

A note on the tax equations

Each country chapter contains a section describing in a standard format the equations under-pinning the calculations required to derive the amounts of income tax, social security contributions and cash transfers. These algorithms represent in algebraic form the legal provisions described in the chapter and are consistent with the figures shown in the country and comparative tables. This section describes the conventions used in the definition of the equations and how they could be used by those wishing to implement the equations for their own research.

The earlier sections of the country chapters describe how the tax and other systems work and present the values of the parameters of those systems such as the levels of allowances and credits, and the schedule of tax rates.

In the first part of the equations section is a table showing a brief description of each parameter (such as “Basic tax credit”), the name of the parameter as used in the algebraic equation (“Basic_cred”) and the actual value for the relevant year (such as “1098”). Where there is a table of values – for example a schedule of tax rates and the associated thresholds of taxable income – a name is given to the entire table (for example “tax_sch”). These variable names are those used in the equations.

After the table of parameters is the table of equations. The four columns contain information as follows:

- The first two columns give a description and a variable name for the result of the equation on that row of the table. These always include the thirteen main financial value entries in the country tables. Additional rows define any intermediate values which are calculated either to show the detail included in the tables (such as the subdivision of total tax allowances into the different categories) or values which make the calculation clearer.
- The third column shows the range of the calculation in that row. This is necessary to allow for the different way that tax may be calculated for married couples. The options are:
 - B: the calculation is carried out separately for both the principal earner and the spouse using their individual levels of earnings. This applies in the case of independent income tax and usually also in respect of social security contributions.
 - P: the calculation applies for the principal earner only. An example is where the principal earner can use any of the basic tax allowance of the spouse which cannot be set against the income of the spouse.
 - S: the calculation applies for the lower earning spouse only.
 - J: the calculation is carried out only once on the basis of joint income. This applies to systems of joint or family taxation and is also usual for the calculation of cash transfers in respect of children.

- The final column contains the equation itself. The equation may refer to the variables in the parameters table and to variables which result from one of the rows of the equations table itself. Use is also made of the two standard variables “Married”, which has the value 1 if the family consists of a married couple and 0 in the case of a single individual, and “Children” which denotes the number of children. Sometimes there is a reference to a variable with the affix “_total” which indicates the sum of the relevant variable values for the principal earner and the spouse. Similarly, the affixes “_princ” and “_spouse” indicate the value for the principal earner and spouse, respectively.

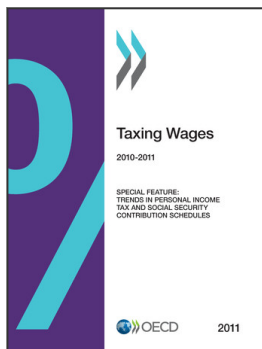
In the equations, a number of functions are used. Some of these are used in the same way as in a number of widely available “spreadsheet” computer packages. For example, $\text{MAX}(X,Y)$ and $\text{MIN}(X,Y)$ find the maximum and minimum of the two values, respectively. $\text{IF}(\text{condition } X,Y)$ chooses the expression X if the condition is true and the expression Y if it is false. Boolean expressions are also used and are taken to have the value 1 if true and 0 if false. As an example, $(\text{Children}=2*\text{CB}_2)$ is equivalent to $\text{IF}(\text{Children}=2, \text{CB}_2,0)$.

There are also three special functions commonly used which denote calculations often required in tax and social security systems. These are:

- Tax (taxinc, tax_sch): this calculates the result of applying the schedule of tax rates and thresholds in “tax_sch” to the value of taxable income represented by “taxinc”. This function may be used in any part of the equations, not just in the income tax calculation. For some countries it is used for social security contributions or even for allowance levels which may be income dependent.
- Positive (X): this gives the result X when this value is positive and zero otherwise. It is therefore equivalent to $\text{MAX}(0,X)$.
- Taper (value, income, threshold, rate): this gives the amount represented by “value” if “income” is less than “threshold”. Otherwise, it gives “value” reduced by “rate” multiplied by $(\text{income}-\text{threshold})$, unless this produces a negative result in which case zero is returned. This provides the calculation which is sometimes required when a tax credit, for example, is available in full provided that total income is below a threshold but is then withdrawn at a given rate for each currency unit in excess of the threshold until it is withdrawn completely.

In some circumstances, there are country specific special functions. These functions involve programming that is designed to simplify the tax calculations. The programming underlying these functions is based on the description of the particular measure given in the relevant country chapter found in Part III. For example, the Earned Income Credit in the United States is calculated using the function called EIC.

Anyone wishing to make their own implementation of the equations will have to write functions corresponding to these special functions or make appropriate modifications to any equations that use them.



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