The Non-Behavioral Module of the Italian Microsimulation Model EconLav

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CONTENTS

1 INTRODUCTION ......................................................................................................................... 3

2 DATA ........................................................................................................................................ 4
   2.1 The SHIW data ......................................................................................................................... 4
   2.2 Fiscal households ..................................................................................................................... 5
   2.3 Non sampling errors ............................................................................................................... 5
   2.4 Gross incomes ....................................................................................................................... 6

3 THE NON-BEHAVIORAL MODULE OF ECONLAV ......................................................... 7
   3.1 Tax evasion ............................................................................................................................. 7
   3.2 Simulation of the 2002 Italian tax-benefit system ................................................................. 8
   3.3 Structural changes of the Italian tax-benefit system over time ............................................. 10
   3.4 Software implementation ..................................................................................................... 11

4 PREDICTIONS OF TAX AGGREGATES ............................................................................. 11

5 MARGINAL EFFECTIVE TAX RATES (METRS) ............................................................. 12

6 CONCLUDING REMARKS AND FUTURE DEVELOPMENTS ........................................... 13

REFERENCES .............................................................................................................................. 14
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Abstract

This paper presents the non-behavioral module of EconLav, a new microsimulation model of the Italian tax-benefit system which is coordinated by ISFOL with the support of the Ministry of Economy and Finance and the Ministry of Labor. First, we describe a number of data quality issues which often arise in the development of a microsimulation model and the strategies adopted to cope with these issues. Then, we discuss the most important features of our model including estimation of incomes from work hidden to tax authorities, simulation of accounting rules embedded in the Italian tax-benefit system, software implementation and other relevant computational issues. Model's performances are assessed by comparing weighted predictions of the main tax aggregates with the corresponding figures from administrative tax data. Furthermore, we use the non-behavioral module of EconLav to compute marginal effective tax rates (METRs) for different groups of the Italian population.

JEL Classification: C42, C81, D10, D31 and H31

Keywords: Microsimulation models; tax-benefit system; policy evaluation, policy design, data quality issues; marginal effective tax rates.

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1 INTRODUCTION

Since the pioneering work of Orcutt (1957), microsimulation models (MSMs) have been used by academic researchers, national governments and international organizations as powerful tools for the evaluation and design of fiscal and social policies. The idea behind policy evaluation is quite simple. Given a baseline tax-benefit system and a set of relevant outcomes considered for policy purposes (e.g. poverty measures, income inequality indicators, tax revenues, effective tax rates, measures of tax progressivity and labor supply), these models allow to estimate the causal effects of a policy reform by numerically simulating the tax-benefit system before and after the policy intervention. Under a suitable set of assumptions, this exercise can then be viewed as a controlled experiment where the outcomes of interest may only vary in response to simulated changes in the baseline tax-benefit system. If other elements of the model are allowed to vary, then it should be possible to disentangle the direct effects due to the simulated policy intervention from the indirect effects due to variations of other endogenous phenomena. MSMs are used, for example, to investigate who gains and who loses from a new policy reform, the welfare effects of a new policy reform in terms of poverty and income inequality, the tax incidence of a new budget law, the sustainability of a tax-benefit system and the labor supply effects of alternative taxation schemes. MSM can be also used as a policy design tool. This kind of analysis may involve choosing the eligibility criteria of a mean-tested benefit to reach particular segments of the target population, setting the amount of a benefit which is consistent with a certain variation of the public budget, defining the policy coefficients of a given taxation scheme in order to boost the female participation rate.

