

Implicit Tax Rates on Consumption and Labor in Europe

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The aim of this blog post is to compute the implicit tax rates (ITR) on consumption, labour and corporate income for France, Italy, Spain, Germany and the Euro Area since 1995. We use as reference the report on Taxation trends in the European Union (2019) from the European Commission, and the previous reports since 2014.

This database is built and updated through [DBnomics](https://db.nomics.world/) using the [rdbnomics](https://cran.r-project.org/web/packages/rdbnomics/index.html) package. All the code is written in R, thanks to the [RCoreTeam \(2016\)](#) and [RStudioTeam \(2016\)](#).

Implicit tax rate on consumption

The ITR on consumption is defined as all consumption taxes divided by the final consumption expenditure of households (domestic concept). The DG Taxation & Customs Union of the European Commission proposes a detailed calculation methodology [here](https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2017_methodology.pdf). We follow this general methodology using Eurostat's data for the 19 countries composing the Euro Area, and we will add some specificities for France, Germany, Italy and Spain using national tax lists. Given that the ITR is a ratio, we structure this section in 4 steps. We begin by gathering all data on consumption taxes (the numerator), we add the specificities for France, Germany, Italy and Spain, then we retrieve data on the final consumption expenditure of households on the economic territory (the denominator), and we finish by constituting the Euro Area GDP-weighted average.

Step 1: taxes on consumption

Following the DG Taxation & Customs Union's methodology, we consider as taxes on consumption the following aggregates (values in parenthesis represent the ESA 2010 nomenclature):

1. Value added type taxes (D211)
2. Taxes and duties on imports excluding VAT (D212)
3. Taxes on products except VAT and import duties (D214), excluding:
 - a. Stamp taxes (D214B)
 - b. Taxes on financial and capital transactions (D214C)
 - c. Export duties and monetary compensatory amounts on exports (D214K)
4. From other taxes on production:
 - a. Taxes on international transactions (D29D)
 - b. Taxes on pollution (D29F)
 - c. Under-compensation of VAT (flat rate system) (D29G)

5. From other current taxes:

- a. Poll taxes (D59B)
- b. Expenditure taxes (D59C)
- c. Payments by households for licences (D59D)

These aggregates can be found in Eurostat's database, using the dataset "Main national accounts tax aggregates" (gov_10a_taxag).

```
url_country <- paste(c("AT", "BE", "CY", "EE", "FI", "FR", "DE", "EL", "IE", "IT",
                      "LV", "LT", "LU", "MT", "NL", "PT", "SK", "SI", "ES"),
                    collapse = "+")

url_taxes <- paste(c("D211", "D212",
                    "D214", "D214B", "D214C", "D214K",
                    "D29D", "D29F", "D29G",
                    "D59B", "D59C", "D59D"),
                  collapse = "+")

filter <- paste0("A.MIO_NAC.S13_S212.", url_taxes, ".", url_country)

ITR_cons_num <-
  rdb("Eurostat", "gov_10a_taxag", mask = filter) %>%
  filter(year(period)>=1995 & year(period)<yearmax) %>%
  select(country=geo, period, var=na_item, value)
```

We check the beginning and the end of the data series we have just obtained from Eurostat's database:

Taxes on consumption: beginning of the sample												
country	D211	D212	D214	D214B	D214C	D214K	D29D	D29F	D29G	D59B	D59C	D59D
AT	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
BE	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
CY	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
DE	1995	1995	1995	1995	1995	NA	NA	1995	1995	NA	NA	1995
EE	1995	1995	1995	NA	NA	NA	NA	1995	NA	NA	NA	NA
EL	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
ES	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
FI	1995	1995	1995	1995	1997	NA	NA	1996	NA	NA	NA	1995
FR	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
IE	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
IT	1995	1995	1995	1995	1995	NA	NA	1995	NA	NA	NA	1995
LT	1995	1995	1995	1995	NA	NA	NA	1995	NA	NA	NA	1995
LU	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995	1995
LV	1995	1995	1995	NA	1995	1995	NA	1995	NA	NA	NA	2007
MT	1995	1995	1995	1995	1995	NA	NA	2007	NA	NA	1995	1995
NL	1995	1995	1995	NA	1995	NA	NA	1995	NA	NA	NA	NA
PT	1995	1995	1995	1995	1995	NA	NA	2006	NA	2015	NA	1995
SI	1999	1995	1995	NA	1995	NA	NA	1995	1999	NA	NA	1995
SK	1995	1995	1995	1995	1995	NA	NA	1995	NA	NA	NA	1995

Note:

The following taxes are not applicable for some countries (in a determined period of time): D214B, D214C, D214K, D29D, D29F, D29G, D59B, D59C, D59D. Thus we replace their NA values by 0 for the calculation.

