

Documentation of the MATLAB-codes used in:  
Long-term Changes in Married Couples' Labor Supply and Taxes:  
Evidence from the US and Europe Since the 1980s\*

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**Abstract**

We implement the statutory labor income tax systems of the US, Germany, the UK, Italy, France, the Netherlands, Belgium, and Portugal for the years 1983-2016 in MATLAB. This set of non-linear tax codes is based on the annual Taxing Wages publications of the OECD and allows to compute the tax position (amounts of federal and local labor income taxes, employee and employer social security contributions, cash benefits, and the final net take-home pay) of households with specifiable characteristics (marital status, number of children, and labor income). Our program provides a simple way to extract the data and to incorporate the output produced into an empirical analysis or computational model.

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# 1 Terms of Use

While the coding was done carefully and we did several consistency-checks to check for bugs, it is possible that we may have missed some mistakes, and we cannot guarantee the accuracy of the codes. Any errors in the use of the codes are the sole responsibility of the user. The codes are made available for scientific research use only. Please contact us at alexander.bick@asu.edu, bruegge@mcmaster.ca, fuchs@wiwi.uni-frankfurt.de, or hannah.paule@hof.uni-frankfurt.de for any comments, questions, or corrections.

Anyone using the codes, **needs to cite** the following paper: “Long-term Changes in Married Couples’ Labor Supply and Taxes: Evidence from the U.S. and Europe Since the 1980s” by A. Bick, B. Brüggemann, N. Fuchs-Schündeln, and H. Paule-Paludkiewicz, 2018, NBER Working Paper 24995.

# 2 General Description

We implement the statutory labor income tax codes for the US, Germany, the UK, Italy, France, the Netherlands, Belgium, and Portugal for 1983-2016 in MATLAB. 1995 and 2001 are missing as there is no OECD documentation for those years. Given the marital status, the number of children in the household, and the combination of labor income of both spouses (if they are married), the codes compute as outputs the amounts of federal and local labor income taxes, employee and employer social security contributions, cash benefits, and the final net take-home pay that a household in a particular country and year faces.

These codes are based on the Taxing Wages reports published annually by the OECD.<sup>1</sup> The publications contain country chapters that describe the legal provisions of the tax system of each country and year in detail. Starting from 1996, the reports also contain a methodological part that presents the parameter values and equations characterizing the statutory labor income tax codes in the respective countries. We use the descriptions (until 1994) and the algorithms (starting from 1996) to code up the tax codes in MATLAB. The equations follow a standardized structure: First, they define standard tax allowances. Depending on the country, these can e.g. be basic allowances, allowances related to the family structure (marriage, children etc.) or work-related allowances. Also, social security contributions are deductible in some countries. We subtract the allowances from the gross wage earnings to compute the taxable income. Based on taxable income, the equations specify the amount of the federal government tax liability based on the prevailing tax schedule. We add potential local (state, provincial, city, or municipality level) income taxes to the taxes levied by the central government, i.e. at the federal level. Next, the algorithm considers tax credits, which may reduce the tax payments depending on the marital status and the number of children or in form of a general basic credit. Finally, the equations determine compulsory employee social security contributions that the household has to pay and any cash transfers it receives. Subtracting the tax liability and the employee social security contributions from gross wage earnings and adding cash transfers yields net earnings. In a separate step, the system of equations defines the employers’ compulsory social security contributions.

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<sup>1</sup>The reports are called “Taxing Wages” since 1999. From 1996 to 1998 they were called “The Tax-Benefit Position of Employees” and from 1984 until 1995 they were called “The Tax Benefit Position of Production Workers”.

These are however not available for France and Italy for the years prior to 1995 due to missing information either in the tax reports or in the OECD tables. The equations consider for each step whether the calculations have to be done based on the individual income or the joint income of couples.

For the implementation of the codes, we follow the assumptions made in the OECD report. We assume that children are between six and eleven years old (inclusive).<sup>2</sup> As income sources of the household we include employment income and cash benefits only. Only standard tax reliefs are taken into account, i.e. only those which accrue independent of the actual expenditure of the household. Examples of standard tax reliefs are reliefs granted based on the marital status or the number of children in the household. Local income taxes depend on the levels of sub-central governments, which differ between countries. We follow the OECD and consider taxes imposed on sub-central levels of government (e.g. the state level, provincial level, municipality level, or city level). As the local tax system often also varies within the country, the OECD either assumes the tax codes of a typical area (e.g. in the US and Italy) or the average local rates of the whole country (e.g. in Belgium). Only social security contributions to the federal government are considered. The cash benefits consist of payments to families by the federal government (usually for children). All numbers are on an annual basis.