This paper describes the main features of EconLav, a new MSM of the Italian tax-benefit system which is coordinated by ISFOL with the support of the Ministry of Economy and Finance and the Ministry of Labor. Specifically, EconLav is a static MSM which ignores inter-temporal phenomena related to both demographic changes of the target population over time (e.g. mortality, ageing, marriage, fertility, divorce) and other dynamic events that may interact with the simulated policy reforms (e.g. education, consumption and saving decisions). Moreover, it is a partial equilibrium model where prices, wages and other quantity constraints are taken as given. Compared to other Italian MSMs, our model provides a very detailed representation of the Italian tax-benefit system and it allows to estimate labor supply responses of the simulated policy interventions. The model consists of two modules. The ‘non-behavioral’ module assumes that agents’ choices are not affected by the simulated policy reforms. This assumption is relaxed in the ‘behavioral’ module which embeds a structural model of labor supply with taxes to predict how simulated changes in the baseline tax-benefit system may affect agents’ labor supply decisions. By comparing outcomes from the behavioral and non-behavioral modules, one can also identify and disentangle first order effects (i.e. variations in the outcomes due to simulated policy reforms) from second order effects (i.e. variations in the outcomes due to changes in agents’ behaviors).

In this paper, our attention is focused on the non-behavioral module of EconLav because the importance of the issues addressed in this part of the model is often understated. First, it is worth noticing that this module remains the most attractive tool to use when evaluating public

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1 A description of the structural module of labor supply estimated in EconLav can be found in De Luca et al (2012).
policies which are expected to have negligible labor supply effects. Second, accuracy of the behavioral module depends crucially on accuracy of the non-behavioral module because the latter is iteratively used by the former to approximate the agents’ budget constraints over a finite set of job opportunities. Third, as argued by Martini and Trivellato (1997), the interface between MSM and survey data is often complicated by a number of methodological and empirical issues that may undermine accuracy of the model. Hence, it is important to identify the most worrisome sources of error and evaluate effectiveness of the proposed corrections. After discussing the main issues faced in the construction of the non-behavioral module of EconLav, we compare weighted predictions of tax aggregates with figures from administrative tax data in order to assess the model’s performances in reproducing the main features of the Italian tax-benefit system. Furthermore, we compute marginal effective tax rates (METRs) to evaluate incentive and disincentive effects of the effective tax schedule faced by different groups of the Italian population.

The remainder of the paper is organized as follows. Section 2 describes the Survey on Household Income and Wealth (SHIW) focusing on the methodological issues that may affect accuracy of our MSM and the procedures adopted to cope with these issues. Section 3 discusses the key features of the non-behavioral module including estimation of incomes from work hidden to tax authorities, simulation of accounting rules embedded in the Italian tax-benefit system, software implementation and other relevant computational issues. Section 4 presents comparisons between model predictions and administrative tax aggregates, while Section 5 presents METRs for different population groups. Finally, Section 6 offers some concluding remarks.

2 DATA

EconLav uses cross-sectional data from the 2002, 2004, 2006 and 2008 waves of the Survey on Household Income and Wealth (SHIW), a multipurpose household survey on the resident Italian population carried out every two years by the Bank of Italy.

2.1 The SHIW data

The sampling design of the SHIW is based on a two-stage procedure with municipalities selected as primary sampling units and households selected as secondary sampling units. In the first stage, municipalities with more than 40,000 inhabitants are selected with certainty, while smaller municipalities are selected with probability proportional to the size of their populations. In the second stage, households are randomly selected from the registry office records of each municipality. According to this sampling design, the baseline sample unit is the household, which is defined as a group of individuals linked by ties of blood, marriage or affection, sharing the same dwelling, and pooling all or part of their incomes. The sample of each wave includes about 8,000 households and 22,000 individuals. Most interviews are conducted by Computer Assisted Personal Interview (CAPI) and the survey instrument covers a wide range of topics including socio-demographic characteristics, labor force status, income, consumption, saving
and wealth. Questions on the whole household are answered by either the household head or the household member who is most knowledgeable about financial matters. Questions about individual incomes are instead answered by each household member and proxy reporting is allowed only if the designed respondent is absent during the interview. Additional information on the SHIW can be found in Brandolini (1999).

