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Working Paper n. 81, November 2009

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ABSTRACT: The Siena Micro-Simulation Model (SM2) has been developed as a practical tool aimed at providing a robust and convenient procedure for the conversion between net and gross forms of household income. In this paper we describe the logic and standard structure of the SM2. The primary issue, which this model has been designed to address, may be summarised as follows. Starting from data on household and personal income given in different forms, and on the basis of the prevailing tax regime in a country, the model is designed to estimate full information on income by component, with a breakdown of gross amounts into taxes, social insurance contributions of various types, and net and disposable income. The immediate context for the development of SM2 has been the requirements of EU-SILC (EU Statistics on Income and Living Conditions). The, paper presents the provisional results of microsimulation for EU-SILC 2007 target income variables for Turkey, based on the 2006 rules of the tax-benefit system in Turkey.

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1. Introduction

Income of households is made up of diverse components received by multiple individuals. Its elements may be compiled from different types of sources, which may differ in concepts and definitions and may not refer to exactly the same reference time. The different sources may be subject to differing patterns of response and recording errors, sampling errors, inconsistencies and incompleteness etc. This paper is not concerned with such conceptual and measurement issues, but with the following additional important problem.

Income can be recorded in various forms - such as gross, or net of taxes and/or other retentions at source, or as the final amounts actually received - differently for different components and for different income earners in the household. Aggregating these elements of income into the household's total income and its main components requires not only that information is available on all the elements, but also that it exists in a *homogeneous form to permit aggregation*. The form must also be the same for all households so as to permit aggregation to the sample or the population. Furthermore, the same information in *more than one form* is often required to meet different analytical objectives. For instance, for poverty and social exclusion research it is necessary to have information on total household *disposable income*. Total disposable income means gross income *less* income tax, regular taxes on wealth, employee, self employed, unemployed and other compulsory social insurance contributions, employers' social insurance contributions and inter household transfers paid. To study the effect on income distribution, the breakdown of disposable household income into old-age and survivors' benefits and other social transfers is needed. On the other hand, for the study of redistribution effect of taxes, for micro-simulation and many other research and policy purposes, information is also required on *gross income* and its detailed breakdown by component and individual income recipient.

Different forms of income (gross, disposable or net, etc.) are related through extremely complex national fiscal systems, often with sub-national variations as well. This complexity has many aspects. (i) The relationships or rules vary by income component and according to characteristics and circumstances of the income recipient, in great detail and with many special cases. Some components may be exempt from tax and other deductions, while others may be subject to either or both, fully or in part. (ii) The

rules may apply to different types of units, to individual persons, whole households, or some other intermediate 'tax units' within households. (iii) Different aggregations across income components may be involved in the application of the rules: some components may be treated individually, while others pooled together. (iv) How income is *received* can vary: it may for instance be received after retentions at source, or received gross to be taxed later. (v) What form it is *reported* in may vary from one component and recipient to another in the same data set. (vi) Who receives income may vary: while most income is received by individuals, some parts (e.g. certain transfers) may actually pertain to the whole household. (vii) When the income is received or deductions made and the period to they which relate may differ. All this complexity is increased where individuals have a choice among alternative rule-sets to be applied to their particular case.

Various micro-simulation models have been developed to simulate taxes, social insurance contributions, benefits and other transfers received to affect the transformation between gross and net forms of income, mediated through complexities of the national fiscal systems. Important examples are Euromod and similar national micro-simulation models. A main objective of these models is to provide, on the basis of specific micro-datasets incorporated into the system, a comprehensive facility for simulation of the effect of varying parameters of the tax-benefit system on the income received by various segments of the population. Simulation of taxes and benefits under different regimes (fiscal policy options) forms the output of the system.

Our orientation in utilising the Siena Micro-Simulation Model (SM2; Verma *et al.*, 2003; Betti *et al.*, 2010) described in this paper is somewhat different, even though this new system shares much in objectives and methods with existing micro-simulation models. At the outset, SM2 was designed for *multi-country application*, as a *flexible tool* which is *portable* to the maximum extent possible across (at least the European) countries despite great differences in fiscal systems.