From the year 2001 onwards, the OECD has implemented the tax codes in Stata (the OECD Tax-Benefit Model). This OECD program also computes the tax-benefit position of households with precisely specifiable characteristics. In comparison to our codes it allows to vary the age of the children, considers child care costs, and includes additional cash benefits like unemployment assistance, social assistance, and housing benefits. However, not all of these benefits are implemented in the Stata codes in all years and all countries. Although the program is richer in options than ours, the sample period covered is much more restrictive and our program is a step forward in terms of user-friendliness when it comes to incorporating the output produced into an empirical analysis or computation model.

### **3 Instructions for Use**

#### **3.1 The Structure of the Code**

The code consists of a master file and country specific files for the US, Germany, the UK, Italy, France, the Netherlands, Belgium, and Portugal for 1983 to 2016. To generate the standard output variables, no modifications to the country files are required, but only the master file has to be adjusted as described below. It only becomes necessary to adjust the country specific files if the needs go beyond the options described here.

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<sup>2</sup>If the reliefs or transfers relating to children differ within this age group in a particular year and country, the OECD considers the most generous amounts.

## Master File

The master file reads in the data and specifies how to handle the missing years (1995 and 2001, and in the case for Belgium for 1997 as well). The master file computes the outputs (the amounts of federal and local labor income taxes, employee and employer social security contributions, cash benefits, and the final net take-home pay of a household in a particular country and year) and constructs and saves a data set that consists of the new output variables computed by the master file and the pre-existing household specific variables.

## Country Codes

In order to compute the outputs named above, the master code accesses the country- and year-specific MATLAB files. These are stored in the folders named by the respective country name. For more details on the country specific files, please see section 4. For further information, please check the OECD Taxing Wages-reports.<sup>3</sup>

## 3.2 Running the Code

### Preparing the Input

To use the MATLAB code, the input data set must be stored in a txt-file. Please do not include the variable names in the txt-file. The data set has to include the following variables in the specified order:

- *id*: household id
- *year*: must range between 1983 and 2016
- *country*: country of residence as a numerical variable, coded as follows:
  - US: 1
  - Germany: 2
  - UK: 3
  - Italy: 4
  - France: 5
  - Netherlands: 6
  - Belgium: 7
  - Portugal: 8
- *married*: marital status coded as follows:

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<sup>3</sup>The reports can be found on the OECD homepage for the years since 1999: [https://www.oecd-ilibrary.org/taxation/taxing-wages\\_20725124](https://www.oecd-ilibrary.org/taxation/taxing-wages_20725124).

Figure 1: Example of the Data Input

	id	year	country	married	children	wage_princ~l	wage_spouse		
1	278820	1983	1	1	1	18051	8831.3		
2	723440	1984	1	1	3	23685	2450.2		
3	266330	1984	1	1	0	19153	7604.4		
4	278220	1984	1	1	0	19035	8759.8		
5	725020	1985	1	1	0	7590.8	5469.1		
6	723130	1985	1	0	3	20212	0		
7	203270	1985	1	1	0	23462	5854.1		
8	110930	1986	1	1	0	10114	6246.9		
9	723440	1987	1	0	4	22120	0		
10	295740	1988	1	0	3	4189.9	0		
11	725020	1988	1	0	4	4045.3	0		
12	723130	1988	1	0	4	3122.2	0		
13	280410	1988	1	0	4	3658.5	0		
14	281490	1988	1	0	4	3232.5	0		
15	702200	1988	1	1	3	2389	2389		
16	723130	1988	1	0	3	4048.4	0		
17	725020	1988	1	0	4	3388.9	0		
18	725020	1988	1	0	4	3920.6	0		
19	723370	1989	1	1	1	4218.9	4218.9		
20	278820	1990	1	1	1	14850	4542.4		
21	82740	1990	1	1	1	11929	4841.7		
22	82740	1990	1	1	1	11352	3659.3		
23	30660	1990	1	1	1	24278	3499.5		
24	723370	1990	1	1	1	9012.6	3665.8		
25	294140	1990	1	1	1	9849.9	3478.2		
26	702200	1991	1	1	1	4988.5	2656.7		

- single: 0
- married: 1
- *children*: number of children, must range between zero and four
- *wage\_principal*: gross annual labor income of the partner with the higher income
- *wage\_spouse*: gross annual labor income of the partner with the lower income
  - only relevant if married==1
  - please set *wage\_spouse* equal to zero if married==0

Figure 1 shows an example of how the data should look like.

The variables *wage\_principal* and *wage\_spouse* have to be in nominal terms and in the respective national currency prevailing in the respective year (i.e. for example wages in 1995 in Italy have to be in Lire).

Please sort the data set by country and year and save it (in txt-format). If the data set is in Stata-format (dta-file), this can be done using the do-file `statatmatlab.do` provided in the same folder as the Master Code.

### Preparing the MATLAB Master File and Generating the Output

Please add the path, where the “Tax Codes” folder is stored to the MATLAB search path.

Next, please open the file `master.m` in MATLAB. First, the correct data paths have to be inserted. Please put the path where the current data set is stored at the beginning of the file (line 16), and the path where the new data set should be stored (including the new tax variables) at the end of the MATLAB-file (line 153).