### 2.2 Fiscal households

Although the Italian tax-benefit system is based on an individual taxation scheme, tax credits for dependent family members and family allowances are assigned to groups of individuals that may not coincide with the definition of household adopted in the SHIW. To get a suitable representation of the eligibility criteria underlying these accounting rules is then necessary to define the concept of ‘fiscal household’. Specifically, a fiscal household may include the household head, the spouse (if any, but not the partner), plus children and other relatives whose total taxable income before deductions is lower than 2,840.51 Euro. This definition suggests that each household in the SHIW may contain more than one fiscal household. After using information on parental relationships and total taxable income, our model identifies about 27 millions of fiscal households against 21 millions of households as defined in the SHIW.

### 2.3 Non sampling errors

Non sampling errors such as nonresponse and measurement errors are well known data quality issues that may affect accuracy of MSMs built up on survey data (see Martini and Trivellato 1997). In the SHIW, one of the most worrisome sources of non sampling errors is unit nonresponse (i.e. survey nonparticipation). The unweighted household response rate of the 2002 wave is equal to 34 percent and explicit refusal to participate is the main reason for lack of cooperation with the survey request. The data validation study of D’Alessio and Faiella (2002) further suggests that the participation probability is significantly lower among well-off households and those headed by highly educated individuals. Measurement errors due to under-reporting, recall errors and intentional misreporting of incomes from work, pensions, real estates and financial assets are other important sources of non sampling error that may generate a downward bias in the observed distributions of income and wealth (see Biancotti et al. 2008; Neri and Zizza 2010).

Our strategy to deal with these sources of non sampling errors relies upon the weighting procedure developed by Deville and Särndal (1992). This procedure gives calibrated weights which are as close as possible, according to given distance measure, to the original sampling design weights while also respecting a set of known population totals (called calibration margins) obtained from external sources. The methodological aspects of this procedure are given in Appendix 1. Here, we find it is important to stress that statistical properties of estimators based on weighted observations depend on the set of calibration margins entering as constraints in the weighting procedure. On the one hand, these constraints determine the dimensions of the target population that are taken under control when computing calibrated
weights. Under this viewpoint, one may want to simultaneously account for as many calibration margins as possible to improve representativeness of the sample with respect to several dimensions of target population. On the other hand, however, one cannot ignore the trade-off between bias and precision. Using a large set of calibration margins allows to reduce the bias generated by nonresponse and under-reporting, but it also increases the variability of the calibrated weights and thus reduces the precision of our estimators. This implies that, to minimize the mean squared error, one should select a parsimonious set of calibration margins which covers important dimensions of the target population to be controlled for. Clearly, the choice of the calibration margins can be related to the specific aims of the simulated policy reforms and thus it does not need to be necessarily the same for all simulations. In most empirical applications, we use a baseline set of calibration margins for age groups (19-, 20-64, 65+), gender (male and female) and geographical area (north, center and south) obtained from ISTAT, plus a set of 10 calibration margins from SOGEI administrative tax data for the distribution of taxpayers across classes of taxable income before deductions. Depending on the aims of the simulated policy reforms and the availability of external information on population totals, this baseline set of calibration margins can be augmented with additional constraints. In some circumstances, for example, one may want to account for the number of extremely poor individuals, the number of elderlies receiving particular types of pensions, or the number of married couples with young children.

In our model, we compute both calibrated individual weights for inference on the target population of individuals and calibrated household weights for inference on the target population of households. The former are appropriate, for example, to analyze incentive effects because labor supply outcomes are properly defined at the individual level. The latter are instead appropriate to analyze redistributive effects because poverty indicators are generally defined on the basis of the disposable household income. Calibrated individual weights are computed by assigning an individual specific weight to each sample respondent as a function of the household design weight and the vector of calibration variables for that respondent. Calibrated household weights are instead computed by assigning a common weight to all household members as a function of the household design weight and the vectors of calibration variables of all household members.