¹ D214B is not applicable for: EE, LV, SI.

² D214C is not applicable for: EE, LV, SI; it is applicable for FI since 1997.

³ D214K is not applicable for: EE, FI, IT, LT, MT, PT, SI, SK.

⁴ D29D is not applicable for: EE, FI, IT, LT, LV, MT, PT, SI, SK.

⁵ D29F is applicable since: 1996 for FI, 2007 for MT, and 2006 for PT.

⁶ D29G is not applicable for: EE, FI, IT, LT, LV, MT, PT; it is applicable for SI since 1999.

⁷ D59B is not applicable for: EE, FI, IT, LT, LV, MT, SI, SK; it is applicable for PT since 2015.

⁸ D59C is not applicable for: EE, FI, IT, LT, LV, PT, SI, SK.

⁹ D59D is not applicable for: EE; it is applicable for LV since 2007.

Taxes on consumption: end of the sample												
country	D211	D212	D214	D214B	D214C	D214K	D29D	D29F	D29G	D59B	D59C	D59D
AT	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
BE	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
CY	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
DE	2018	2018	2018	2018	2018	NA	NA	2018	2018	NA	NA	2018
EE	2018	2018	2018	NA	NA	NA	NA	2018	NA	NA	NA	NA
EL	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
ES	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
FI	2018	2018	2018	2002	2018	NA	NA	2018	NA	NA	NA	2018

Note:

The following taxes are not applicable for some countries (in a determined period of time): D214B, D214C, D214K, D29D, D29F, D29G, D59B, D59C, D59D. Thus we replace their NA values by 0 for the calculation.

¹ D214B is not applicable for: EE, LV, SI; it is applicable for FI until 2002, and for SK until 2004.

² D214C is not applicable for: EE, LV, SI.

³ D214K is not applicable for: EE, FI, IT, LT, MT, PT, SI, SK. it is applicable for MT until 1999.

⁴ D29D is not applicable for: EE, FI, IT, LT, LV, MT, PT, SI, SK.

⁵ D29G is not applicable for: EE, FI, IT, LT, LV, MT, PT.

⁶ D59B is not applicable for: EE, FI, IT, LT, LV, MT, SI, SK.

⁷ D59C is not applicable for: EE, FI, IT, LT, LV, PT, SI, SK; it is applicable for MT until 1995

⁸ D59D is not applicable for: EE.

country	D211	D212	D214	D214B	D214C	D214K	D29D	D29F	D29G	D59B	D59C	D59D
FR	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
IE	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
IT	2018	2018	2018	2018	2018	NA	NA	2018	NA	NA	NA	2018
LT	2018	2018	2018	2018	NA	NA	NA	2018	NA	NA	NA	2018
LU	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
LV	2018	2018	2018	NA	2018	1999	NA	2018	NA	NA	NA	2018
MT	2018	2018	2018	2018	2018	NA	NA	2018	NA	NA	1995	2018
NL	2018	2018	2018	NA	2018	NA	NA	2018	NA	NA	NA	NA
PT	2018	2018	2018	2018	2018	NA	NA	2018	NA	2018	NA	2018
SI	2018	2018	2018	NA	2018	NA	NA	2018	2018	NA	NA	2018
SK	2018	2018	2018	2018	2018	NA	NA	2018	NA	NA	NA	2018

Note:

The following taxes are not applicable for some countries (in a determined period of time): D214B, D214C, D214K, D29D, D29F, D29G, D59B, D59C, D59D. Thus we replace their NA values by 0 for the calculation.

¹ D214B is not applicable for: EE, LV, SI; it is applicable for FI until 2002, and for SK until 2004.

² D214C is not applicable for: EE, LV, SI.

³ D214K is not applicable for: EE, FI, IT, LT, MT PT, SI, SK. It is applicable for MT until 1999.

⁴ D29D is not applicable for: EE, FI, IT, LT, LV, MT, PT, SI, SK.

⁵ D29G is not applicable for: EE, FI, IT, LT, LV, MT, PT.

⁶ D59B is not applicable for: EE, FI, IT, LT, LV, MT, SI, SK.