Second, please choose how to handle the years missing in the tax code. The OECD does not provide a description of the tax codes for the years 1995 and 2001, and in the case for Belgium for 1997 as well. We provide three options for how to deal with these years:

1. Apply the tax codes from the preceding year (1994, 1996 for Belgium, 2000, respectively)
2. Apply the tax codes from the subsequent year (1996, 1998 for Belgium, 2002, respectively)
3. Do not apply any tax code, results in missing values

Please substitute “yournumber” in the code (line 32) with 1, 2, or 3 depending on the preferred option. Once the data paths and the way how to deal with the missing years are specified, the code can be run. The new data set will be saved in txt-format. To transform it into a Stata data set, the do-file `matlabtostata.do` can be used.

### 3.3 Explanation of the Output

The following variables are generated by the code:

- *inctax*: amount of federal income taxes (after standard tax allowances and tax credits) faced by the household
  - *inctax\_p*, *inctax\_s*: for the UK and the Netherlands, the income taxes are calculated separately for each partner (*inctax\_p*: income tax of the principal earner, *inctax\_s*: income tax of the secondary earner). The variable *inctax* corresponds to the sum of *inctax\_p* and *inctax\_s*.
- *locltax*: amount of sum of local taxes faced by the household (this may be taxes at state level, the provincial level, the municipality level or the city level depending on the country)<sup>4</sup>
  - *statetax*: for the US *statetax*=state tax (Michigan), whereas *locltax*=city tax(Detroit)+state tax(Michigan)

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<sup>4</sup>The variable only exists for the US, Italy, and Belgium.

- *socsec*: amount of employee social security contributions of the household
  - *socsec\_p*, *socsec\_s*: for the US, the UK, the Netherlands and Portugal, the employee social security contributions are computed separately for each partner (*socsec\_p*: employee social security contributions of the principal earner, *socsec\_s*: employee social security contributions of the secondary earner). The variable *socsec* corresponds to the sum of *socsec\_p* and *socsec\_s*. Note that also in other countries, e.g. Germany, social security contributions are levied on the individual level and independent of the spousal income. In the output of our MATLAB codes we currently simply do not report them separately for each individual for all countries, but on the household level.
- *ssc\_empr*: amount of employer social security contributions (for both partners). The variable does not exist for France and Italy up to 1994 due to missing information in the OECD reports.
- *benefit*: amount of cash benefits received by the household. The variable does not exist for the US and Germany. Note that the German child benefit “Kindergeld” is modeled as a tax credit.
- $netincome = wage\_principal + wage\_spouse - inctax - localtax - socsec + benefit$ 
  - $netinc\_wobenefit = wage\_principal + wage\_spouse - inctax - localtax - socsec$

For Italy we also compute net income without cash benefits as an extra outcome variable, as child benefits had to be approximated in several years due to incomplete information in the OECD reports.

## 4 Country Codes

### 4.1 General

The country- and year-specific MATLAB files are stored in the folder “Country Code” and the subfolders named by the respective country name. The country codes are structured in the following way:

The program for each year consists of a main function and four extra functions, which are called by the main function. The naming of the main function is: “*tax.country\_YEAR*” i.e. for France in 2000 the main function would be “*tax\_fr\_2000*”. The functions called by the main function are:

- Parameter function
- Social Security Contribution function
- Tax function
- Taxable Income function<sup>5</sup>

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<sup>5</sup>This function does not exist for Belgium. Also for Italy this function only exists for the years 2004-2006 and taxable income is directly computed in the main function file for the other years.



In the final part of the main function the benefits are computed for the UK, Italy, France, the Netherlands, Belgium, and Portugal. They are given to the household as a cash transfer. For Germany, we compute the solidarity surcharge and decide on whether child allowances or child credit (for the years after 1995) are more beneficial for the household in the final part of the main function<sup>6</sup>. There are no cash benefits in the US.

#### 4.1.1 Parameters

Parameter files are stored in the **Parameters** folder. The parameter files are specific for each year and country. The naming of the parameter function is: “*COUNTRY\_parameters\_YEAR*” i.e. for France in 2000 the parameter function would be “*fr\_parameters\_2000*”. All the parameter values used in the tax and social security calculations are stored in the parameter files. For Germany, there are separate parameter files for social security contributions, solidarity surcharges, taxes, and taxable income. Note that there is no conceptual reason why this is different for Germany. We just did not align the German structure with the one we used for the other countries.

#### 4.1.2 Social Security Contributions

Social security contribution functions are stored in the **Socsec** folder. Social security functions are specific for each country. The same social security calculation function is used in years in which the social security contribution calculations are the same. The naming of the function is: “*COUNTRY\_socsec\_YEAR*” i.e. for France in 2000 the social security function would be “*fr\_socsec\_2000*”.