The immediate context for the development of SM2 was the EU-SILC requirements (EU Statistics on Income and Living Conditions). EU-SILC is a statistical source, being developed by European Commission (Eurostat) and implemented by all EU and also many other European countries, for the generation of comparable and detailed information on living conditions and income of households and persons. The central

issue to be addressed is that, while the source, type and form of input (collected) information varies across and even within countries, the output required at the European level has to be comparable and standardised. Furthermore, while the information which can be collected is limited to particular forms because of the restrictions of the sources providing it, it is required in both net and gross forms for diverse academic and policy research. We see SM2 as a *tool*, under continuing development, for meeting these objectives in the international, comparative context. Starting from data on household and personal income given in different forms (including some missing data), and on the basis of the prevailing fiscal system in a country, the model estimates full information on income by component, with breakdown of gross amounts into taxes, social insurance contributions, social transfers, and net and disposable income. Therefore it can be applied to diverse data sets to generate variables (such as the EU-SILC Target Variables) in a standard form. Furthermore, it is designed to be *flexible* to deal with an annual flux of data in different forms across and within countries and also with periodic changes in the national tax systems, which a longitudinal data source such as EU-SILC must deal with.

Thus an outstanding and unique feature of the SM2 system is that its core consists of a *standardised set of routines* which can handle a great diversity of input data forms and national tax systems. *Country-specific routines* are required to convert the input data into standardised forms, and also to specify parameters of the national tax system in an appropriately standardised form. These, then, form inputs to the central core of the system designed to generate the required standardised outputs.

The system has been developed to maintain a clear distinction between the common and the country-specific parts, and even more importantly, to maximise the part which can be standardised. This feature makes the system an appropriate and convenient tool for multi-country application. Given the specific context and objectives of its development, hitherto SM2 is fully 'data based' and does not incorporate simulation of benefits or any other income components. It is taken as given that information on all income components has been collected, compiled or imputed in some form, and that the objective is to convert it, under a specified national tax system applicable at the time, to the standard form (specifically that required by EU-SILC). It incorporates generally the same or similar level of detail as other major micro-simulation models - a little less

detailed on some points but also more complete on some others, apart from so far being data-based rather than simulation-based as far as benefits and similar transfers are concerned. Detailed applications have already been developed for France, Italy and Spain using European Community Household Panel (ECHP) data as the input (Eurostat, 2004).

2. The Siena Micro-Simulation Model

2.1 Gross-to-Net conversion algorithm

Table 1 shows the basic relationship between gross and net forms of income when more than one income components and possibly more than one individual in the tax unit are involved. The relationships between gross taxable income for a particular component, H_i, and quantities like gross income G_i and income after retentions at source XST_i are generally simple, dependent only on the income component concerned (i) and determined independently of other components and other persons in the tax unit. The same applies to the relationship between H_i and net N_i for components which are taxed separately at a flat rate or a rate determined only by the level of income from that component, and of course also for tax exempt components. Sometimes, dependence of the relationship on other sources of income may also be involved, but mostly these are simply in the form of upper limits which may apply to certain quantities pooled over more than one component.

Generally, all or most taxable income is pooled together over components and over persons in the tax units for the purpose of determining the amount of tax due. The relationship between H_i and N_i for components in the pool is, by contrast, more complex. Going from known H_i to N_i is simpler since the relationships (the tax rules) are a function of the former. These relationships are specified in more detail in Table 1. Going from given N_i to H_i required iterative solutions, and are described in the next section.

Social insurance contributions; The social insurance contributions S_i, if applicable to the component, are generally a function of the gross amount G_i, but in the case of employment income excluding the employer's contribution. However, some more complex situations can be allowed for in the model while retaining its basic structure. Specifically, it can allow for the dependence of S_i for any particular component i on any

set of income components, i.e., a functional relationship of the form $S_i = S_i(G_I)$, where subscript I refers to any set of income components (normally including the particular i, of course). In the French system for instance, the pooled contributions for a number of components may be subject to a common maximum limit. The functional relationship $S_i(G_i)$ is specific to the component and the country. This is specified (and 'called' as a subroutine in the application programs) separately from the common structure represented in Table 1.