### 2.4 Gross incomes

The lack of exhaustive information on the variables that would be needed to simulate a tax-benefit system is another important issue complicating the interface between MSMs and survey data. In the SHIW, the most striking data limitation is the lack of information on gross incomes. To simulate policy reforms on taxes and social benefits one usually needs information on gross incomes, while most of the income components collected in this sample survey are net of taxes and social security contributions. In principle, gross incomes could be calculated analytically inverting the tax-benefit function which relates gross to net incomes. In practice, however, the

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2 Other variables like cadastral rents, health expenditures and disability status are imputed using standard regression techniques on basis of auxiliary sources of data. In particular, cadastral rents and health expenditures are imputed using the administrative tax data, while disability status is imputed using the Multiscopo survey data.
analytical solution to this problem may either do not exist or be tedious to derive due to discontinuity and non-linearity of the tax-benefit function. Moreover, tax credits for dependent relatives and family allowances are assigned at the fiscal household level. Hence, net incomes of individuals within the same fiscal household are not mutually independent.

To deal with this problem, EconLav uses an iterative income grossing-up procedure. As discussed at length in Appendix 2, this is a numerical process where gross incomes are iteratively adjusted to minimize the difference between simulated (i.e. the value simulated by our model) and observed (i.e. the value observed in the SHIW) values of total net income. The most attractive feature of this approach is that one can take fully into account the structure of the Italian tax-benefit system in the year of data collection while also avoiding tedious analytical calculations due to complexity and inter-relations of the underlying accounting rules.

3 THE NON-BEHAVIORAL MODULE OF ECONLAV

The Italian tax-benefit system consists of a rather complicated set of accounting rules which describes the overall process relating gross to disposable incomes. Given its institutional purpose, a key objective of EconLav is to provide a detailed representation of Italian tax-benefit system to minimize measurement errors that may arise in the simulation of policy reforms. Before discussing the set of accounting rules covered by our model, we need to introduce tax evasion. According to recent estimates by ISTAT, the size of Italian shadow economy in 2008 as a percentage of the official GDP ranges between 16.3 and 17.5 percent. These figures suggest that tax evasion is a widespread phenomenon and thus it cannot be neglected when carrying out policy simulations on taxes. First, ignoring tax evasion unavoidably leads to upward biased estimates of public budget measures. Second, if tax compliance behaviors are unevenly distributed across individuals, then this may also lead to biased measures of horizontal and vertical equity. In other words, people with the same taxable income may be subject to different fiscal burdens (horizontal equity) and people with lower taxable income may be better off than people with higher taxable income because of different tax compliance behaviors (vertical equity).

3.1 Tax evasion

Estimating tax evasion is undoubtedly a complicated task and alternative approaches require to some extent strong assumptions about a phenomenon that is observed neither in administrative nor in sample survey data. In addition, although the most reliable approaches seem to be macro-founded, to capture the effects of tax evasion on horizontal and vertical equity one needs (at least) estimates of tax compliance behaviors across homogeneous population groups.

Following the experience of other Italian MSMs, our model relies on the approach suggested by Marenzi (1996), D’amuri and Fiorio (2005, 2006), and Marino and Zizza (2008).

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3 A review of alternative estimation methods and their assumptions can be found in Zizza (2002).
According to this approach, measures of taxable income hidden to fiscal authorities (hidden income) are computed using discrepancies between survey and administrative income data. The main assumption is that incomes collected in sample survey are not affected by tax non-compliance behaviors due to the privacy criteria ensured by data protection laws. The empirical evidence in Fiorio and D’amuri (2006), Cannari and D’Alessio (2008) and Marino and Zizza (2008), among others, suggests that discrepancies between survey and administrative income data are considerably larger for some income components (self-employment incomes), some deciles of the income distribution, and some population groups (young people and people living in southern regions). Thus, comparisons between survey and administrative data are carried out by conditioning on a set of observable characteristics that are potentially correlated with tax compliance behaviors.4

In our MSM, we apply this approach to obtain proxy measures of tax evasion on employment and self-employment incomes. Although this can be considered a restrictive view of tax evasion, two remarks are worth making. First, pensions are hardly affected by tax evasion because they are mostly paid by national institutions. After excluding pensions, incomes from work represent about 92 percent of total taxable income (Fiorio and D’amuri 2005). Second, we are particularly concerned with tax evasion on income from work because labor supply is a key outcome of our model. In practice, we estimate hidden incomes by comparing net incomes from employment and self-employment in the SHIW and the SOGEI data, respectively. Our set of conditioning variables consists of gender, age, NUTS2 regional indicators, and deciles of employment and self-employment income distributions.