#### 4.1.3 Taxation

Income tax calculation functions are stored in the **Tax** folder. Tax functions are country specific. Some tax functions are used in multiple years where calculations are the same. The naming of the tax function is: “*COUNTRY\_tax\_YEAR*” i.e. for France in 2000 the tax function would be “*fr\_tax\_2000*”.

#### 4.1.4 Taxable Income

Taxable income calculation functions are stored in the **Taxableincome** folder. Taxable income functions are country specific. Some taxable income functions are used in multiple years where calculations are the same. The naming of the taxable income function is: “*COUNTRY\_taxableinc\_YEAR*” i.e. for France in 2000 the taxable income function would be “*fr\_taxableinc\_2000*”.

#### 4.1.5 Deviations from the OECD Tables

In addition to the descriptions of the tax systems for each country and year, the OECD Taxing Wages publications also contain tables which show the tax/benefit positions of specific household types (singles

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<sup>6</sup>Note that the German child benefit “Kindergeld” is modeled as a tax credit.

and married couples, with and without children, and with different income levels) (see Appendix Figure A.1 and A.2 for exemplary tables). We use these tables to cross-check our numbers and check the accuracy of our results. The main differences between the tables and our results are listed in each country section.

## **4.2 US**

### **4.2.1 Tax Unit and Currency Used**

In the US, income taxes are computed at the household level, employee social security contributions are computed separately for the principal and spouse. Since there is no cash benefit for children in the United States, the cash benefit is always equal to zero. Monetary unit is the US dollar (USD).

### **4.2.2 Deviations from the OECD Tables**

#### **For the years 1983-2016:**

There were no major differences with OECD data except for rounding errors.

**Note:** For the years 1983-1986 we use information on the tax schedule from the sources listed below, as they are not provided in the OECD reports.

**Note:** Information on local taxes are either incomplete or missing in the OECD reports before 1993. For the years 1983-1986, parameters are based on the (incomplete) information given in the OECD reports. For 1987 we assume that the system of 1986 still applies, as there is no information available in the OECD report. For 1988-1992 we use information from the Michigan Department of Treasury combined with information from OECD reports after 1992.

### **4.2.3 Additional Sources Used**

#### **For the years 1988-1992:**

For the local taxes:

<http://www.senate.michigan.gov/sfa/publications/notes/2015notes/notesspr15lpdz.pdf>  
[https://www.michigan.gov/documents/IIT99rpt\\_3163\\_7.pdf](https://www.michigan.gov/documents/IIT99rpt_3163_7.pdf)  
[http://www.michigan.gov/treasury/0,4679,7-121-44402\\_44404\\_44406\\_44410\\_65751---,00.html](http://www.michigan.gov/treasury/0,4679,7-121-44402_44404_44406_44410_65751---,00.html)

#### **For the years 1983-1986:**

For the tax schedule:

<https://www.tax-brackets.org/federaltaxtable/1983>  
<https://www.tax-brackets.org/federaltaxtable/1984>  
<https://www.tax-brackets.org/federaltaxtable/1985>  
<https://www.tax-brackets.org/federaltaxtable/1986>

For the social security contributions:

<https://www.ssa.gov/oact/ProgData/taxRates.html>

<https://www.ssa.gov/oact/COLA/cbb.html#Series>

## **4.3 Germany**

### **4.3.1 Tax Unit and Currency Used**

In Germany, the tax unit is the couple - spouses are taxed jointly (income splitting). They can, however, opt for separate taxation. Output is given at the household level, not separately for principal and spouse. The monetary unit is Deutsche Mark (DM) for the years 1983-2000 and Euro for the years 2002-2016.

### **4.3.2 Deviations from the OECD Tables**

#### **For the years 2000-2016:**

No differences, only some rounding errors.

#### **For the years 1996-1999:**

Difference in the standard tax allowances. The OECD has used an extra tax allowance called “Other” which combines the tax allowance for special expenses (108 DM per person) and some extra allowances, which are not specified in the explanations. Apart from that, there are no further differences.

#### **For the years 1983-1994:**

Differences in the standard tax allowances: The OECD lists an extra tax allowance called “Other” in the tax position tables, which is neither mentioned nor described in the tax reports. The only explanation given in the tables is that the allowance concerns church taxes and some tax-free income. To approximately get the numbers in the tables despite the lack of information, we proceed as follows: for 1982, the OECD tables still decompose the “other” tax allowance into tax allowance on church taxes and tax allowance on tax-free income. Subtracting this tax-free income number from gross income and then computing the social security contributions based on the remaining income exactly yields the social security contributions stated in the tables. Therefore, we conclude that households do not have to pay neither taxes nor social security contributions on this tax-free income. In the years 1983-1994, church taxes and tax-free income are not listed separately in the tables, so we try to identify the amount of tax free-income based on the information on social security contributions that we have from the tables. In the next step, we then use this tax-free income to compute taxable income. In 1991-1994, this “tax free income” is equal to zero. Besides this, the taxes and the social security contributions are equal to the OECD reports apart from some rounding errors.