Table 1 Gross-to-Net conversion algorithm

	Income measure	**total**	**by component**[(1)]
1	GROSS(2)	$G=\Sigma G_i$ ←	G_i
2	Social Insurance contribution		$\mathbf{S_i=S_i(G_i)}$
3	GROSS TAXABLE	$H=\Sigma H_i$ ←	$H_i= G_i - S_i$
4	Component-specific deductions		$\mathbf{D_i=D_i(H_i)}$
Aggregation over components and individuals in tax unit			
5	TAXABLE INCOME	$Y=\Sigma Y_i$ ←	$Y_i= H_i - D_i$
6	Common deductions	$\mathbf{D_0= D_0(H)}$	
7	Taxable income(0)	$Y_0= Y - D_0$	
8	Tax due(0)	$\mathbf{W_0= W_0(Y_0)}$	
9	Common tax credits	$\mathbf{C_0= C_0(Y_0)}$	
10	TAX DUE	$W= W_0 - C_0$	
11	Component-specific tax credits	$C=\Sigma C_i$ ←	$\mathbf{C_i=C_i(Y_i)}$
12	TAX PAID	$X= W - C$	
13	TOTAL NET	$N=H - X$	
14	Tax rate(0)	$R_0= X/H$	
15	TAX RATE = TAX DUE/ TAXABLE INCOME	$\mathbf{R =W/Y}$	
Disaggregation – personal income by component			
16	Proportionate tax by component		$X_i=\mathbf{R}*Y_i - C_i$
17	NET BY COMPONENT		$N_i=H_i - X_i$

(1) The functional relationships in this column may be somewhat more complex or varied.
(2) Gross including employers' social insurance contribution (SS) is: $GG=G+SS(G_I)$

Deductions; (Net) taxable income (row 7) is obtained by subtracting from gross taxable income the part which is tax exempt ('deductions'). These deductions are a certain function of gross taxable income. These may be of two types: (i) specific deductions which apply to the particular income components D_i (row 4); and (ii) common deductions which apply to the (remaining taxable) income from all sources together (row 6). In case (i), in most situations the functional relationship $D_i(H_i)$ is specific to the component *i*, i.e., D_i depends on the gross taxable income H_i for the component concerned. As a generalisation, the model can allow for the dependence of D_i for any particular component i on any set of income components, i.e., a functional relationship of the form $D_i = D_i(H_I)$, - or even more generally as $D_i = D_i(H_I, G_I)$ - where subscript I refers to any set of income components (normally including the particular i, of course). In case (ii), a functional relationship of the form $D_0(H)$ is in terms of total gross taxable income i.e. all components together. Both types of functions are of course country-specific. Again, these relationships can be specified separately from the common structure represented in the table.

Aggregation; After the removal of component-specific deductions, it is necessary to pool the income over individuals in the same tax unit and across components which are treated together for taxation purposes. Certain income components may be excluded from this common 'pool' and taxed separately; this type of situation is accommodated in the present model.

Tax credits; Initial tax due is computed as a function of total taxable income (row 8). This is determined by the countries 'basic' income tax schedule, normally applied to pooled income from different sources. This tax liability is normally reduced by tax credits. Tax credits are mostly based on characteristics of the unit (single parent, pensioner, etc.) or are given in compensation for particular expenses (medical, educational, etc.), i.e., are not specific to a particular income *source*. We refer to these as 'common tax credits' (row 9); these are normally expressed as a function of the total taxable income. The result is a more precise expression of 'total tax due' (row 10). In addition to the common tax credits, there may also be component-specific tax credits (row 11). Generally, these are based on net taxable income for the component concerned. However, the functional relationship may be more complex: involving other components of income and/or income in other forms (gross, gross taxable, etc.).

Tax paid and net income; Deduction of these tax credits from the tax due (as defined in row 10), gives the final tax to be paid (row 12): i.e., total tax to be actually paid is tax due, less all (common as well as component-specific) tax credits. Total net income is total gross taxable income less tax paid (row 13). The above two quantities, tax paid and net income (rows 12-13) refer at this stage to total income, and not to income by individual components.

Tax rate; This refers to the effective tax rate which applies to pooled components. Tax rate in Table 1 has been defined in two forms. (i) The first (row 15) is a descriptive measure. It is the ratio of the total amount of tax to be paid, to the total gross taxable income (row 12/row 3). Hence it is indicative of the overall tax burden. (ii) The second (row 16) provides a more analytical measure in the following sense. It is the ratio of the total amount of tax due before taking into account any *component-specific tax credits* (row 10), to the total taxable income after removing *component-specific deduction* (row 5). By removing all known component-specific aspects, that is component-specific deductions and tax credits, it can be seen as the *common rate* which applies to all taxable income, from whatever source, which has been pooled and subject to a common tax schedule.

Parameter R has two functions. Firstly, it provides a means for the disaggregation of total tax and net income into component when required (see below). Secondly, it is the parameter of the iteration in going from net to gross, as described in the next section. Its role is even more important in the presence of missing data where modelling has to be used in conjunction with imputation. Betti *et al.* (2003) have explored these issues in a separate paper.

