and D depend on the BT income, on personal and household characteristics of individual *j* and on the vector of incomes of the other family members, ygf :

$$yg_j = yn_j + \mathrm{T}\left[yg_j - \mathrm{A}(yg_j, x_j)\right] - \mathrm{D}(yg_j, x_j, ygf_j) \qquad (1)$$

[1] For a discussion of the way that TABEITA models implements grossing-up weights see D'Amuri and Fiorio, 2006.

The solution is a vector of gross income, yg^*, so that:

$$yg^*_j - yn_j + \mathrm{T}\left[yg_j - \mathrm{A}(yg^*_j, x_j)\right] - \mathrm{D}(yg^*_j, x_j, ygf_j) = 0 \qquad (2)$$

holds simultaneously for every j=1,...,n . Since finding a close form solution for the vector of individual incomes *yg** is not analytically possible, one needs to use also numerical approximation.

In order to solve the system we approached the problem in two steps. In the first step given an estimate of each taxpayer's gross income we calculated tax benefit and tax allowances for the tax payer and for all the household members. The resulting tax benefits and tax allowances are then fed, together with the single taxpayer AT income, in the inverse tax function to get a second estimate of the BT gross income. This was then used to estimate a new level of tax benefits and allowances and the process repeated until a stable solution was achieved.

If tax credits and allowances as given the tax function is easily invertible. The specification of the inverted tax function is the following:

1) A starting value:

$$yg_{j0} = yn_j - D_j \qquad (3)$$

where *yn* is the observed value of the net income of the individual and *D* is the amount of tax credits.

2) An iteration mechanism for all the income tax brackets

$$\begin{aligned} & T_{ji} = Max\left\{0, Min\left\{\frac{t_i}{1-t_i}\left(yg_{j(i-1)} - LB_{ji}\right), t_i\left(UB_{ji} - LB_{ji}\right)\right\}\right\} \\ & yg_{ji} = yg_{j(i-1)} + T_{ji} = yn_j + \sum_{k=0}^{i} T_{jk} \\ & \forall i = 1, 2, ..., I \end{aligned} \qquad (4)$$

where I is the maximum number of tax brackets, t_i is the marginal tax rate of the *i*-th tax bracket, and UB_{ji} and LB_{ji} are respectively the upper bound and the lower bound of the *i*-th income tax bracket calculated for the *j*-th individual according to the following formula:

$$\begin{aligned} UB_{ji} &= UB_i + A_j \\ LB_{ji} &= LB_i + A_j \end{aligned} \tag{5}$$

where UB_i, LB_i are respectively the upper bound and the lower bound of the *i*-th income tax bracket of the general income function and A_j is the amount of the tax allowances that the *j*-th individual is entitled to. The simulated gross income can then also be written as

$$yg_j = yn_j + \sum_{k=0}^{I} T_{jk} = yn_j + T_j$$

In this case a further complication arises from the fact that the SHIW dataset mixes BT and AT income. In fact while generally incomes are surveyed at their AT level, the income from real estate and building property (rents and cadastral income) are recorded at the BT level. This means that when inverting the tax function rents and cadastral income have to be treated differently from other types of income reported at their after-tax levels. While net income is augmented by the net tax, gross income (such as from rents) cannot be augmented in that way as they already include taxes. In order to keep the two income type separated, gross income is treated in the model as a negative tax allowance for the determination of the marginal tax rate and the total due tax.

As stated above if one takes the amount of tax allowances and tax credits as given, the problem of calculating the gross income from the net income is straightforward. What makes the whole process of gross income estimation from SHIW data complex is the interdependence in individual gross income within the family. Since the family is fiscally interdependent through tax credits which are dependent on gross income, the gross income estimation problem has to be solved simultaneously for all the family members.

This means that one needs to solve a system of non linear equations in the form stated in equation (1). To solve such systems one may use different methods, one of the easiest to implement is called the fixed point method (for a complete survey of iterative methods for non-linear system see Conte and de Boor, 1980 and Oliver and Shakiban, 2007).

In general to solve a system in the form $f(x) = 0$, one needs to identify a function in the from $x = g(x)$, so that $\forall x : x = g(x), f(x) = 0$, any solution for the latter is a solution to the former. Such a function is called an iteration function.

In order to find the solution (2) TABEITA04 relies on the following iteration function, expressed in terms of the inverted tax function:

$$yg_j = yn_j + \mathrm{T}^{-1}\left[yn_{\mathrm{j}}; \mathrm{A}(yg_j; x_j); \mathrm{D}(yg_j; x_j; ygf_j) \right]$$

where all variables are defined as above. The iteration algorithm is then specified as

$$yg_{j0} = yn_j$$
$$yg_{ji} = yn_j + \mathrm{T}^{-1}\left[yn_{\mathrm{j}}; \mathrm{A}(yg_{j(i-1)}; x_j); \mathrm{D}(yg_{j(i-1)}; x_j; ygf_{j(i-1)}) \right]$$

for j=1,…,n and i=1,2,3,…

After each iteration an error function is evaluated as:

$$\varepsilon_{ji} = \left| yg_{ji} - yg_{j(i-1)} \right|$$

The system is iterated until an exit condition is met in the form of

$$\varepsilon_{ji} < \varepsilon \qquad \forall j = 1,..,n$$

Where ε is an arbitrarily small number. Under conditions of regularity of the iteration function, the convergence of the iteration function towards a fixed point is a sufficient condition for the fixed point to be a solution to the original equation.