⁷ D59C is not applicable for: EE, FI, IT, LT, LV, PT, SI, SK; it is applicable for MT until 1995

⁸ D59D is not applicable for: EE.

Step 2: taxes on consumption - example of specificities for France, Germany, Italy and Spain

We pay special attention to France, Italy, Spain & Germany, and following the DG Taxation & Customs Union we add some specificities using a detailed list of taxes and social contributions according to national classification (NTLs - national tax lists), as follows:

France

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_and_national-tax.xlsx):

1. From council tax (D59A):
 - a. (C05): part raised on consumption.
2. From capital transfers from general government to relevant sectors representing taxes and social contributions assessed but unlikely to be collected (D995):
 - a. part raised on consumption.

Germany

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_and_national-tax.xlsx):

1. From other current taxes n.e.c. (D59F):
 - a. (C03): tax on radio and TV.

Italy

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_and_national-tax.xlsx):

1. From stamp taxes (D214B):
 - a. (C01): excise duty on tobacco.
 - b. (C02): excise duty on spirits.
 - c. (C03): receipts from sale of denaturing agents and government seals
2. From other current taxes on production n.e.c. (D29H):
 - a. (C02): other taxes on production.
 - b. (C05): fees to national & local economic bodies.

Spain

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_and_national-tax.xlsx):

1. From taxes on products except VAT and import duties (D214) exclude also:
 - a. (D214L_C01): tax on building, equipment and works.
2. From other taxes on production assessed but unlikely to be collected (D995B):
 - a. part raised on consumption.

To find more information about other EU country specificities, check the National Tax Lists online in the DG Taxation and Customs Union [website](https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en) (https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en), or Eurostat's dedicated [website](https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics) (https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics) on Tax Revenue Statistics.

```
conso_specificities <-
  read_xlsx("s_conso.xlsx") %>%
  mutate(period=as.Date(period)) %>%
  select(country, period, var, value=total) %>%
  filter(year(period)>=1995 & year(period)<yearmax) %>%
  spread(var,value)

ITR_cons_num <-
  ITR_cons_num %>%
  spread(var,value) %>%
  left_join(conso_specificities,by=c("country","period"))

ITR_cons_num[is.na(ITR_cons_num)] <- 0

ITR_cons_num <-
  ITR_cons_num %>%
  transmute(period,
            country,
            value=D211+D212+(D214-D214B-D214C-D214K)+(D29D+D29F+D29G)+(D59B+D59C+D
59D)+spec) %>%
  add_column(var="tx_cons")
```

Step 3: final consumption expenditure of households on the economic territory

The denominator of the ratio we are constituting is defined as the final consumption expenditure of households on the economic territory - domestic concept (P31_S14_DC). This aggregate can be retrieved from Eurostat's dataset "Final consumption aggregates by durability" (nama_10_fcs).

```
filter <- paste0("A.CP_MNAC.", "P31_S14_DC", ".", url_country)

ITR_cons_den <-
  rdb("Eurostat", "nama_10_fcs", mask = filter) %>%
  filter(year(period)>=1995 & year(period)<yearmax) %>%
  select(country=geo, period, value, var=na_item)
```

Final consumption expenditure of households: beginning and end of the sample

country	mindate	maxdate
AT	1995	2018
BE	1995	2018
CY	1995	2018
DE	1995	2018
EE	1995	2018
EL	1995	2018
ES	1995	2018
FI	1995	2018
FR	1995	2018
IE	1995	2018
IT	1995	2018
LT	1995	2018
LU	1995	2018
LV	1995	2018
MT	1995	2018
NL	1995	2018
PT	1995	2018
SI	1995	2018

country
SK

mindate
1995

maxdate
2018

Step 4: Euro Area GDP-weighted average

After setting up the ITR on consumption for the 19 countries that compose the Euro Area, it is possible to build the GDP-weighted average for the Euro Area. First, it is necessary to establish the weights that will be used for this purpose, using the GDP of each country (million purchasing power standards). Data series for each country is available since 1995.

```
filter <- paste0("A.CP_MPPS.", "BIGQ", ".", url_country)

gdp <-
  rdb("Eurostat", "nama_10_gdp", mask = filter) %>%
  select(period, value, country=geo) %>%
  add_column(var="gdp") %>%
  filter(year(period)>=1995 & year(period)<yearmax)

EA_gdp <-
  gdp %>%
  group_by(period) %>%
  summarize(value=sum(value))

weights <-
  gdp %>%
  left_join(EA_gdp, by="period") %>%
  ungroup() %>%
  transmute(country, period, weight=value.x/value.y)
```