## **4.4 UK**

### **4.4.1 Tax Unit and Currency Used**

In the UK, the tax unit is the individual since 1990, therefore, all the tax calculations are based on individual income and output is given at the individual level, i.e. separately for principal and spouse. In the years before 1990, there are two options: we compute the taxes separately for both spouse and also jointly and choose the more favorable option. If joint taxation is more favorable, we split the total amount of taxes equally between the two spouses. Monetary unit is Pound Sterling (GBP).

### **4.4.2 Deviations from the OECD Tables**

#### **For the years 2003-2016:**

A major difference arises in income tax calculation for couples in the years 2003 and 2004 which ranges between 2% to 8%. This difference in 2003 may come from the fact that tax credits were introduced in April 2003. We have assumed that they are applied to the whole year of 2003. Another reason for the difference may be that the OECD calculates the tax credits on a daily basis and then annualizes the total amount. This causes some discrepancies due to rounding the daily rate and is magnified when it is annualized. For further information on how the OECD computes the amount of credits see corresponding footnotes on “Personal Income Tax System” in OECD Taxing Wages Documents (2003-2016).

#### **For the years 1983-2000:**

The only major difference is in employee social security contributions for the year 1989. This difference amounts to 4%. This may come from the change in calculation rates during the tax year. All other income tax and social security contributions correspond to the OECD tables.

There is 4% or less difference in child benefits for the years 1983, 1984, and 1989. For all the other years, child benefits are consistent with the OECD tables.

## **4.5 Italy**

### **4.5.1 Tax Unit and Currency Used**

In Italy, the tax unit is the individual, therefore, most of the calculations are done for the spouses separately. However, some of the tax credits can be shifted among the spouses. Output is therefore given at household level. The monetary unit is the Lire (ITL) for the years 1982-2000 and Euro (EUR) for the years 2002-2016.

### **4.5.2 Deviations from the OECD Tables**

#### **For the years 2007-2016:**

Our model gives the exact same results as in the OECD Taxing Wages tables apart from the following cases:

Years 2007 & 2008: local taxes differ slightly for some household types listed in the OECD tables. This is caused by an error in the calculation in the OECD tables. These are not in line with the description of the

tax code by the OECD.

Years 2008-2016: we get exact results for families without children. However, there are some minor differences in the child credit in 2008 to 2016 (leads to deviations of up to 1% in central government income taxes paid). Also the cash benefits differ slightly in 2008-2012 and the deviations become more substantial in 2013 and 2016 (amount to up to 300 Euros or roughly 1% in net income). The reason for the differences in cash benefits is that the OECD documents do not report the parameter tables for the computation of the cash benefits since 2007, because the computation is too complicated (the parameter tables are too long). Based on the Stata “Taxben” module (available until 2014), we tried to approximate the cash benefits. However, even the parameters in these Stata files are not updated anymore for the later years, which might explain the deviations that we find. For 2015 and 2016, we use the parameters of the previous years as we do not have any information on updates.

**For the years 1996-2006:**

Apart from some rounding errors, our model gives the exact same results as in OECD Taxing Wages tables for the net income, income tax, social security contributions and child benefits. There are just two minor deviations. In 2000, the tax credit differs slightly for the married household type in which the principal earner earns 100% of the average wage, the spouse earns 33% of the average wage, and the household has two children. The reason is an inconsistency in the OECD tables: adding up the separate tax credits listed in the OECD table yields a different number than the sum of it reported in the table. In 2002, the income tax differs slightly for the same household type, which is caused by the same inconsistency in the OECD table.

**For the years 1983-1993:**

Due to missing information in the OECD reports, information for some household types and tax/benefit categories are also missing in our code or had to be approximated:

Social security contribution: no information on employer contributions, hence, this variable is also missing in our code. For the employees, the OECD report only provides the average rate paid by employees, so that the computation is not very precise.

Tax credits: Basic credit/Credit for dependent worker: information given in the OECD reports is missing and rules seem to change several times during this time span, so we need to make several assumptions to approximate the tax credits effective in each year. E.g. in 1993, while the report mentions that the amount of the credit depends on seven different tax brackets, only the lowest and the highest threshold of the income brackets are given with the respective credits and we choose a linear approximation for the income in-between.

Child & Marriage cash benefit: for 1988-1993: only the values for a married couple with two children are provided, while information for all other household types is missing. Hence, we can only code the benefit for this specific household type based on the reports. For 1987: only some example values for a married couple with two children are provided that we can use to approximate the cash benefit for this household type. In 1986, the information provided is not enough to approximate benefits, so we impose the values from 1987. As child benefits are missing in 1986 to 1993 for married households with one child, we assume that

they receive half of what a household with two children gets. For 1984-1985: we have to approximate the transfers based on the information given in the report. We impute the transfers based on the information on the untaxable transfer per child, the progressivity and phasing out of the transfer as well as related income thresholds.