When such a value is found it is called a fixed point equilibrium for the system. Fixed points can be divided in three classes:

- asymptotically stable when all the nearby solution converge towards it,
- stable when all the nearby solutions converge towards the fixed point,
- unstable when most of the nearby solutions diverge away from the fixed point, and the only stable solution around the fixed-point is the fixed point itself.

In general the fixed point iteration method applied to the tax inversion problem may generate all types of fixed points. The behaviour of the system is governed by the value of the first derivative of the inverse tax function: when the absolute of the first derivative evaluated at the fixed point is less than one then the fixed point is asymptotically stable otherwise the fixed point is unstable.[2]

When this situation occurs the system has multiple solutions and we do not have any way to discriminate since all of them are possible solutions to the problem. TABEITA04 deals with the existence of multiple solutions with a sub algorithm that identifies them. For instance, multiple solutions occur when the actual value of the gross income falls very close to the threshold of a non continuous tax credit or tax allowance function and the same level of net income is compatible with two different levels of gross income resulting from the attribution of two different values of a tax credit, or again within a family when the distribution of observable net incomes is compatible with more than one tax credit sharing scheme between the parents.

TABEITA04 model was validated against the data made available from the Italian Ministry of Finance for the year 2003 (Ministry of Finance, 2006). Unfortunately, to the best of our knowledge, no data for year 2004 is currently available. The validation process has been undertaken maintaining the sample weights calculated by Bank of Italy

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[2] In general fixed points are stable, with the notable exceptions of some cases in which steps in the tax allowances or tax credits structures, coupled with the interdependence of gross incomes within the household, generates orbits. A orbit is a situation in which the iteration function jumps between multiple solutions without ever converging to a specific one. When the system falls into an orbit the the convergence condition are satisfied every k iterations, so that examining the process of the iteration function we find that:

$$yg_{j(i+k)} = yg_{ji}$$

and included in the SHIW04 dataset. As SHIW data are well known to aggregate to larger figures than total declared income in official tax forms, the data have been calibrated to tax form data by assuming different rates of tax evasion. According to this calibration, tax evasion of employment, self-employment, capital, and real estate and building property incomes have been estimated at the 5%, 50%, 60% and 40%, respectively. Figure 1 plots the cumulative distribution of taxpayers by BT income class using tax forms data and declared income as simulated by TABEITA04: results seem to be pretty close with actual data. The main problem lies in the overestimation of the frequency of lower-to-middle income tax payers (from € 10,330 to € 60,000) and the subsequent underestimation of the frequency of higher income tax-payer.

Overview of TABEITA04

TABEITA integrates the individual tax inversion approach with the family joint solution in the following way:

1) An arbitrary starting point is chosen as the first estimate of gross income for each individual.
2) Given the vector of estimated gross income for the individuals belonging to each family the family income structure is analyzed to identify fiscal dependencies within the family (dependent children, dependent spouse and other relatives).
3) Income dependent tax credits and allowances are calculated for each individual depending from the family structure.
4) For each family a benefit sharing scheme is calculated to ensure that all the tax credits that are freely transferable between members of the family are allocated to taxpayers in the families so that overall tax burden is minimized.
5) Transferable tax benefit are allocated to individuals according to the sharing scheme defined before.
6) The “no-tax area” allowance is determined taking into account each individual overall income, income type and other tax allowances.
7) The full profile of tax credits and tax allowances is calculated for each individual.
8) The gross and net tax debt are calculated for each individual.
9) The estimate for each individual gross income is calculated by adding the net tax debt to the net income and observed gross income.
10) An exit condition is evaluated in the form of a threshold for the difference between the gross income estimated in the current iteration an the gross income estimated in the previous iteration. The algorithm is iterated replacing the starting value of iteration j with the end value of iteration j-1 until the exit condition is verified.