Disaggregation of tax and net income by component; This common 'tax rate' can be seen as a rate applying to each component individually, and not merely some average rate applicable only at the level of total income. This permits the decomposition of tax paid by income components (row 16), and consequently the decomposition of total net income into components (row 17). This decomposition is essential for the construction of variables such as net income before and after social transfers. For research and policy purposes, such decomposition is usually required in much less detail than the breakdown of gross income. In any case, this sort of breakdown does not affect the performance of the rest of the system in the model in any way.

Country-specific schedules; The last two columns of Table 1 define the various income measures in terms of measures defined in the preceding rows; those in the first column concern total income, in the second they concern income components. The table involves six country-specific relationships or tax schedules:

-three concerning total income $D_0= D_0(H)$, $W_0= W_0(Y_0)$, $C_0= C_0(Y_0)$;

-another three specific to each component (i) $S_i=S_i(G_i)$, $D_i=D_i(H_i)$, $C_i=C_i(Y_i)$.

The functional dependence can be somewhat more complex than indicated above, as explained earlier. In addition, there may be parameters determining retentions at source, taxation of parts of SI contributions, etc. Finally, it should be mentioned that the application of various formulae and relationships requires certain constraints to be met, such as to ensure that all quantities which, to be meaningful, must be non-negative are in fact so. It is not useful to list here such (and many other) programming details. The structure in Table 1 is very general and provides a common framework accommodating a wide variety of specific situations. We have found this to be the case at least for the six countries (Spain, Italy, France, Portugal, Greece and Turkey) for which the fiscal systems by individual income component have been examined in some detail. Here are some examples of how different types of situations can be handled within this common structure.

2.2 The core iterative procedure: net-to-gross conversion

Data forms; The form in which data on income by component are available may vary from one country (tax regime) to another, and also among individuals and households within the same country. There are two dimensions of variation:

A. Whether or not a particular component is subject to social insurance contributions and to income tax. Income tax may apply in various forms. (i) Some components may be pooled together, across components and also across individuals in some appropriately defined tax unit. (ii) Some may be subject to tax separately, each at a certain flat rate. (iii) Some components in the 'pool' may be tax exempt up to a certain flat rate but taxed beyond that if a higher rate applies. (iv) Some may be subject to double taxation, perhaps representing some combination of the other forms. (v) And of course, many types of incomes, in particular social transfers, may be tax exempt. Mostly, the form applicable to each type of income is determined by

the national tax regime, normally uniform for all respondents in a country. Hence this information can be compiled at the aggregate level and need not be collected at the micro level. There can be exceptions, however, for persons in special circumstances. There can also be other complications, such as more than one components, otherwise treated separately, being subject to common ceilings. In some systems, individuals have a choice among the various options.

B. The form in which the information has been collected. This may generally vary from one individual to another in the same survey, though a uniform reporting form may prevail for some components. In any case, the information on the form in which the data are available is required at the micro-level. The amount may for instance be reported as gross, or net of social insurance contributions and/or tax; and in the case of tax retentions, whether they are 'retentions at source' according to some rules or individual arrangements or as the 'final retentions' of the tax actually due, in the sense explained below. Table 2 lists the various reporting forms.

Table 2 Forms of reporting of an income component

Income component (i) subject to tax and social insurance contributions
B. Form (X_i) in which data on the income component have been collected:
G_i gross income (before tax and SI contributions, if applicable)
H_i gross taxable (before tax, but after SI contributions, if any)
N_i net income (after deducing 'final' tax and SI contributions, i.e., as the final amount actually received)
Income received after retentions at source:
XT_i taxed at source (but no SI contribution); tax at source T_i
XS_i SI contributions (but not tax) at source; SI contributions at source S_i
XTS_i both tax and SI contributions at source, tax and SI at source T_i+S_i

In this section, we describe the standardised 'core' of the SM2 system, taking account of complexities B, but assuming for the moment that form (i) of A applies to the total income, i.e., the information may be reported in diverse forms, but all income components over individuals in the tax unit are pooled together and subject to a common tax schedule. A remarkable feature of the system is that by appropriately defining certain 'deductions' and tax credits, much of the complexity A can also be incorporated into the standardised procedures.