Under the assumptions and with the limitations named above, we are able to get the tax/benefit position results for the two household types provided in the OECD reports and only face some minor approximation errors in 1985, 1987, 1989-1993. In 1988, the income tax deviates by about 7% to 8%, because the numbers in the OECD report are not updated between 1988 and 1989. Net income deviates by 4% for the couple household in 1986 due to missing information on cash benefits. In 1982-1984, net income deviates by 3% or less.

**Note:** In most years cash benefit values are only available for specific family types in the OECD reports (e.g. families with up to two children). Therefore, we interpolate cash benefits for families with a different number of children. To abstract from this approximation, one may want to use the variable net income without child benefits: *netinc\_wobenefit*.

## **4.6 France**

### **4.6.1 Tax Unit and Currency Used**

In France, the tax unit is the family, therefore all the tax calculations are done for the household income and output is given at the household level, not separately for principal and spouse. Monetary unit is French Francs for the years 1982-2000 and Euro for the years 2002-2016.

### **4.6.2 Deviations from the OECD Tables**

#### **For the years 2002-2016:**

The employee social security calculations give exact results with the OECD model except for some rounding errors. The employer social security contribution calculations give exact results in 2002-2004 and 2010-2016 and lead to some discrepancies with the OECD reports in 2005-2009 (up to 2% in 05,06,08,09 and up to 7% in 07). The reason might be that for some years, there is an inconsistency between the list of parameters provided in the OECD reports and the parameters used in the tax functions such that we have to make some (minor) assumptions about the true parameters/functions. In the income tax calculations, we face some differences with the OECD model due to differences in employment premium tax credit calculations until 2014. The largest difference is 9% for 2004 and 2003 when one of the individuals earns 67% of the average wage. Other differences are smaller than 3%. We have modeled the employment premium tax credits as explained in Taxing Wages documentation by OECD.

#### **For the years 1996-2000:**

In 1997, the employer social security contributions differ from the OECD model by about 4%. Otherwise, the largest difference that we observe is less than 0.5 %.

**For the years 1983-1994:**

Our model computes slightly higher final taxes for low income families with 2 children. The reason for the difference is the lack of information related to the tax deductions that were used in those years. However the difference in the final tax does not go beyond 0.5% of the annual income.

The difference in employee social security contributions is 4.7% for 1993 for a married couple and smaller than 1.8% for other years.

Please note that the SMIC (minimum wage) is not available in the OECD reports before 1996 and the OECD tables do not provide information on the amount of employer social security contributions for the years prior to 1996, hence there is no possibility to validate the code. Therefore, we do not compute employer social security contributions for these years.

## **4.7 Netherlands**

### **4.7.1 Tax Unit and Currency Used**

In the Netherlands, the tax unit is the individual, therefore the tax calculations are done separately for the principal earner and the spouse. There are some tax reliefs for married couples, which allow them to transfer some allowances between the spouses. In our calculations, these allowances will show up in the taxes of the spouse who claimed them. After 2000 income tax and social security contributions are calculated at the household level in the OECD reports. To keep a similar structure of the code, we split the taxes and contributions computed at the household level equally between the principal and the spouse in the years 2000 to 2016.

Monetary unit is Dutch guilder for the years 1986-2000 and Euro (EUR) for the years 2002-2016.

### **4.7.2 Deviations from the OECD Tables**

**For the years 2009-2016:**

The amount of taxable income as reported in the OECD Taxing Wages reports in the tax/benefit position tables is inconsistent with the tax functions given in the report (tax/benefit position 4 is unequal to position 1-2+3, although it should be the same (see Appendix Figure [A.1](#) and [A.2](#) for the different positions)). E.g. in 2010, deviations in taxable income amount to up to 3%. As all numbers (social security contributions, taxes etc.) are based on taxable income, also these numbers do not correspond to the numbers in the tables. If we enforce the taxable income provided in the tax/benefit tables manually, our results for single persons are consistent with the tax/benefit tables (deviations are <1%).

In 2009-2016, the tax equation for the employer social security contributions in the OECD reports are missing/wrong. At the position of the system of equations in the OECD reports, where the social security contribution equation should show up, a different equation is provided that does not refer to social security contributions. We coded the contributions according to the description in the reports. However, this leads to deviations with the tax/benefit position tables of about 5%.

**For the years 1983-2008:**

The largest differences that we observed until 2008 in income taxes and employee social security contributions are:

8% difference in employee social security contributions for married couples in 1991. We believe this is due to some error in the Taxing Wages documents as there is an inconsistency with numbers.

4% difference in employee social security contributions in 1989.

1.8% difference in income tax for year 1991 and 1.4% difference in employee social security contributions for singles in year 1991.

For all other years the difference is less than 1%.

The employer social security contributions correspond to the OECD tables in the years 2000-2008.