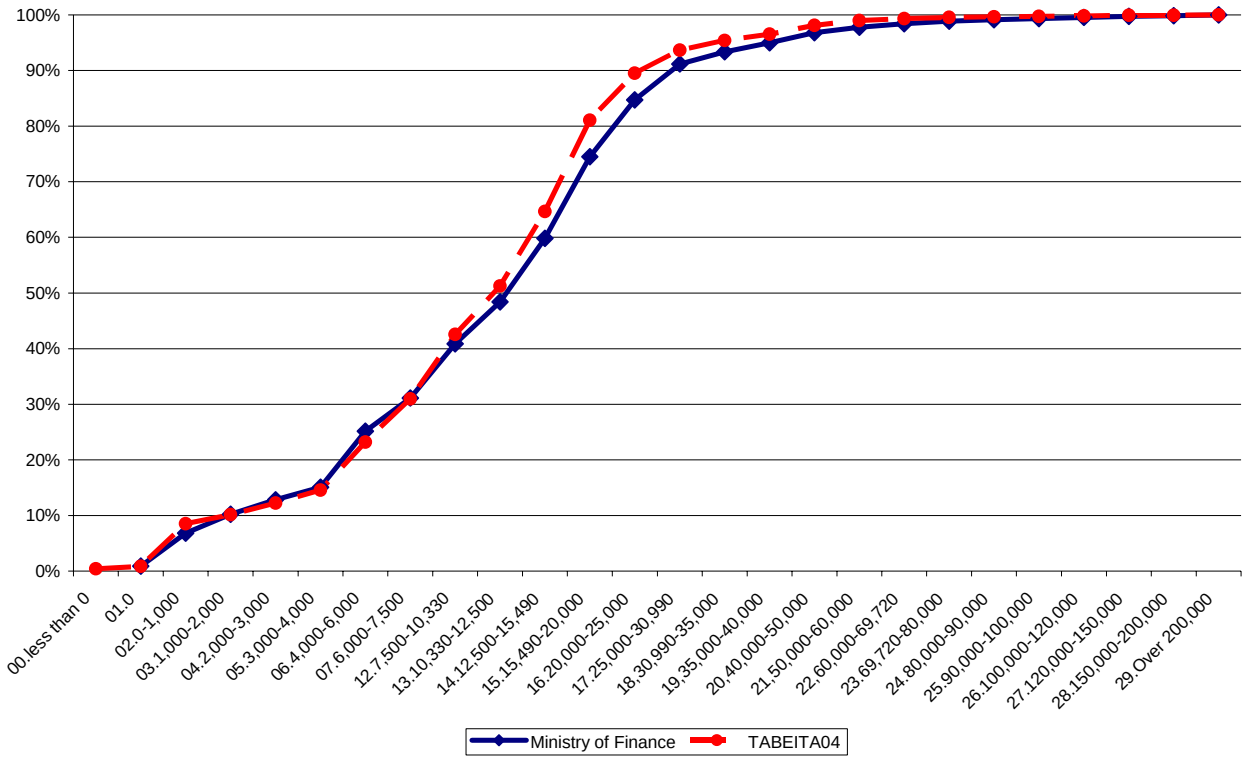

Figure 1: comparison between tax form data and estimated declared income using TABEITA04

5 What if Italy switched to family taxation?

In this section we try to answer two main questions: (a) is it true that families would benefit more (i.e. pay less taxes) if the tax unit was the family rather than the individual? (b) How would the marginal tax rate change for the second earner if the family instead than the individual tax unit was used?

By using TABEITA04, we answer these questions simulating alternative tax rule scenarios. Instead of defining our own family tax system, we considered the French tax

system as a benchmark, and developed our simulations accordingly.[3] The French tax system differs from other family income tax systems, such as the US and the German ones as it is not an exact splitting of a couple total income, but is based on the definition of a family dimension (*quotient familial*, henceforth QF).

The French splitting method is used to take into consideration the family size and to lessen the impact of tax progressiveness by applying the progressive tax rate to a definition of income per parts. The method consists in dividing the taxable income of the fiscal family by the QF (which is equal to one for a single person, to two for a married couple, an additional half for each of the first two dependent children and an additional part for each dependent child thereafter), obtaining a taxable income per parts or equivalent taxable income. Then, the progressive tax bracket system is applied to the taxable income and, by multiplying the result by QF, the final due gross tax is obtained. The final net due tax, T_J, of a generic family *J* in the population is obtained as:

$$\mathrm{T_J}=\mathrm{T}\left(\frac{Y_J-\mathrm{A_J}}{\mathrm{QF_J}}\right)\mathrm{QF_J}-\mathrm{D_J}$$

where A is tax deduction, which reduces the taxable income, D is the tax credit reducing the due tax, $T(\bullet)$ is the tax bracket system and $Y=\sum_{j\in J} yg_j$ is the sum of BT incomes of all family members.

Unfortunately, the QF is not the only difference between the Italian and the French tax systems: non-taxable incomes, tax deductions, tax credits, and tax bracket structure differ, as there is no coordination at all between Italy and France as far as personal income taxation is concerned. These differences often have very important effects on the final due tax (for a brief overview of the French tax system, see MEFI, 2005).

[3] A similar exercise was performed by Bachlet et al. (2005), replacing the German with the French tax system. However, both the French and the German tax system are defined on a family unit bases, although the splitting method is different.

Our exercise is not a comparison between Italian and French income tax systems, but a comparison between the actual 2004 Italian tax system and an alternative tax system where some features are taken from the 2004 French tax system. In particular, we only adopt the following features:

a) the definition of fiscal family, i.e. the unit that defines the tax unit;

b) the coefficients for the calculation of the QF;

c) the tax bracket structure.