Now we apply these weights to our country data in order to build the Euro Area GDP-weighted average. The figure below shows the final series for France, Germany, Italy, Spain and the Euro Area.

```
ITR_consumption_EA_na <-
  ITR_consumption %>%
  left_join(weights, by=c("country", "period"))

ITR_consumption_EA_na[is.na(ITR_consumption_EA_na)] <- 0

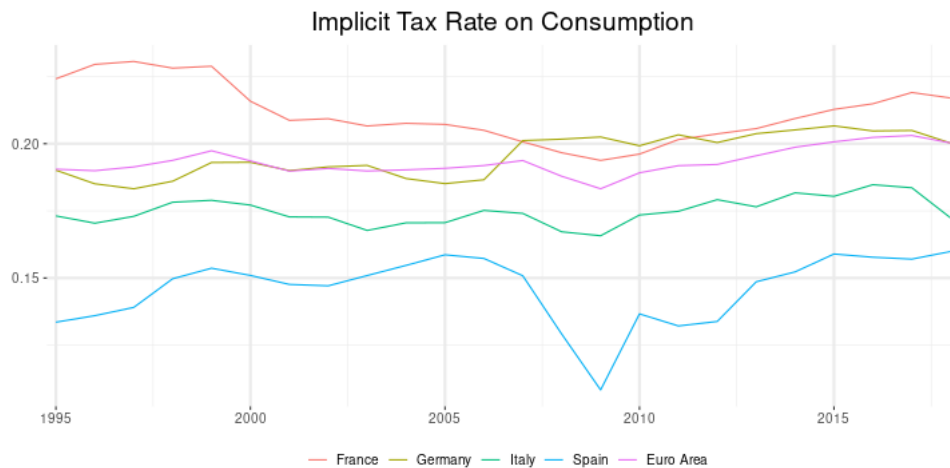
ITR_consumption_EA <-
  ITR_consumption_EA_na %>%
  transmute(period, value=value*weight) %>%
  group_by(period) %>%
  summarize(value =sum(value)) %>%
  add_column(country="EA19")

ITR_consumption_4 <-
  ITR_consumption %>%
  filter(grepl('FR|DE|IT|ES', country))

ITR_consumption_FIN <-
  bind_rows(ITR_consumption_4, ITR_consumption_EA) %>%
  add_column(var="Consumption tax")

ITR_consumption_FIN$country <- factor(ITR_consumption_FIN$country)
levels(ITR_consumption_FIN$country) <- listcountry

ggplot(ITR_consumption_FIN, aes(period, value, colour=country))+
  geom_line()+
  scale_x_date(expand = c(0.01, 0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Implicit Tax Rate on Consumption")
```



Implicit tax rate on labour

The ITR on employed labour is defined as the sum of all direct and indirect taxes and employees' and employers' social contributions levied on employed labour income, divided by the total compensation of employees working in the economic territory. As for the ITR on consumption, the DG Taxation & Customs Union of the European Commission proposes a detailed calculation methodology [here](https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2017_-_methodology.pdf) (https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2017_-_methodology.pdf). We follow this general methodology using Eurostat data. Given the nature of the ITR, we structure this section in 5 steps. We begin by gathering all data on employed labour taxes (the numerator), we add the specificities for France, Germany, Italy and Spain, then we deal with the special case of the personal income tax. After that we retrieve data on the total compensation of employees & wage bill and payroll taxes, and finally we constitute the Euro Area GDP-weighted average.

Step 1: taxes on employed labour

Following the DG Taxation & Customs Union's methodology, we consider as taxes on employed labour the following aggregates:

1. From taxes on income:
 - a. Taxes on individual or household income including holding gains - part raised on labour income (D51A_C1). We deduce the part raised on labor income in the next step
2. From other current taxes:
 - a. Total wage bill and payroll taxes (D29C)
3. From employers' actual social contributions:
 - a. Compulsory employers' actual social contributions (D611C)
4. From households' actual social contributions:
 - a. Compulsory employees' actual social contributions (D613CE)