In the years 1998 and 1999, differences are smaller than 2%, in 1997 and 1996 differences amount to up to 7%, in 1994: 4.5%, in 1993: smaller than 0.1%, in 1992: 5.4%, in 1991: 1.9%, in 1990: 6.1%, in 1989: 2.5%, in 1988, 1987: smaller than 0.1%, in 1986: 0.2%, in 1985: 1.9%, in 1984: smaller than 0.1%, in 1983: 20%. It is not clear where the differences are coming from.

**Note:** In the years 1983-2016, families with children receive a tax free benefit, depending on the number (and age) of the children. In the Taxing Wages documents only the benefit for a family with two children is reported. We assume that the child benefit per child is half of the amount stated in the reports for two children.

## **4.8 Belgium**

### **4.8.1 Tax Unit and Currency Used**

In Belgium, the tax unit is the individual. However, part of the income can be transferred among the spouses under certain circumstances. Therefore, all the tax calculations are done for the household income and output is given at household level, not separately for principal and spouse.

Monetary unit is Belgian Francs (BEF) for the years 1983-2000 and Euro for the years 2002-2016.

### **4.8.2 Deviations from the OECD Tables**

**For the years 2002-2016:**

We get exactly the same results, except for a few cases explained below:

Year 2004, one earner couple with 2 children: We find around 7% less taxes compared to the OECD tables. We could not find any explanation for the difference.

Year 2008, couples: We find between 0.5-1% higher taxes. This is due to the difference in the family credit, which is higher in the OECD tables.

Year 2010: The employer social security contributions deviate by about 3-4%. We could not find the reason for the numbers in the OECD tables.



**For the years 1989-2000:**

We find exactly the same results, except for single households in years 1992 and 1993 where the largest difference we observe is less than 2%.

**For the years 1983-1988:**

We get exact results for single households and social security contributions. Our model gives a 24% lower income tax on average for couples due to the reduction in income tax due to marital status. The explanations given in OECD Taxing Wages documents do not seem to be applied in the tables. We have programmed what is written in the taxing wages documents.

Note that since 1992, we do not consider the “pécule de vacances” to be part of the employer social security contribution. There is an inconsistency in the OECD tax-benefit position tables: in some years this amount is considered, in other years it is not considered.

In the child benefit calculations we have used the same assumption regarding the age of children as used in the taxing wages documents. The model assumes that children are younger than 6 years old for the years 1983-1987 and that the children are between 6 and 12 years old for the years between 1988-2008.

## **4.9 Portugal**

### **4.9.1 Tax Unit and Currency Used**

In Portugal, the tax unit is the family, therefore all the tax calculations are done for the household income and output is given at household level. In 2016, individual taxation was introduced with the option for couples to choose joint taxation (income-splitting).

The monetary unit is Portuguese escudo (PTE) for the years 1986-2000 and Euro (EUR) for the years 2002-2016.

### **4.9.2 Deviations from the OECD Tables**

**For the years 2001-2016:**

We get the same results as in the OECD Taxing Wages tables.

**For the years 1997-2000:**

The only difference that we find is in the child benefits. Our model takes into account the different income brackets and calculates the child benefit according to the income level of the household as explained in the OECD Taxing Wages documents. However, the tables given in OECD Taxing Wages documents do not take into account those different income brackets.

**For the years 1996 and 1991-1994:**

We get a difference in final tax paid by the one earner couple. This difference comes from the divisor variable used in dividing the taxable income. We have used the values stated in Taxing Wages documents. However the tax/benefit tables use different values. This causes a difference of 5% to 17% in income tax finally paid for the one earner case.

**Note:** Child benefit: in the years 1986-1996, there is a fixed child benefit amount for all households. For households with income smaller than 1.5 times the minimum wage, child benefit increases for the third and subsequent children. However we were not able to find the historical minimum wages, therefore, we have only used the fixed child benefit for every household.

**For the years 1983-1986:**

In 1986: We have a difference of less than 0.1 % in employee social security contributions, this is due to the removal of unemployment benefits in October 1986. We have assumed that the unemployment benefit is paid for 9 months only and calculated the rate according to this assumption.

In 1983-1986: Difference in employer social security contributions of 10% to 20%. It is not clear where these differences are coming from. Unfortunately, from the OECD reports the basis of calculation of the employer social security contributions is not entirely clear ("salariés versés"), so maybe this is the reason for the large discrepancies.

In 1984: difference in child benefit. There seems to be a mistake in the Taxing Wages report or in the table. While the child benefit numbers in the report are the same as in 1985, the numbers in the tables differ between 1984 and 1985. Difference of about 3% in income taxes: the tax rate assumed in the tables seems to be a different one than the one specified in the report.

In 1983: Difference in employee social security contributions of roughly 4%. We use the same MATLAB function as in the following years as the description in the Taxing Wages reports remained the same. While it leads to the right results in the following years, we get the deviation of 4 % in 1983.