The fiscal family is made of the parents, the dependent children and other dependent relatives. To be considered a dependent person, according to the 2004 French tax system one has to have an income below a given threshold. In our simulation we set the threshold of € 2,840.51, which is the one used in Italy for defining a dependent relative. The fiscal family is then different from a biological family as children and other relatives are considered a fiscally separate family if they have an income over the threshold. Hence, the number of families of the SHIW sample is smaller than the number of fiscal families. In particular in the 2004 data set, there are 8,012 families and 10,144 fiscal families.[4]

The QF parameter are set as in the French system. The French tax bracket structure is reported in Table 1. Compared to the Italian one it is clearly more progressive with a lower tax rate equal to 0%, while Italian one is 23% and a top tax rate of 48.09%, while Italian is 45%.

4 Although we refer to families, the SHIW data set only records households, i.e. a group of people sharing the same dwelling. As it is impossible to recover the family as distinguished from the household, given the information provided, we ignore the difference between family and household, as it is common practice when using SHIW dataset.

Tax bracket system

France		Italy	
Income brackets	Tax rate	Income brackets	Tax rate
€0-€4,334	0%	€0-€15,000	23%
€4,334-€8,524	6.83%	€15,000-€29,000	29%
€8,524-€15,004	19.14%	€29,000-€32,600	31%
€15,004-€24,294	28.26%	€32,600-€70,000	39%
€24,294-€39,529	37.38%	€70,000 and over	45%
€39,529-€48,737	42.62%		
€48,737 and over	48.09%		

Table 1: The French and Italian tax bracket system for income earned in 2004.

There is another important issue involved in our, as well as in similar tax simulation exercises: if different tax units and tax systems are considered, the total tax revenue might change. We analyze what happens to the family due tax both in the case of constant tax structure and of constant total tax revenue.

Constant tax revenue is achieved by increasing each marginal tax rate by a constant amount. Some other simulations might have been developed, such as those modifying the income brackets of the tax rule or those changing the number of tax brackets. Some other were explicitly ruled out. In particular, a constant tax revenue achieved by increasing tax rates proportionally was not performed as it would significantly increase the top tax rate and we feel it would be politically unfeasible. In all simulations presented, whenever QF system is used, the 2004 IRPEF tax credits for family burdens have been removed. Other tax credits and tax deductions are left in place and summed up among the members of the same fiscal family.

Table 2 presents the amount gained or lost on average by couples and singles, with and without children and by income classes, if the Italian tax system for incomes earned in 2004 was replaced by a QF system. In Table 2 the tax revenue is held constant. In the first part of the table, the Italian tax bracket system is used. Looking at the first part of the table, it clearly emerges that those benefiting the most are high income families, as they can greatly reduce their average tax rate when incomes are not evenly earned in the family. Interestingly, couples without children benefit more than couples with children, especially for family incomes below €50,000. Singles with children would also be net losers when their family income is below €30,000. In other words, for families with

children and low income it would clearly be preferable to keep the individual tax unit system with 2004 tax credits for family burdens than moving to a family tax unit system similar to that in place in France. A different picture emerges from the bottom panel of Table 2, where the Italian is replaced with the French tax bracket system. As the latter is more progressive than the former, if Italy adopted the French tax bracket structure as well as the French definition of tax unit, low income families would benefit. However, it should also be noted that on average couples without children would benefit more than families with children. In fact, couples without kids where both spouses have an income over € 2,840.51 would benefit for the reduction of tax rates for income splitting caused by the QF, while in the actual system they cannot claim tax credits for dependent children nor tax credit for dependent spouse.

Family type/ Scenarios	Income class (in €)	Couples with children	Couple without childrens	Singles with children	Singles without childrens	Whole sample
QF Italy	0 or less	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00
	0-10,000	-€ 132.04	-€ 74.94	-€ 82.45	-€ 0.30	-€ 72.43
	10,000-15,000	-€ 654.38	-€ 100.84	-€ 362.86	€ 5.49	-€ 278.15
	15,000-20,000	-€ 799.54	-€ 3.87	-€ 477.29	€ 18.01	-€ 315.67
	20,000-30,000	-€ 609.65	€ 186.07	-€ 271.88	€ 26.93	-€ 167.13
	30,000-50,000	-€ 203.22	€ 432.36	€ 1,217.00	€ 53.07	€ 374.80
	50,000-80,000	€ 1,678.29	€ 1,540.24	€ 4,327.00	€ 66.29	€ 1,902.95
	80,000 or over	€ 5,659.98	€ 3,134.24	€ 10,474.00	€ 158.12	€ 4,856.58
QF France	0 or less	€ 0.00	€ 0.00	€ 0.00	€ 0.00	€ 0.00
	0-10,000	€ 1.85	€ 26.07	€ 14.53	€ 147.41	€ 47.46
	10,000-15,000	€ 162.18	€ 552.00	€ 513.35	€ 776.63	€ 501.04
	15,000-20,000	€ 821.31	€ 1,353.54	€ 1,552.98	€ 127.78	€ 963.90
	20,000-30,000	€ 1,542.12	€ 1,594.25	€ 1,956.00	-€ 1,510.94	€ 895.36
	30,000-50,000	€ 771.97	-€ 428.58	€ 1,531.70	-€ 5,281.98	-€ 851.72
	50,000-80,000	-€ 2,521.43	-€ 5,775.42	-€ 107.57	-€ 12,274.51	-€ 5,169.73
	80,000 or over	-€ 14,865.25	-€ 19,627.47	-€ 2,698.00	-€ 33,850.88	-€ 17,760.40
Mean of QF Italy		€ 617.43	€ 639.16	€ 1,852.94	€ 40.95	€ 787.62
Mean of QF France		-€ 1,760.91	-€ 2,788.20	€ 345.37	-€ 6,483.31	-€ 2,671.76