These aggregates can be retrieved from Eurostat's dataset "Main national accounts tax aggregates" (gov_10a_taxag).

```
url_taxes <- paste(c("D51A_C1", "D29C", "D611C", "D613CE"),
  collapse = "+")
filter <- paste0("A.MIO_NAC.S13_S212.", url_taxes, ".", url_country)

ITR_lab_num_raw <-
  rdb("Eurostat", "gov_10a_taxag", mask = filter)

ITR_lab_num1 <-
  ITR_lab_num_raw %>%
  transmute(country=geo, period, var=na_item, value) %>%
  filter(year(period)>=1995 & year(period)<yearmax & !grepl('D51A_C1', var))
```

Step 2: taxes on employed labour - example of specificities for France, Germany, Italy and Spain:

We pay special attention to France, Italy, Spain & Germany, and following the DG Taxation & Customs Union we add some specificities using a detailed list of taxes and social contributions according to national classification (NTLs - national tax lists), as follows:

France

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_analysis/national-tax.xlsx):

1. From contributions on the value added of the corporations (D29A):
 - a. part raised on employers' labour tax.
2. From capital transfers from general government to relevant sectors representing taxes and social contributions assessed but unlikely to be collected (D995):
 - a. part raised on employers' labour tax.
 - b. part raised on employees' labour tax.
3. From taxes on individual or household income including holding gains - part raised on labour income (D51A_C1), exclude the following for the calculation of the personal income tax:
 - a. (D51A_C02): used dividend imputation (positive).
 - b. (D51A_C05): civil servants contribution to the unemployment insurance regime.
 - c. (D51A_C06): other social levies.
 - d. (D51A_C08): levies on the income from financial assets (PRCM).
4. From taxes on individual or household income including holding gains - part raised on labour income (D51A_C1), include the following for the calculation of the Employees' SSC:
 - a. (D51A_C05): civil servants contribution to the unemployment insurance regime.

Spain

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_analysis/national-tax.xlsx):

1. Taxes on income assessed but unlikely to be collected (D995C).
 - a. part raised on personal income tax.

For Italy and Germany, it is also possible to apply some specificities, e.g. for Germany the trade tax (D51M_C4) can be excluded from D51A_C1, and for Italy part of the Revenue from IRAP tax can be included to labour and employers' SSC. However, the general formula was already sufficient to recover the general trend of the implicit tax rate. To find more information about other EU country specificities, check the National Tax Lists online in the DG Taxation and Customs Union [website](https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en) (https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en), or Eurostat's dedicated [website](https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics) (https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics) on Tax Revenue Statistics.

```
labour_specificities <-
  read_xlsx("s_labour.xlsx") %>%
  mutate(period=as.Date(period)) %>%
  select(country, period, corr_pit=total_split1,corr_leyrs=total_leyrs, corr_lees=
total_lees) %>%
  filter(year(period)>=1995 & year(period)<yearmax)
```

Step 3: personal income tax, part raised on labour income

The fundamental methodological problem in calculating the ITR on labour relies in this part: the personal income tax is broad-based and relates to multiple sources of income (i.e. employed labour, self-employed labour, income from capital and income in the form of social benefits and pensions received). For constituting this ITR, it is then only necessary to use the part raised on labour income. The DG Taxation & Customs Union uses disaggregated taxpayers'

data in order to allocate the personal income tax revenue across different sources of income. It provides data for estimating the part of the revenue from personal income tax that can be attributed to labour income. The tables below can be found in the reports on Taxation Trends in the European Union in its [2020](#)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2020.pdf), [2019](#)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2019.pdf), [2018](#)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2018.pdf), [2017](#)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2017.pdf), [2016](#)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_a and [2014](#)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_a editions (pages 297, 292, 292, 276, 330 and 303 respectively). We will chain the tables by averaging the data points when they differ from table to table, in order to get the (1995-2018) series on the percentage of personal income tax revenue allocated to employed labour income. We use these percentages to obtain the final series on personal income tax raised on labour income.

```
url_country_pit <- paste(c("AT", "BE", "CY", "EE", "FI", "FR", "DE", "EL", "IE", "IT",
                           "LV", "LT", "LU", "MT", "NL", "PT", "SK", "SI", "ES"),
                        collapse = "|")

pit_2020_raw <- read_csv("pit_2020.csv") %>%
  filter(grepl(url_country_pit, country))
```