## A Appendix

Figure A.1: Example of a Tax/Benefit Position Table for Single Persons,  
Source: OECD “Taxing Wages”, 2014

France 2014					
The tax/benefit position of single persons					
	Wage level (per cent of average wage)	67	100	167	67
	Number of children	none	none	none	2
1. Gross wage earnings		25 076	37 427	62 504	25 076
2. Standard tax allowances					
Basic allowance					
Married or head of family					
Dependent children					
Deduction for social security contributions and income taxes		4 780	7 134	11 489	4 780
Work-related expenses		2 030	3 029	5 101	2 030
Other					
	Total	6 809	10 163	16 591	6 809
3. Tax credits or cash transfers included in taxable income		0	0	0	0
4. Central government taxable income (1 - 2 + 3)		18 267	27 264	45 913	18 267
5. Central government income tax liability (exclusive of tax credits)		3 172	5 482	13 048	1 971
6. Tax credits					
Basic credit					
Married or head of family					
Children					
Other		0	0	0	72
	Total	0	0	0	72
7. Central government income tax finally paid (5-6)		3 172	5 482	13 048	1 899
8. State and local taxes		0	0	0	0
9. Employees' compulsory social security contributions					
Gross earnings		3 523	5 259	8 358	3 523
Taxable income					
	Total	3 523	5 259	8 358	3 523
10. Total payments to general government (7 + 8 + 9)		6 695	10 741	21 405	5 422
11. Cash transfers from general government					
For head of family (Gross)					
For two children (Gross)		0	0	0	1 558
CRDS Deducted		0	0	0	- 8
	Total	0	0	0	1 550
12. Take-home pay (1-10+11)		18 381	26 687	41 098	21 204
13. Employers' compulsory social security contributions		8 445	14 335	27 477	8 445
14. Average rates					
Income tax		12.6%	14.6%	20.9%	7.6%
Employees' social security contributions		14.1%	14.1%	13.4%	14.1%
Total payments less cash transfers		26.7%	28.7%	34.2%	15.4%
Total tax wedge including employer's social security contributions		45.2%	48.4%	54.3%	36.7%
15. Marginal rates					
Total payments less cash transfers: Principal earner		32.1%	43.8%	42.5%	21.9%
Total payments less cash transfers: Spouse		n.a.	n.a.	n.a.	n.a.
Total tax wedge: Principal earner		62.6%	59.3%	59.9%	57.0%
Total tax wedge: Spouse		n.a.	n.a.	n.a.	n.a.

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Figure A.2: Example of a Tax/Benefit Position Table for Married Couples,  
Source: OECD “Taxing Wages”, 2014

France 2014					
The tax/benefit position of married couples					
	Wage level (per cent of average wage)	100-0	100-33	100-67	100-33
	Number of children	2	2	2	none
1. Gross wage earnings		37 427	49 778	62 504	49 778
2. Standard tax allowances					
Basic allowance					
Married or head of family					
Dependent children					
Deduction for social security contributions and income taxes		7 134	9 488	11 914	9 488
Work-related expenses		3 029	4 029	5 059	4 029
Other					
	Total	10 163	13 517	16 973	13 517
3. Tax credits or cash transfers included in taxable income		0	0	0	0
4. Central government taxable income (1 - 2 + 3)		27 264	36 261	45 531	36 261
5. Central government income tax liability (exclusive of tax credits)		2 942	4 056	7 217	6 276
6. Tax credits					
Basic credit					
Married or head of family					
Children					
Other		0	702	0	0
	Total	0	702	0	0
7. Central government income tax finally paid (5-6)		2 942	3 354	7 217	6 276
8. State and local taxes		0	0	0	0
9. Employees' compulsory social security contributions					
Gross earnings		5 259	6 994	8 782	6 994
Taxable income					
	Total	5 259	6 994	8 782	6 994
10. Total payments to general government (7 + 8 + 9)		8 200	10 348	15 999	13 270
11. Cash transfers from general government					
For head of family (Gross)					
For two children (Gross)		1 558	1 558	1 558	0
CRDS Deducted		- 8	- 8	- 8	0
	Total	1 550	1 550	1 550	0
12. Take-home pay (1-10+11)		30 777	40 980	48 054	36 509
13. Employers' compulsory social security contributions		14 335	15 854	22 780	15 854
14. Average rates					
Income tax		7.9%	6.7%	11.5%	12.6%
Employees' social security contributions		14.1%	14.1%	14.1%	14.1%
Total payments less cash transfers		17.8%	17.7%	23.1%	26.7%
Total tax wedge including employer's social security contributions		40.5%	37.6%	43.7%	44.4%
15. Marginal rates					
Total payments less cash transfers: Principal earner		21.9%	42.3%	32.1%	32.1%
Total payments less cash transfers: Spouse		17.4%	41.7%	32.1%	32.1%
Total tax wedge: Principal earner		43.5%	58.3%	50.9%	50.9%
Total tax wedge: Spouse		26.4%	48.1%	62.6%	39.5%

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