Income net of tax; As noted above, in the case of tax retentions, an important distinction is to be made between: (i) 'retentions at source' (withholding taxes), and (ii) the 'final retentions' as appropriate for the income source concerned. This is a very important distinction. It is essential to know what is meant when a component is reported as 'net of tax'. Does the information on retentions refer to withholding taxes, to final taxes, or even to some mixture? In some systems the withholding tax is quite different in size as well as structure to the final tax liability, and the taxpayers may even be able to choose their withholding rate of tax.

Tax retention at source; Among the two, this may be the more common form in which net income is reported. We take 'retention at source' to mean that *the amount of tax has been assessed depending only on the income received from the particular source concerned, not taking into account income received from any other sources or the individual's (the tax unit's) personal characteristics.*

Indeed, in many situations, these retentions may be according to relatively simple and standard rules, which may be expressed, say, as $T_i = (H_i - XST_i) = T_i(H_i)$, where tax retention at source (T), being the difference between gross taxable income (H) and the amount received after social insurance and tax retention at source (XST), is some known function of gross taxable income for only the component concerned. Provided that these rules are standard and known, XST_i is directly convertible to H_i without reference to other components of income for the unit. By comparison, the relationship with H_i of the "final net" N_i is more complex, as it depends on the unit's total income from all sources.

The real difficulty however arises when the rules for retention at source are not standard, are not applied uniformly, or are even non-existent in the sense that the taxpayers can choose or negotiate their withholding tax rates. In such situations, the construction of the gross taxable amount from the reported amount after withholding tax will require separate information on the amount withheld (or the withholding rule applied) in the particular case.

Final tax retention; By contrast to the above, the final tax retention is meant to reflect the tax actually due after taking into account the total income situation and characteristics of the tax unit. Consequently, the rules involved in this case tend to be more complex and involve the nature of the unit (individual person, household, or some

other tax unit), the unit's particular circumstances and its income from all sources simultaneously.

On the other hand, those rules are supposed to be applied (except for tax evasion and similar factors not considered here) in a standard way, not subject to variations according to individual arrangements as may apply to some retentions at source.

In practice, there may often be some ambiguity as to what a figure reported as 'net' by a survey respondent actually represents. For instance, employers often adjust the employee's 'tax code' on the basis of tax returns for previous years, such that the amount withheld at source actually approximates the amount of 'final tax' which the employee would have to pay on this income in accordance with the prevailing tax rules. In the presence of such ambiguity, it is perhaps safer to interpret the amount reported in the sense of 'net after paying the final tax due'. Then the term 'tax retention at source' would be reserved for situations where the 'retention at source' rules or arrangements have been applied more clearly.

Social insurance contributions; In contrast to tax retentions, social insurance contributions are essentially component-specific, i.e. determined only or mainly in relation to the income component concerned, so that the above distinction between 'retention at source' and 'final retention' is generally not relevant. They are usually collected at source in any case.

Conversion routines. Table 3 shows the procedure for converting the reported amount with any combinations of the above dimensions of variation into a standard form. For all forms other than 'final net' N_i, it is convenient to take 'gross taxable income' H_i as the standard: $[G_i, H_i, XS_i, XTS_i, XT_i] \Rightarrow H_i$.

This conversion involves the component and country-specific functional relationships or schedules, namely $S_i = S_i(G_i)$, social insurance contributions, and $T_i = T_i(H_i)$, tax retention at source.

As noted, tax retentions at source may be according to fixed schedules, or according to arrangements determined at the individual (micro) level.

In a majority of the cases, H_i can be determined directly from the collected amount, for instance from gross amount (G_i) reported for an income component i subject to social insurance contributions: $H_i = G_i - S_i(G_i)$.

In other cases, an iterative procedure may be required. However, generally the iteration is very simple and converges quickly. This is because by and large component-specific schedules apply to each component separately. There are no other parameters to be estimated. The need for numerical iteration arises simply from the fact that the unknown quantity to be determined (H_i) appears in an implicit equation.