Personal income tax revenue allocated to employed labour income, in % of total revenue of personal income tax (2004–2018)

country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AT	62.2	62.8	62.2	62.8	63.1	62.0	61.7	62.5	62.6	62.2	61.7	61.7	60.3	60.4	60.5
BE	77.0	77.3	77.0	77.3	77.6	77.9	78.0	78.1	77.3	77.0	76.1	75.3	75.0	73.9	73.9
CY	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5
DE	71.9	70.3	71.9	70.3	71.2	73.2	72.7	72.7	72.7	72.7	72.5	71.6	71.7	71.7	72.4
EE	88.0	89.5	88.0	89.5	88.5	86.7	86.1	86.8	88.2	88.4	88.5	87.5	87.7	87.8	86.4
EL	51.0	50.7	51.0	50.7	50.0	50.3	50.5	47.7	50.2	50.2	50.2	50.2	50.2	50.2	50.2
ES	67.2	68.2	67.2	68.2	70.9	72.4	73.0	72.1	70.7	69.5	68.4	67.6	67.3	66.6	65.8
FI	67.3	66.3	67.3	66.3	69.1	69.1	67.3	66.7	66.4	65.5	63.5	62.3	61.8	61.0	60.6
FR	58.2	58.4	58.2	58.4	58.1	57.8	54.2	55.5	56.8	55.4	55.4	55.2	55.8	55.8	56.1
IE	80.4	80.5	80.4	80.5	81.1	81.7	82.3	82.9	83.4	83.2	83.7	80.9	83.6	83.9	83.9
IT	54.4	54.4	54.4	54.4	55.6	55.1	54.7	54.5	55.0	54.4	53.5	53.9	53.8	54.4	54.4
LT	88.7	87.4	88.7	87.4	84.0	71.0	76.9	77.9	78.5	80.3	79.7	79.8	79.6	77.0	78.1
LU	72.8	71.8	72.8	71.8	74.5	73.3	73.4	72.7	72.5	72.7	72.1	72.5	72.3	71.8	71.8
LV	95.7	96.6	95.7	96.6	96.3	94.4	89.0	87.1	87.1	86.8	86.1	86.5	85.8	84.6	84.7
MT	69.5	69.2	69.5	69.2	69.7	69.3	69.7	69.8	70.4	70.2	70.4	69.7	70.4	69.7	75.0
NL	70.3	69.6	70.3	69.6	68.7	73.2	71.4	72.4	71.7	69.5	63.9	67.0	66.7	62.6	65.2
PT	63.6	60.6	63.6	60.6	58.9	59.1	61.2	59.1	54.8	55.6	55.4	57.3	59.0	60.0	60.0
SI	87.6	82.2	87.6	82.2	83.7	87.2	87.8	87.9	86.4	89.8	88.4	87.3	88.0	86.7	86.7
SK	85.4	86.5	85.4	86.5	88.1	93.9	94.3	93.8	94.4	93.8	93.9	94.3	95.0	96.4	96.3


```

pit_2020 <-
  pit_2020_raw %>%
  gather(period,r_2020,-country)

pit_2019 <- read_csv("pit_2019.csv") %>%
  filter(grepl(url_country_pit, country)) %>%
  gather(period,r_2019,-country)

pit_2018 <- read_csv("pit_2018.csv") %>%
  filter(grepl(url_country_pit, country)) %>%
  gather(period,r_2018,-country)

pit_2017 <- read_csv("pit_2017.csv") %>%
  filter(grepl(url_country_pit, country)) %>%
  gather(period,r_2017,-country)

pit_2016 <- read_csv("pit_2016.csv") %>%
  filter(grepl(url_country_pit, country)) %>%
  gather(period,r_2016,-country)

pit_2014 <- read_csv("pit_2014.csv") %>%
  filter(grepl(url_country_pit, country)) %>%
  gather(period,r_2014,-country)

pit <-
  pit_2014 %>%
  full_join(pit_2016,by=c("country","period")) %>%
  mutate(r_2016=ifelse(is.na(r_2016),r_2014,r_2016)) %>%
  full_join(pit_2017,by=c("country","period")) %>%
  mutate(r_2017=ifelse(is.na(r_2017),r_2016,r_2017)) %>%
  full_join(pit_2018,by=c("country","period")) %>%
  mutate(r_2018=ifelse(is.na(r_2018),r_2017,r_2018)) %>%
  full_join(pit_2019,by=c("country","period")) %>%
  mutate(r_2019=ifelse(is.na(r_2019),r_2018,r_2019)) %>%
  full_join(pit_2020,by=c("country","period")) %>%
  mutate(r_2020=ifelse(is.na(r_2020),r_2018,r_2020)) %>%
  transmute(country,period=ymd(period),a_weight=r_2020/100)

ITR_lab_num2 <-
  ITR_lab_num_raw %>%
  transmute(country=geo,period,var=na_item,value) %>%
  filter(year(period)>=1995 & year(period)<yearmax & var=="D51A_C1") %>%
  left_join(labour_specificities, by=c("country","period"))%>%
  left_join(pit,by=c("country","period"))

ITR_lab_num2[is.na(ITR_lab_num2)] <- 0

ITR_lab_num2<-
  ITR_lab_num2 %>%
  transmute(country,period,var,value=((value+corr_pit)*a_weight))

ITR_lab_num <-
  bind_rows(ITR_lab_num1,ITR_lab_num2)