Table 1 presents estimates of average tax evasion rates, separately by type of income and decile of the underlying distribution. We find that, at the median of the two income distributions, the tax evasion rate on self-employment incomes is 30 percentage points higher than the tax evasion rate on employment incomes. Consistently with previous empirical estimates, tax evasion rates on self-employment incomes are positive across all deciles of the distribution, while tax evasion rates on employment incomes are zero above the median. In both cases, tax evasion rates are also decreasing across deciles of the two income distributions.

3.2 Simulation of the 2002 Italian tax-benefit system

The first set of accounting rules simulated by EconLav involves social security contributions on gross incomes from employment and self-employment.5 For employment incomes, social security contributions are paid partly by the employee (around one third) and partly by the employer (around two third). The contribution is determined through a proportional scheme with contribution rates varying by sector (industry, business, logistic, public administration, credit, third sector and domestic sector) and type (primary or secondary) of activity, type of contract (temporary or permanent contract), number of employees of the firm

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4 For additional information on comparability between SOGEI and SHIW data, we refer the reader to Marino and Zizza (2008).
5 Our model also allow to simulate social security contributions for unemployment benefits (“Indennità di Mobilità” and “Cassa Integrazione”) and incomes from contingent work activities (Co.Co.Co. and Co.Co.Pro contracts). Here, for sake of simplicity, these sources of income are assimilated to income from employment. However, differences in contribution rates are appropriately taken into account.
(1-19, 20-49, 50-99, 100+), occupational category (blue collar, white collar and manager) and years of contribution. For self-employment incomes, social security contributions are instead paid by self-employed workers only. The computational basis is defined by the sum of incomes from primary and secondary activities and the amount of the contribution is determined through a progressive scheme with contribution rates and income brackets varying by type of self-employment activity.

The second set of accounting rules involves the calculation of the net personal income tax (IRPEF). First, we compute income deductions related to housekeeping assistance social security contributions, social security contributions paid by fiscally dependent relatives, health care expenditures for disabled relatives, supplementary pension premiums and alimonies. Due to the lack of suitable information in the SHIW data, we ignore other minor income deductions such as those for donations to non-profit organizations and kindergarten expenditures. Subtracting social security contributions and income deductions from total gross income we obtain total taxable income, which is the computational basis of the gross personal income tax and the local surcharge taxes. The gross personal income tax is computed at the national level through a progressive taxation scheme. Local surcharge taxes are instead computed at the regional level through a progressive taxation scheme and at the municipal level through a proportional taxation scheme. As for taxes at the municipality level, some approximation is needed since the finest geographical detail provided by the SHIW is up to the regional level. Accordingly, within each region, we use weighted averages of the municipal tax rates with weights proportional to the relative size of the population in each municipality.

IRPEF is obtained by subtracting tax credits from the gross personal income tax. Our model includes tax credits for labor incomes and pensions, fiscally dependent relatives and other expenditures. Tax credits for employment incomes, self-employment income and pensions are mutually exclusive. Hence, in case of eligibility for more than one tax credit, individuals can choose only one of them and we assume they choose the highest. Tax credits for fiscally dependent relatives include those for the spouse, children and other relatives whose total taxable income before deductions is lower than 2,840 Euros. Special tax credits are also given to households with children aged less than three years and those with children affected by disability. Finally, tax credits for other expenditures include those related to health care, secondary and tertiary education, life insurance premiums, mortgage payments, payments of rent for dwelling, and extraordinary expenditures for the maintenance of dwellings.

In addition to accounting rules related to IRPEF, we simulate some accounting rules included in the so-called separate taxation scheme which is applied to all incomes excluded from the computational basis of IRPEF. Some examples are lump-sum payments received by employees at the end of the work relationship (TFR) and incomes from financial assets. Taxes on TFR are not simulated because of lack of suitable information on individual working histories, while taxes on incomes from financial assets are simulated using a proportional taxation scheme with asset specific tax rates.