Table 3 Calculation of H_i according to the form in which the component is specified

Set H

given value P_i =	XS_i	$H_i = XS_i$	
	G_i	$H_i = G_i - \mathbf{S_i(G_i)}$	
	XT_i	$H_i = G_i - \mathbf{S_i(G_i)}$ where $G_i = XT_i + \mathbf{T_i(H_i)}$	Simple iteration, generally separate for each component
	XTS_i	$H_i = XTS_i + \mathbf{T_i(H_i)}$	

Set N

given value P_i =	N_i	$H_i = Y_i + \mathbf{D_i(H_i)}$ where $Y_i = [H_i - N_i + \mathbf{C_i(Y_i)}]/ \mathbf{R}$	Double iteration (i) with assumed R, for each component in turn (ii) for determining R, common to all pooled components

The second panel of the table shows the relationship between H_i and the reported amount in the form 'final net' N_i. Going from N_i to H_i in fact involves a double iterative loop. The inner loop of iteration is applied with an assumed value of the parameter "tax rate" (R, as defined in Table 1). Once this has been done for every income component in the group (including over all individuals in the same tax unit), an outer iterative loop obtains a convergent value of this parameter which is common to all those components. The N_i to H_i conversion process is therefore considerably more complex. Furthermore, this complexity is substantially increased in the presence of missing data, where the modelling and imputation procedures will have to be applied interactively.

Iterative procedure. Table 4 demonstrates the common structure of the iterative procedure. As noted at the bottom of the table, the income components may be divided into two sets, say 'N' and 'H', depending on whether the amount reported is 'final net' (N_i), or is in some other form (G_i, XS_i, XT_i, XTS_i, H_i) more directly convertible to the 'gross taxable' form H_i.

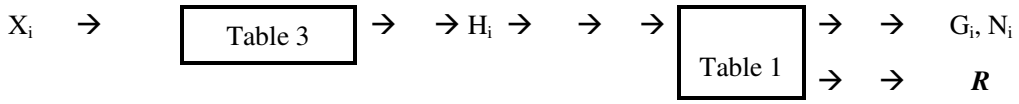
The procedure may be applied as follows. The required H_i quantities for set H are computed (only once) using Table 3, and form an input into the iterative cycle for

parameter R required for set N. The parameter is best estimated by using information on all income components from both the sets.

Table 4 Common structure of the iterative model

Reported amount →	Gross taxable →	Net and gross

All data in or convertible to the "H" form:



Data a mixture of "H" and "N" forms:

Set of variables N: set of income components which are subject to income tax (irrespective of whether the component is also subject to social insurance contributions), and for which the 'final net' amount (X_i=N_i) has been specified in the data collected.
Set of variables H: all other income component (not subject to tax, or for which the data has been collected in a form other than the 'final net' amount)

For application in the multi-country comparative context, which motivates the development of SM2, it is very desirable (and possible) to standardise to a high degree the list of modelling variables (income components) across countries, removing the effect of differences in the list of collection variables. The individual data records with collection variables can be aggregated to the required level of tax units and modelling variables, the latter standardised across countries to the maximum extent possible. For each income component for each unit, the data file should contain information on the amount received and the form in which it has been reported. The various tax and deduction schedules are also country-specific. Beyond these variations, however, the procedures described above have a common structure, applicable to different tax systems.

3. The tax-benefit system in Turkey

3.1 Overview of the system

Table 5 summarises the main income components and whether they are liable to social insurance contributions and tax in the Turkish system. The table depicts the relationship between gross income, net income and the structure of the fiscal system.

Income from work (employment and self-employment) is subject to social insurance contributions, determined as a function of gross income (Gi).

The main Turkish income tax is computed by applying marginal progressive rates to the increasing income brackets. Employment income and Self-employment income are pooled together only if both amounts are greater than 18,000YTL. Otherwise the two amounts are taxed at source separately, but using the same taxation rules.

Capital income and property rental income are not subject to general taxation, but are taxed at flat rates. Capital income at one single tax rate, and property rental income at three different flat rates: in our model, such 'flat rate taxation' is handled by simply treating it as a 'negative tax credit'; it is for this reason that this tax is shown in the last column of the table under 'component-specific tax credits'.

Components which are not subject to the common tax are removed from the common pool by simply specifying their 'component-specific deductions' as equal to the component's total gross taxable income (so that the resulting net taxable income is automatically zero). This applies to financial capital income and to tax-exempt benefits.

A brief description of the different kind of income follows.

Table 5 Income components

N	Income Components	Social Insurance Contributions (Si)	Tax	Included in common pool	Component-specific Deduction (D_i)	Component-specific Tax Credits (C_i)
1	Employment income	Employer's $S_0(G_1)$ Employee's $S_1(G_1)$	General taxation Damga	X	$D_1(Y_1)$	
2	Self-employment income	$S_2(G_2)$	General taxation Damga	X*	$D_2(Y_2)$	
3	Capital income		Taxed at source (flat rates K_{3a}, K_{3b} K_{3c})			- K_{3a}*H_{3a} - K_{3b}*H_{3b} - K_{3c}*H_{3c}
4	Property rental income		Taxed at source (flat rate K_4)			- K_4*H_4
5	Unemployment benefits		Tax exempt		H_5	
6	Old age related and survivors benefits		Tax exempt		H_6	
7	Sickness, invalidity and other benefits		Tax exempt		H_7	
8	Education related benefits, social assistance and housing allowance		Tax exempt		H_8	

3.2 Employment income (wages and salaries)

3.2.1 Definitions

Income earned by dependent workers - it is liable to social insurance contributions (paid both by the employers and the employee) and to income taxation.