```

Step 4: compensation of employees, wage bill and payroll taxes

The total compensation of employees (D1) is part of the denominator of the ratio we are constituting. Following the DG Taxation & Customs Union's methodology, it is defined as total remuneration, in cash or in kind, payable by an employer to an employee in return for work done. It consists of gross wages (in cash or in kind) and thus also the amount paid as social insurance contributions and wage withholding tax. In addition, employers' social contributions (including imputed social contributions) as well as to private pensions and related schemes are included. Personal income taxes and social contributions paid by EU civil servants to the EU Institutions are not included. Compensation of employees is thus a broad measure of the

gross economic income from employment before any charges are withheld. This aggregate can be retrieved from Eurostat's database, using the dataset "GDP and main components (output, expenditure and income)" (nama_10_gdp).

```
filter <- paste0("A.CP_MNAC.", "D1", ".", url_country)

ITR_lab_den<-
  rdb("Eurostat", "nama_10_gdp", mask = filter) %>%
  transmute(country=geo, period, value, var=na_item) %>%
  filter(year(period)>=1995 & year(period)<yearmax)

ITR_labour_na <-
  bind_rows(ITR_lab_num, ITR_lab_den) %>%
  spread(var, value)
```

Taxes on employed labour: beginning of the sample

country	D1	D29C	D51A_C1	D611C	D613CE
AT	1995	1995	1995	1995	1995
BE	1995	1995	1995	1995	1995
CY	1995	1995	1995	1995	1995
DE	1995	NA	1995	1995	1995
EE	1995	NA	1995	1995	2002
EL	1995	1995	1995	1995	1995
ES	1995	1995	1995	1995	1995
FI	1995	1995	1995	1995	1995
FR	1995	1995	1995	1995	1995
IE	1995	1995	1995	1995	1995
IT	1995	1995	1995	1995	1995
LT	1995	2002	1995	1995	1995
LU	1995	1995	1995	1995	1995
LV	1995	2003	1995	1995	1995
MT	1995	NA	1995	1995	1995
NL	1995	1995	1995	1995	1995
PT	1995	1995	1995	NA	1996
SI	1995	1995	1995	1995	1995
SK	1995	NA	1995	1995	1995

Note:

The following aggregates are not applicable for some countries (in a determined period of time): D51A_C1, D29C, D611C, D613CE. Thus we replace their NA values by 0 for the calculation.

¹ D1 has not been collected for IE before 1998. We will omit these points in the estimation.

² D29C is not applicable for: EE, MT and SK; it is applicable for LT since 2002 and for LV since 2003.

³ D611C is not available, exists but has not been transmitted/collected for PT.

⁴ D613C is applicable for EE since 2002; it is not available, exists but has not been collected for PT before 2010

Taxes on employed labour: end of the sample

country	D1	D29C	D51A_C1	D611C	D613CE
AT	2018	2018	2018	2018	2018
BE	2018	2018	2018	2018	2018
CY	2018	2018	2018	2018	2018
DE	2018	NA	2018	2018	2018
EE	2018	NA	2018	2018	2018
EL	2018	2018	2018	2018	2018
ES	2018	2018	2018	2018	2018
FI	2018	2014	2018	2018	2018
FR	2018	2018	2018	2018	2018
IE	2018	2018	2018	2018	2018
IT	2018	2018	2018	2018	2018
LT	2018	2016	2018	2018	2018
LU	2018	2018	2018	2018	2018
LV	2018	2018	2018	2018	2018
MT	2018	NA	2018	2018	2018
NL	2018	2018	2018	2018	2018
PT	2018	2002	2018	NA	2018
SI	2018	2018	2018	2018	2018
SK	2018	NA	2018	2018	2018

Note:

The following aggregates are not applicable for some countries (in a determined period of time): D51A_C1, D29C, D611C, D613CE. Thus we replace their NA values by 0 for the calculation.