Municipality level taxes on real estates (ICI) are also considered outside of the taxation scheme for IRPEF. As before, within each region, we apply again weighted averages of municipal tax rates with weights proportional to the relative size of the population in each municipality.
Among social benefits, the baseline legislation simulated by our model includes family allowances. Other social benefits, such as unemployment benefits, are taken as observed from the SHIW data. To be eligible for family allowances, household incomes from employment (net of social security contributions) plus taxable and non-taxable pensions of all individuals within the same fiscal unit must be at least 70 percent of gross household income (including incomes subject to separate taxation). This eligibility criterion excludes from family allowances all households who have income from self-employment as primary source of income. Conditional on eligibility, the benefit entitlement is mean-tested against gross household income, household size, and household composition.

A key outcome of the non-behavioral module of EconLav is disposable income, defined as the sum of taxable and non-taxable gross incomes, plus social transfers (family allowances and other observed benefits), minus social security contributions and taxes (net personal income tax, local surcharge taxes, taxes from separate taxation and ICI). In policy simulation, we compare a set of alternative tax-benefit systems by analyzing variations of disposable income distribution, poverty indicators and inequality measures.

### 3.3 Structural changes of the Italian tax-benefit system over time

Although EconLav is a static MSM, the accounting rules simulated by the model have been updated almost every year (with few exceptions) since 2002. Given that policy simulations are typically carried out using the most recent tax-benefit system as baseline scenario, updates of the accounting rules are relevant for the maintenance of the model.

Table 2 provides an overview of the main structural changes occurred in the Italian tax-benefit system during the last ten years. The major changes occurred between 2002 and 2004 are (i) the introduction of new income deductions for employment incomes, self-employment incomes and pensions, (ii) the use of a different computational basis in the tax credits for labor incomes and pensions, and (iii) the introduction of the so-called safeguard rule which ensures that taxpayers are required to pay the minimum IRPEF resulting from the 2002 and 2004 taxation schemes. Three additional structural changes occurred between 2004 and 2006: (i) tax credits for labor incomes and pensions were entirely transformed in income deductions by completing the reform started in 2004, (ii) tax credits for fiscally dependent relatives were transformed into income deductions, and (iii) the safeguard rule was extended to comparisons between the 2002, 2004 and 2006 taxation schemes. The structure of the 2007 tax-benefit system is similar to that enforced in the 2002. Income deductions for labor incomes, pensions and fiscally dependent relatives were again transformed into tax credits and the safeguard rule was abolished. Between 2006 and 2009, the major changes are (i) the introduction of a simplified taxation scheme for self-employed workers not earning more than 30,000 Euro (i.e. a minimum taxation regime with a flat tax of 20 percent) and (ii) the introduction of two new means-tested benefits (family bonus and social card) for large households, elderly individuals and households with children aged less than 3 years. In 2008, ICI on the main dwelling was abolished, but it was introduced again in 2012 under a new taxation scheme (called IMU) which increased the cadastral values of real estates and the computational basis of this tax. According to the new scheme, taxpayers can benefit from a deduction of 200 Euro for the main dwelling,
plus an additional deduction of 50 Euro for each child aged less than 26 years up to a maximum of 400 Euro. Since 2011, incomes from rent have been also excluded from the computational basis of IRPEF and they are now taxed separately with a flat tax rate of 20 percent.

3.4 Software implementation

Our MSM is fully programmed in Stata, a statistical package which contains “state-of-the-art” econometric procedures and is fully integrated with a matrix language. The advantage of using Stata is twofold. First, this package is fast and allows to write flexible programs that can be easily tested, modified and adapted when simulating new policy reforms. Second, Stata provides a suitable common platform for the two modules of our MSM.