Source: Our calculations using TABEITA04 on SHIW04.

Notes: Number represents the average difference between the actual Italian personal income taxation and alternative scenarios, by family. Income is total family income. Scenario "QF Italy" means that French family splitting have been introduced in place of Family tax allowances, with Italian tax bracket structure and holding tax revenues constant. Scenario "QF France" means that French family splitting have been introduced in place of Family tax allowances, with French tax bracket structure and holding tax revenues constant.

Table 2: Gainers and losers with respect to personal income taxation, by family type, and income class.

Although absolute changes are relevant, they do not necessarily reflect the change in standard of livings, as larger families may enjoy some economies of scale, such as for rent and heating. Typically living standards are evaluated looking at equivalent incomes, by dividing the household income by an equivalence scale. The equivalence scale used in this paper is the QF coefficient, i.e. the equivalence scale assumed by the French fiscal authorities.

By using nonparametric regression, we estimate the relationship between equivalent AT and BT income to assess the average effect of the simulations at different level of BT income. Figure 2 shows another relevant feature of the effect of introducing the QF in the Italian taxation: had the family tax unit been used to replace the individual tax unit in the Italian income tax system, the change of average equivalent AT income would have been negligible on average, regardless of the BT income. The tax rate adjustment for holding the total tax revenue constant would also be limited: the tax rates had to be increase only by 5%. Instead, had the QF been introduced together with the French tax bracket system, the equivalent AT income would have been higher but the tax revenue would have been much smaller. To keep the tax revenue constant, each tax rate had to be increased by 13% with a bottom rate of 13% and a top tax rate of 61%.

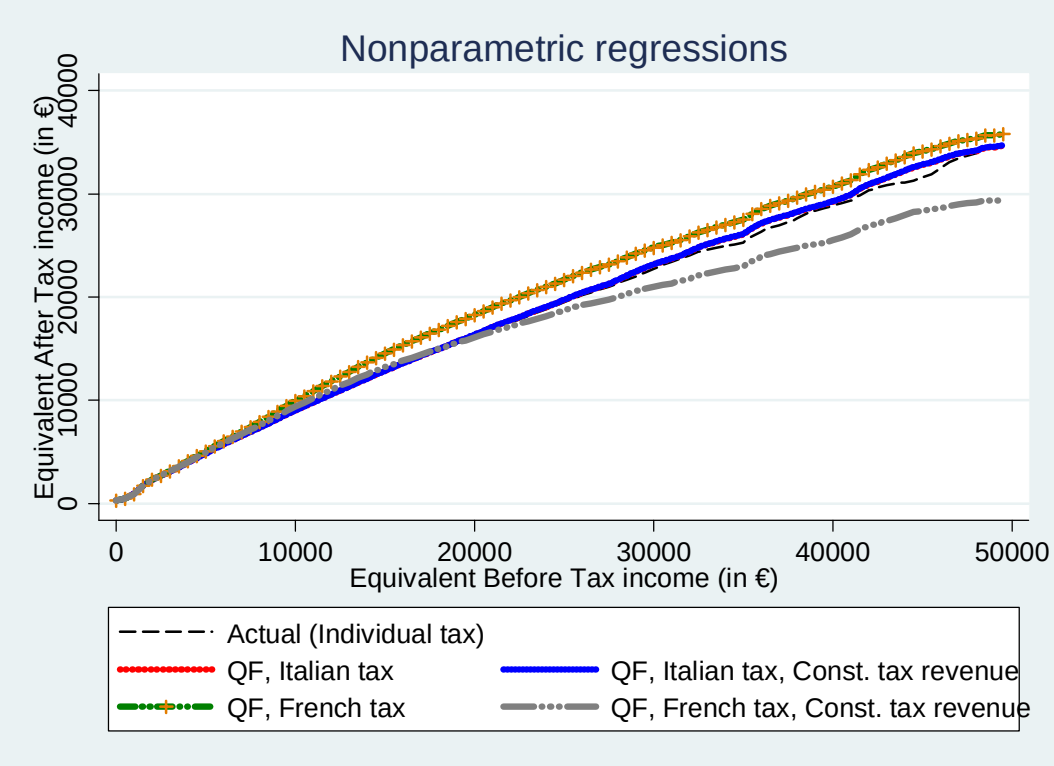

Figure 2: Average relationship between After Tax and Before Tax equivalent income.