Salary depends on the company or work place. Wages and salaries include cash salaries, ad also kind wages and salaries. There are also bonus, premiums, commitions, allowances, anniversary gifts, this income comprises such income from all kinds of employment in both public and private sector.

Fees, allocations, dividends and the like paid by the chairmen, directors, auditors and the liquidator of the establishment situated in Turkey must be accounted for in Turkey.

Wage and salaries consists to payments given to sportsman transfer and consultants.

3.2.2 Taxation of wages and salaries

Generally the salaries are collected at source, withholding. Tax on most of wages and salaries are deducted at source. There are two taxation method:

→ "Other wages" is similar to a kind of deduction at source, taxes related to this wages are given from report card;

→ Wages and Salaries given from organization with more than two employers.

The employee can have more than one job. This person has to give declaration of all the jobs. The withholding rate varies between 15% and 35%:

Till 7000 YTL		rate 15%
For first 7000 of 18000	1050 YTL and then	rate 20%
For first 18000 of 40000	3250 YTL and then	rate 27%
For first 40000 of 40000	9190 YTL and then	rate 35%

Moreover employment income is subject to the DAMGA tax: 6 %o of net taxable income, and it can not be less than 6 %o of 531 per month.

3.2.3 Social insurance contribution on wages and salaries

There are three types of social insurance contributions for employment income in Turkey. The EMPLOYEE Social Insurance Contributions, which divide into TCES and SSK :

civil servant (public sector 95%) – white collar (TCES) → rate 15%

blue collars (public sector 5% and private sector) (SSK) → rate 14%

The EMPLOYER Social Insurance Contributions:

civil servant (public sector 95%) – white collar (TCES) → rate 20%

blue collars (public sector 5% and private sector) → rate 19,5%

Then Unemployment contributions are present in the private sector only:

Employee → rate 1%

Employer → rate 2%

Government → rate 1%

3.2.4 Deductions on wages and salaries

The person with wages and salaries can have deductions. The deductions are related also to possible wife/husband or children and to possible disabilities.

The deductions is related to expenditure for education, health, clothes, rent and food.

The amount of expenditures should not exceed the total taxable value of wages and salaries.

The rate is:

1. the first 3600 YTL 8%
2. above 3600 YTL 6%

3. above 7200 YTL 4% (the amount exceed 7200).

For what it concerns wages and salary for disability persons, we have to take into account the degree of disability. The main rule for this is that gross amount of wages and salaries should be decreased of a percentage depending on the degree of disability. This is divided into three parts:

Persons with 80% degree of handicap	deduction is 530 YTL
Persons with 60% degree	deduction is 265 YTL
Persons with 40% degree	deduction is 133 YTL

3.3 Self employment income

3.3.1 Definitions

Income earned by non-dependent workers - it is liable to social insurance contributions and income taxation. In Turkey self employed can be considered either a person or a small firm (i.e. agricultural firm, commercial shops, manual workers, etc.). In the second case the income is the profit of the firm.

3.3.2 Taxation of self employment income

Self employment income is taxed in pool with employment income if both sources are exceeding 18,000 YTL. Otherwise this source is taxed separately and the rate varies between 15% and 35%:

Till 7000 YTL		rate 15%
For first 7000 of 18000	1050 YTL and then	rate 20%
For first 18000 of 40000	3250 YTL and then	rate 27%
For first 40000 of 40000	9190 YTL and then	rate 35%

Self employment income is subject to the DAMGA tax: 6 %o of net taxable income, and it can not be less than 6 %o of 531 per month.

3.3.3 Social insurance contribution on self employment income

Social insurance contributions on self employment income are paid on monthly basis and are in function of 24 brackets. Moreover, there exist two kind of contributions: the contribution to the pension scheme and the contribution to the health system.

3.4 Capital income and property rental income

Capital income and property rental income are taxed separately from employment and self employment income.