The non-behavioral module is programmed according to a modular structure. In particular, we have developed a new Stata command for each accounting rule of the Italian tax-benefit system. Eligibility criteria of each accounting rule are imposed by means of logical constraints on a set of socio-demographic variables within the corresponding Stata command, while policy coefficients (i.e. tax rates, income brackets, and benefit amounts) are loaded as Stata global macros from external text files. This structure is particularly useful when updating the model and when simulating new policy reforms as both tasks usually require changing some policy coefficients while leaving the remaining structure of the fiscal rule unchanged.

The tax-benefit system of a certain year is a sequential process which specifies order and inter-relations of several accounting rules. Although some accounting rules involve complicated eligibility criteria and a large number of policy coefficients, the overall process for a sample size of 22,000 individuals requires about 2 minutes on a standard multi-processor workstation.

The income grossing-up procedure is an iterative process which applies the tax-benefit system of a certain year on a grid of income components for each sample unit as discussed in Appendix 2. Here, the tolerance is set to 1 Euro in the first 100 iterations, and is progressively increased up to 100 Euro until convergence. Some convergence problem occurs for less than 1 percent of the sample because eligibility criteria for family allowances generate jumps in value of total net income across subsequent iterations. Although this procedure is computationally demanding (it requires about 1 hour), this is run only when updating the SHIW database.

Construction of individual and household calibrated weights is another time demanding process because we specify a grid of 400 alternative combinations of the free coefficients of the distance function (see Appendix 1). For the baseline set of calibration margins, computing time is about 45 minutes.

4 PREDSICTIONS OF TAX AGGREGATES

Table 3 investigates performances of our model by comparing weighted predictions of the main tax aggregates with the corresponding figures from administrative tax data. Comparisons refer to the tax-benefit system in 2008 and model predictions are based on the 2008 wave of the SHIW data. To evaluate the effectiveness of our calibration procedure, we compare model
predictions obtained through our individual calibrated weights with those obtained through two different weights (namely PESOFIT2 and PESOFL2) included in the public release of SHIW data. In particular, the weights labeled "PESOFIT2" are the original sampling design weights multiplied by a constant of proportionality to fit the size of the Italian population in 2008, the weights labeled "PESOFL2" are post-stratified weights which account for additional population constraints obtained from the Italian Labor Force Survey, the weights labeled "calibrated individual weights" are those provided by our calibration procedure using PESOFIT2 as sampling design weights and the baseline set of calibration margins discussed in Section 2.3. Our findings reveal that EconLav reproduces with a certain degree of accuracy the process relating gross to net incomes. The highest discrepancy between model predictions and administrative tax aggregates is found for family allowances and it is equal to -6.06 percent, while the discrepancies for the other tax aggregates do not exceed 2 percent. Notice that the alignment of taxable income before deductions reflects the effectiveness of our calibration procedure which involves a set of 10 calibration margins for the distribution of taxpayers across classes of taxable income before deductions. The alignments of the other tax aggregates reflect instead the accuracy of the accounting rules simulated by our MSM. We can also notice that our calibrated individual weights clearly outperform the weights provided in the public release of the SHIW data. Using PESOFIT2 and PESOFL2 taxable income before deductions is understated by 7.28 and 4.64 percent, respectively, while using calibrated individual weights the discrepancy with the administrative data is 0.74 percent.

5 MARGINAL EFFECTIVE TAX RATES (METRS)

In this section, we use the non-behavioral module of EconLav to compute average of marginal effective tax rates (METRs) for different population groups. As discussed at length in the literature (see, for example, Blundell 2012, Paulus and Peichl 2009, Immervoll 2004, Carone et al. 2004), METRs allow to quantify how much of a change in gross income is lost by the taxpayer because of the compound effects of taxes, social security contributions and any withdrawal of income-related social benefits. Therefore, these indicators help understand the overall financial disincentive created by a given tax-benefit system, especially in terms of labor supply decisions at the extensive (i.e. whether or not entering the labor market) and the intensive (i.e. how many hours to work) margins. Here, we focus on METRs at the intensive margin for people who are already at work to investigate financial work incentives of the Italian tax-benefit system in 2010. METRs are defined as

\[ METR_i = 1 - \frac{\Delta Y_i^D}{\Delta Y_i} \]

where \( \Delta Y_i \) is a simulated exogenous variation of gross income, \( \Delta Y_i^D \) is the correspondent variation of the disposable income, and the subscript \( i \) indexes sample observations. For this exercise, METRs are computed by simulating a variation of 3 percent on gross labor earnings.