Also the density of equivalent AT income would change. The QF, with French tax brackets and constant tax revenues would reduce the density at low income levels and increase that at equivalent after-tax income around €15,000 (Figure 3).

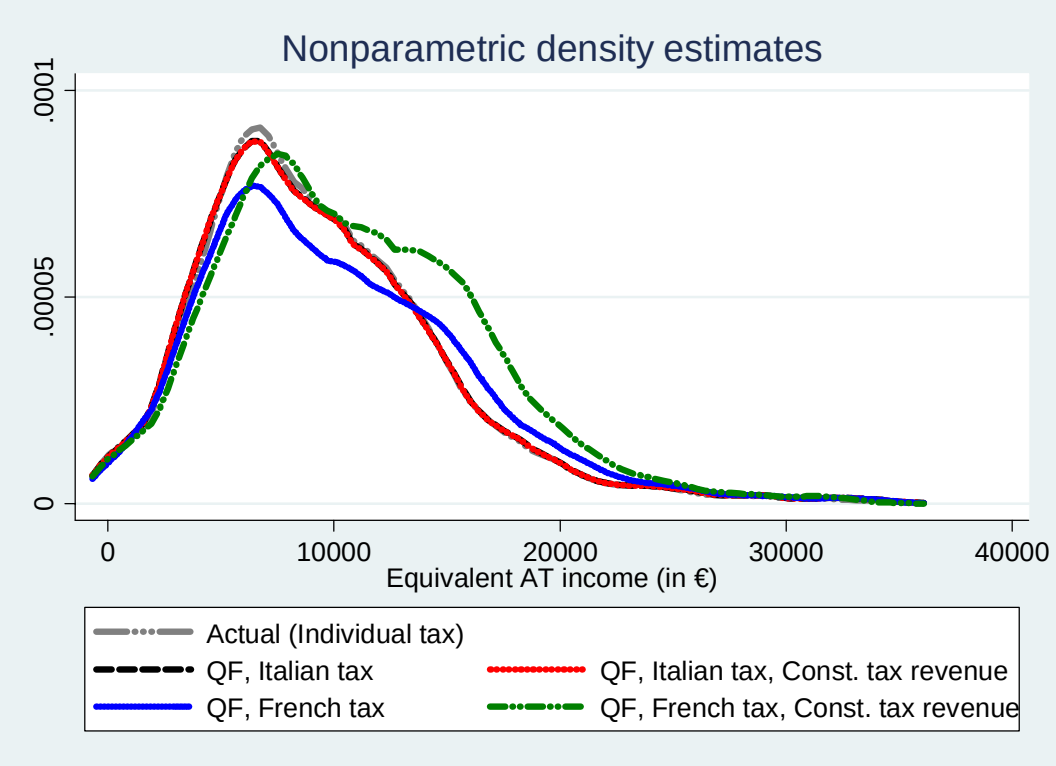

Figure 3: Estimates of equivalent income densities under different simulated scenarios.

Results of the simulation can also be analyzed using some indices for the measurement 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 C_t and the Gini index of before-tax income, G_y;

$$K_t = C_t - G_y$$

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; Lambert, 1993).

The redistributive effect looks at the shift from BT to AT income. With no reranking, 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 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 ($t/(1-t)$):

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

Hence the redistributive effect is determined by disproportionality and tax incidence. As Table 3 shows, progressivity increases if the French tax bracket system is used. Redistribution according to the Reynolds-Smolensky index is not much larger if the French case is considered.

Family income

	K	*RS*	*Gini BT*	*Gini AT*
Actual Italian tax	0.250	0.044	0.408	0.366
QF, Italian tax	0.216	0.038	0.408	0.371
QF, Italian tax, Const. Tax revenue	0.217	0.038	0.408	0.371
QF, French tax	0.431	0.030	0.408	0.378
QF, French tax, Const. Tax revenue	0.306	0.053	0.408	0.357

Equivalent family income

	K	*RS*	*Gini BT*	*Gini AT*
QF, Italian tax	0.272	0.048	0.387	0.340
QF, Italian tax, Const. Tax revenue	0.237	0.042	0.387	0.347
QF, French tax	0.237	0.041	0.387	0.347
QF, French tax, Const. Tax revenue	0.493	0.037	0.387	0.350

Source: Our calculation on SHIW using TABEITA04
Note: AT means after-tax, BT means before-tax.