Taxes paid on property rental income are collected directly by a SILC questionnaire question and do not need to be microsimulated by SM2.

Capital income is divided into three groups of components: one group is tax free; the second group is taxed at a flat rate of 10% (it includes Financial Profit from special finance foundation) and the third group is taxed at the flat rate of 15% (it includes bank account deposit, Government and private securities, shares and other securities).

3.5 Tax free components

The last four components in Table 5 are free of tax. These are 5) Unemployment benefits; 6) Old age related and survivors benefits; 7) Sickness, invalidity and other benefits; and 8) Education related benefits, social assistance and housing allowance.

4. The gross-to-net conversion in Turkey

The SM2 model has been applied in detail on the EU-SILC 2007 data for Turkey, to construct a standardised set of gross and net income variables for Households and individuals. In Table 6 we summarise some main results for the most important income Target Variables in the SILC. Since the SILC 2007 wave data has not yet officially published by Turkstat, in the table the figure are re-scaled so that the average Gross per capita income GG (which includes any type of social insurance contribution) is equal to 15,000 Turkish Lira.

Table 7 shows comparison of SM2 application to Turkey with figures of National Accounts published by Turkstat. The agreement in terms of social insurance contributions, total taxes and disposable income is, in our view, excellent.

However, we may note a slight overestimation of some components of total taxes, in particular taxes for self-employment income: this is due to the impossibility to properly simulate some deductions available for this type of income.

Table 6 SILC Target variables in net and gross form

Variable	N	Average	Minimum	Maximum
GG	10796	15000.00	0	555542.86
SS	10796	698.82	0	60983.74
S	10796	623.90	0	44351.81
S1	10796	498.33	0	44351.81
S2	10796	125.58	0	7802.89
G	10796	13677.28	0	555542.86
Tax	10796	1247.14	0	92302.78
Tax1	10796	980.65	0	90665.27
Tax2	10796	63.70	0	15629.61
Tax3	10796	168.33	0	34535.01
Tax4	10796	0.20	0	5.99
Tax_wealth	10796	11.58	0	6483.85
Damga	10796	34.26	0	1636.51
Damga1	10796	29.80	0	1636.51
Damga2	10796	4.46	0	350.19
N	10796	12422.41	0	521006.85
HY020	10796	12199.42	0	515884.60
PY010G	10796	5711.27	0	272752.34
PY050G	10796	3294.26	0	306199.71
PY070G	10796	67.85	0	17955.28
PY080G	10796	18.63	0	13965.22
PY090G	10796	10.15	0	3772.40
PY100G	10796	1884.64	0	47880.75
PY110G	10796	307.17	0	30723.48
PY120G	10796	3.26	0	4039.94
PY130G	10796	45.13	0	9061.62
PY140G	10796	0.00	0	0.00
HY040G	10796	647.05	0	224441.99
HY050G	10796	23.17	0	4548.67
HY070G	10796	0.65	0	1246.89
HY080G	10796	434.02	0	30922.98
HY090G	10796	1186.52	0	230233.41
HY110G	10796	7.31	0	5087.33
PY010N	10796	4700.81	0	180450.56
PY050N	10796	3218.36	0	290219.91
PY070N	10796	67.85	0	17955.28
PY080N	10796	18.63	0	13965.22
PY090N	10796	10.15	0	3772.40
PY100N	10796	1884.64	0	47880.75
PY110N	10796	307.17	0	30723.48
PY120N	10796	3.26	0	4039.94
PY130N	10796	45.13	0	9061.62
PY140N	10796	0.00	0	0.00
HY040N	10796	646.85	0	224440.99
HY050N	10796	23.17	0	4548.67
HY070N	10796	0.65	0	1246.89
HY080N	10796	434.02	0	30922.98
HY090N	10796	1018.19	0	195698.39
HY110N	10796	7.31	0	5087.33

Table 7 Comparison between SILC and National Accounts figures

Components	**National Accounts**	**SILC**
GG - Gross income including SIC	100.000	100.000
Total Social Insurance Contributions	8.801	8.849
SS - Employer's SIC		4.757
S - Employee and Self-employed SIC		4.092
G - Gross Income	91.199	91.151
Total Tax	6.869	7.451
Tax on Employment Income		6.086
Tax on Self-employment Income	0.384	0.442
Tax on Capital Income		0.689
Tax on Property Rental Income		0.001
Damga		0.232
N - Total Net Disposable Income	84.331	83.699

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