For additional information see: [http://www.bancaditalia.it/statistiche/indcampa/bilfai/docum/legenda-storico.pdf](http://www.bancaditalia.it/statistiche/indcampa/bilfai/docum/legenda-storico.pdf)
Estimates are obtained using the 2008 wave of SHIW data (with income and expenditure data inflated by the real growth rate of the per capita GDP), taking into account tax evasion as described in Section 3.1, and weighting sample observations with calibrated individual weights.

Figure 1 shows average METRs for employees, contingent workers and self-employed by decile of their gross income distributions. We can see that the average METRs for employees and contingent workers are quite close one to each other across all deciles of the gross income distribution and considerably higher than the average METRs for self-employed. These findings are consistent with the structure of the Italian tax-benefit system which provides considerably higher tax credits and social benefits (such as family allowances) to employees and contingent workers. Since tax credits and social benefits are mean-tested against total taxable income, an increase in gross income leads to a progressive reduction of tax credits thereby reducing the incentives to work more hours. These disincentives are negligible at the bottom of the income distribution, but then sharply increase when tax credits and family allowances enter their phase-out regions. The recent paper by De Luca et al (2012) shows similar findings when analyzing the disincentive labor supply effects induced by family allowances on married couples.

Figure 2 shows average METRs by household type, namely singles, lone-parents, childless couples, and one-earner and two-earner couples with children. For the similar reasons, we find that average METRs are generally higher for households with fiscally dependent children than for childless households and for one-earner households with than for two-earner households. Differences in the average METRs of these population groups reflect the effects of tax credits for fiscally dependent family members (spouse, children and other relatives) which are mean-tested against total taxable income before deductions, and family allowances which are increasing with respect to household size and decreasing with respect to gross household income. Hence, an increase in gross income leads again to a progressive reduction of tax credits thereby reducing the incentives to work more hours. At the median of the gross income distribution, the average METRs is 38 percent for single, 40 percent for lone-parent, 37 percent for childless couples, 39 percent for one-earner couples with children, and 38 percent for two-earner couples with children.

6 CONCLUDING REMARKS AND FUTURE DEVELOPMENTS

In this paper, we have discussed the main features of the non-behavioral module of EconLav, a new MSM of the Italian tax-benefit system which is expected to become a useful tool for ex-ante design and ex-post evaluation of fiscal and social policies by the Ministry of Economy and Finance and the Ministry of Labor. Our experience with this project suggest that, although the construction of a MSM requires dealing with a number of challenging tasks, these models may ultimately provide a lot of valuable information for the institutional activities of policy makers. By providing a detailed representation of the Italian tax-benefit system, EconLav allows to accurately reproduce the budget constraint faced by the Italian population of taxpayers and therefore it can be used to analyze the redistributive and public budget effects of fiscal and social policy reforms. Furthermore, the model embeds a multi-sectoral discrete choice model of labor supply with taxes to predict incentive effects of the simulated policy reforms (see De Luca et al 2012). Although some of the assumptions behind the specification of the model are not
exempt from criticisms, the choices made in the phase of model design and the effectiveness of the statistical procedures implemented to deal with data quality issues ensure that EconLav is a flexible and reliable policy evaluation tool. To be operational, it is important that databases and accounting rules are updated every one or two years. We also plan to develop a new database based on the Italian module of EU-SILC which ensures a larger sample size (about 28,000 households), a shorter period of time between subsequent waves (one year instead of two years), and uses an exact matching with administrative data to deal with problems of measurement errors on income components (Istat 2009). Another challenging topic included in the agenda of our project is the development of new modules for welfare analysis and optimal taxation.

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