Table 3: Progressivity and redistributive effects in different simulations

A tax system with family tax unit, such as the French system based on the QF, is expected to reduce the incentives to enter the labour market if one is the second earner in the couple, as with a family tax unit the entering marginal tax rate is typically higher than with an individual tax unit. For estimating the effect on labour force participation

of second earners of a switch to a family tax system, one would need a behavioural MSM. Although TABEITA is only a static MSM and it cannot provide any elasticity estimation of second earner's labour supply, it can still be used to have an idea of how relevant this problem may be and what proportion of the population would be affected.

Table 4 shows that even with a individual tax system, in 2004 only 16% of spouses were earners, 80% of which being female. However, nearly 85% of spouses was not earning any income.

	Sex of the spouse		
	Male	Female	Whole sample
Spouse is an earner	631	2,581	3,212
	6.31%	24.40%	15.61%
Spouse is not an earner	9,372	7,997	17,369
	93.69%	75.60%	84.39%
Total	10,003	10,578	20,581
	100.00%	100.00%	100.00%

Source: Our calculations on SHIW using TABEITA04.

Table 4: Frequency of earning spouse, by sex.

In Table 5 it is shown that 5,192 out of 10,144 families are made of couples, from a fiscal point of view. Hence, the disincentive effects of family tax systems would be relevant for more than 50% of families, where a great majority of second earners (see Table 4) did not enter the labour market even with an individual unit tax system. A switch to a family unit tax system would certainly not improve the situation. Table 6 shows in which bracket falls the income of the main earner's spouse if individual tax unit is used and where it would fall if family tax unit was used instead. It shows that 71% of spouses who have zero tax rate with actual Italian tax system would start from a positive taxable income and face a 23% marginal tax rate if the QF was used instead. Also some of the spouses who already are working would face a higher marginal tax rate. For instance, 10% of those taxed at a 23% marginal tax rate would fall in the third tax bracket with tax rate equal to 29% if the QF system was introduced. Looking at frequencies along and above the main diagonal of Table 5, although 57% of second

earners would face no change in their marginal tax rate, 38% of them would experience an increased tax burden.

	Single	Couple	Total
Only one earner	4,802	1,729	6,531
	96.97%	33.30%	64.38%
Two earners		3,200	3,200
		61.63%	31.55%
No earners	150	263	413
	3.03%	5.07%	4.07%
Total	4,952	5,192	10,144
	100.00%	100.00%	100.00%

Source: Our calculations on SHIW using TABEITA04.

Table 5: Frequency of number of earning spouses, by type of family

			QF, Italian tax Marginal tax rate of the main earner's spouse.						
			0	0.23	0.29	0.31	0.39	0.45	Total
Individual Italian tax. Marg. tax rate of the main earner's spouse		0	144	389	10	0	2	0	545
			26.42%	71.38%	1.83%	0.00%	0.37%	0.00%	42.95%
		0.23	23	536	64	2	7	1	633
			3.63%	84.68%	10.11%	0.32%	1.11%	0.16%	49.88%
		0.29	0	21	40	2	4	0	67
			0.00%	31.34%	59.70%	2.99%	5.97%	0.00%	5.28%
		0.31	0	0	3	2	2	0	7
			0.00%	0.00%	42.86%	28.57%	28.57%	0.00%	0.55%
		0.39	0	0	3	6	7	1	17
			0.00%	0.00%	17.65%	35.29%	41.18%	5.88%	1.34%
		Total	167	946	120	12	22	2	1,269
			13.16%	74.55%	9.46%	0.95%	1.73%	0.16%	100.00%

Source: Our calculations on SHIW using TABEITA04.

Table 6: Proportion of spouses by tax brackets and type of tax unit, with Italian tax bracket structure.

6 Conclusions

In this paper we analyse what are the likely effects on taxpayers if the Italian income taxation changed from an individual to a family tax unit. The analysis was performed using TABEITA04, a tax-benefit microsimulation model for Italy. Simulations were performed assuming that tax credits for family burdens of the 2004 Italian taxation were removed by a family taxation similar to the French *quotient familial*. Although several other sensible simulations could be performed, the one proposed has the merit of being simple.

Probably with surprise to some readers, results show that households with kids might, on average, even lose from such a reform as they are better off with an individual tax system which provides generous tax credits for family burdens. The simulated reform would also be extremely costly in terms of labour force participation of spouses. In our sample, over 80% of spouses in our fiscally defined families are not working and nearly 40% would face an increased marginal tax rate if the family tax unit was introduced. Those benefiting the most would be couples without children where both spouses are working, who are not enjoying any tax credit in the current tax system. Supporters of family tax unit for income taxation, even outside Italy, should be aware of these results.

Appendix: Some details of the IRPEF structure

Standard tax allowances

In general real estate and building income derived enter the tax base at a conventional value, the "cadastral value". The cadastral value is the value attributed to land and buildings by the cadastre office on a conventional basis taking into account factors such as the surface area, the location and the quality of the building. In case the real estate or building is not rented, a virtual income is charged to the taxpayer (cadastral rent), based on the estimated cadastral value, which is often much lower than the market value. However, home owners are entitled to fully deduct the cadastral value of their home from their tax base, regardless of their income and the value of their home.

Other standard tax allowances include compulsory and voluntary social security contributions, up to a certain amount, periodical benefits allowed to the spouse as decided by judicial authority, charitable donations to certain religious institutions and non-governamental organizations, medical and assistance expenses incurred by handicapped persons.

The no-tax area tax allowance

The no-tax area tax allowance was introduced in 2003 to preserve the progressive nature of the tax system after a fiscal reform that raised the first marginal tax rate from 19% to 23%, and erased tax credits that until the previous year were granted for employment, self-employment and pension income. Analogously to erased tax credits, also 2004 no-tax area tax allowances are differentiated by type of income. A general deduction (€3.000) is recognised to all the tax payers, while an extra deduction, is granted only to tax payers whose main income come from employment, pensions or self employment.

Income type	General deduction	Extra deduction	Total maximum deduction, $\overline{A}_j$
	(a)	(b)	(a)+(b)
Employment	3,000	4,500	7,500
Pensions	3,000	4,000	7,000
Self Employment	3,000	3,000	6,000
Other	3,000	0	3,000

Table 7: The “no-tax area” tax allowance.

For taxpayers with more than one type of income the most favourable deduction is applied and for employees and pensioners the deduction is assigned pro-quota in function of the days of work/pension in the year. The mechanism work as a tax shields for income below the threshold (total maximum deduction) defined as the sum of the general deduction (column (a) of Table 7) and the extra deduction (column (b)), which is income specific. For instance, a pensioner with an income below €7,000 does not have to pay any tax. When the income level is above the total maximum deduction level ($\overline{A}_j$), the no-tax area tax allowance of individual *j* is determined as:

$$A_{NTAj} = \bar{A}_j \times \frac{(€26,000 + \bar{A}_j - yi_j)}{€26,000}$$

where is yi_j is taxable income, which is equal to gross income minus standard tax allowances.

Tax credits

Gross tax income is obtained applying the progressive tax bracket schedule as in Table SAW. Net tax is finally obtained reducing the gross tax by the amount of tax credits.

Most important tax credits are those for family burdens, which include dependent spouse, children and other relatives. From a fiscal standpoint a dependent relative is any relative who received an income lower than €2.840,51 throughout 2004. Typically a relative person is the spouse and children. Standard tax credits are generally determined depending on the tax payer gross income and to some other specific characteristics of the household. For instance, tax credits vary according to the number of children (Table 8). A taxpayer is entitled to full children tax credits if the spouse is dependent, otherwise it can be freely shared by parents The family tax credits then augmented by € 123,95 for every child under the age of 3, while disabled children give the tax payer entitlement to a detraction amounting to €774.69 regardless of income level. For single parent taxpayers are allowed to claim for the first child the same tax credit allowed for a dependent spouse, which is more generous (Table 9). Other dependent relatives tax credit are lower in amount and also dependent on the taxpayer's gross income (Table 10).

Children	Income brackets (in €)	First Child (in €)	Other Children (in €)
1	0 - 36,152	516.36	.
1	36,152 – 51,646	303.68	.
1	51,646 and over	285.08	.
2	0 - 41,316.55	516.36	516.36
2	41,316.55 - 51,646	303.68	336.73
2	51,646 and over	285.08	285.08
3	0 - 41,481.12	516.36	516.36
3	41,481.12 - 51,646	303.68	336.73
3	51,646 and over	285.08	285.08

Table 8: Tax credits for dependent children

Income brackets (in €)	Tax allowance (in €)
0 – 15,494	546.18
15,494 – 30,987	496.60
30,987 – 51,646	459.42
51,646 and over	422.23

Table 9: Tax credits for dependent spouse

Gross income (in €)	Tax allowance (in €)
0 - 51,646	303.68
51,646 and over	285.08

Table 10: Tax credits for other dependent relatives

In 2004 the no-tax area tax allowances did not completely replace tax credits for employment, self-employment and pension incomes. Some of the latter were temporarily maintained for 2004 IRPEF. The level of these tax credits can be found in Table 11.

Employment		Self-employment		Pension	
Gross income (in €)	Tax allowance (in €)	Gross Income (in €)	Tax allowance (in €)	Gross Income (in €)	Tax allowance (in €)
27,000-29,500	130	25,500-29,400	80	24,500-27,000	70
29,500-36,500	235	29,400-31,000	126	27,000-29,000	170
36,500-41,500	180	31,000-32,000	80	29,000-31,000	290
41,500-46,700	130			31,000-36,500	230
46,700-52,000	25			36,500-41,500	180
				41,500-46,700	130
				46,700-52,000	25

Table 11: Tax credits by type of income.

Finally, all taxpayers are allowed to deduct from gross tax 19% of some expenditures, including a capped amount of mortgage loan interest, medical expenses exceeding € 129.11, payments to insurance funds up to € 1,291.14, expenses to for secondary and university education of taxpayers and dependent relatives, funeral charges up to € 1,549.37, expenses for disabled persons, donations

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