¹ D1 has not been collected for IE before 1998. We will omit these points in the estimation.

² D29C is not applicable for: EE, MT and SK; it is applicable for LT since 2002 and for LV since 2003.

³ D611C is not available, exists but has not been transmitted/collected for PT.

⁴ D613C is applicable for EE since 2002; it is not available, exists but has not been collected for PT before 2010

```

ITR_labour_na <-
  ITR_labour_na %>%
  left_join(labour_specificities, by=c("country", "period"))

ITR_labour_na[is.na(ITR_labour_na)] <- 0

ITR_labour <-
  ITR_labour_na %>%
  transmute(country, period,
    ITR_labour=(D51A_C1+D29C+D611C+D613CE+corr_leyrs+corr_lees)/(D1+D29C),
    ITR_pi=D51A_C1/(D1+D29C),
    ITR_essc=(D613CE+corr_lees)/(D1+D29C),
    ITR_esscprt=(D611C+D29C+corr_leyrs)/(D1+D29C))

```

Step 5: Euro Area GDP-weighted average

After setting up the ITR on labour for the 19 countries that compose the Euro Area, it is possible to build the GDP-weighted average for the Euro Area. We use the same weights that were established for the ITR on consumption. The chart below shows the final series for France, Germany, Italy, Spain and the Euro Area.

```

ITR_labour_EA <-
  ITR_labour %>%
  left_join(weights, by=c("country"="country", "period"="period")) %>%
  filter(ITR_labour<1) %>%
  transmute(period,
    ITR_labour=ITR_labour*weight,
    ITR_pi=ITR_pi*weight,
    ITR_essc=ITR_essc*weight,
    ITR_esscprt=ITR_esscprt*weight) %>%
  group_by(period) %>%
  summarize(ITR_labour=sum(ITR_labour),
    ITR_pi=sum(ITR_pi),
    ITR_essc=sum(ITR_essc),
    ITR_esscprt=sum(ITR_esscprt)) %>%
  add_column(country="EA19")

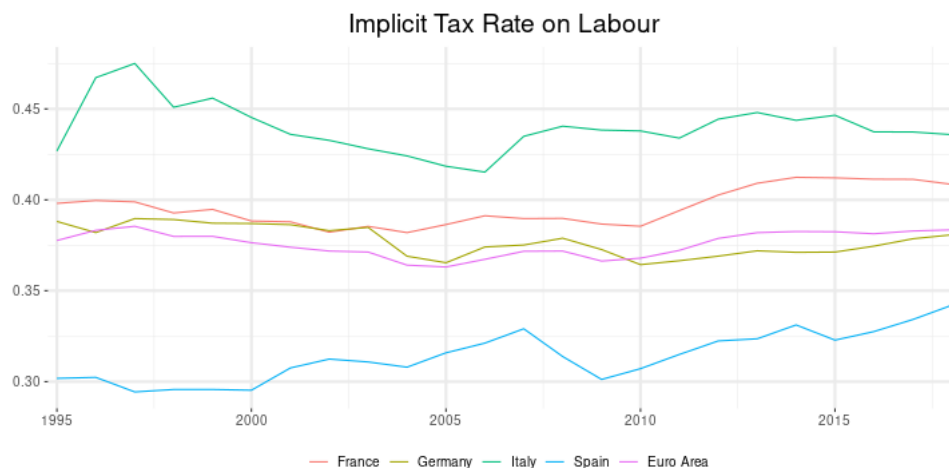
ITR_labour_4 <-
  ITR_labour %>%
  filter(grepl('FR|DE|IT|ES', country))

ITR_labour_FIN1 <-
  bind_rows(ITR_labour_4, ITR_labour_EA)

ITR_labour_FIN1$country <- factor(ITR_labour_FIN1$country)
levels(ITR_labour_FIN1$country) <- listcountry

ggplot(ITR_labour_FIN1, aes(period, ITR_labour, colour=country)) +
  geom_line() +
  scale_x_date(expand = c(0.01, 0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Implicit Tax Rate on Labour")

```



For the analysis, it is possible to recover the evolution of the personal income tax, the employees' SSC and the employers' SSC as a share of the ITR on labour. The chart below shows this evolution:

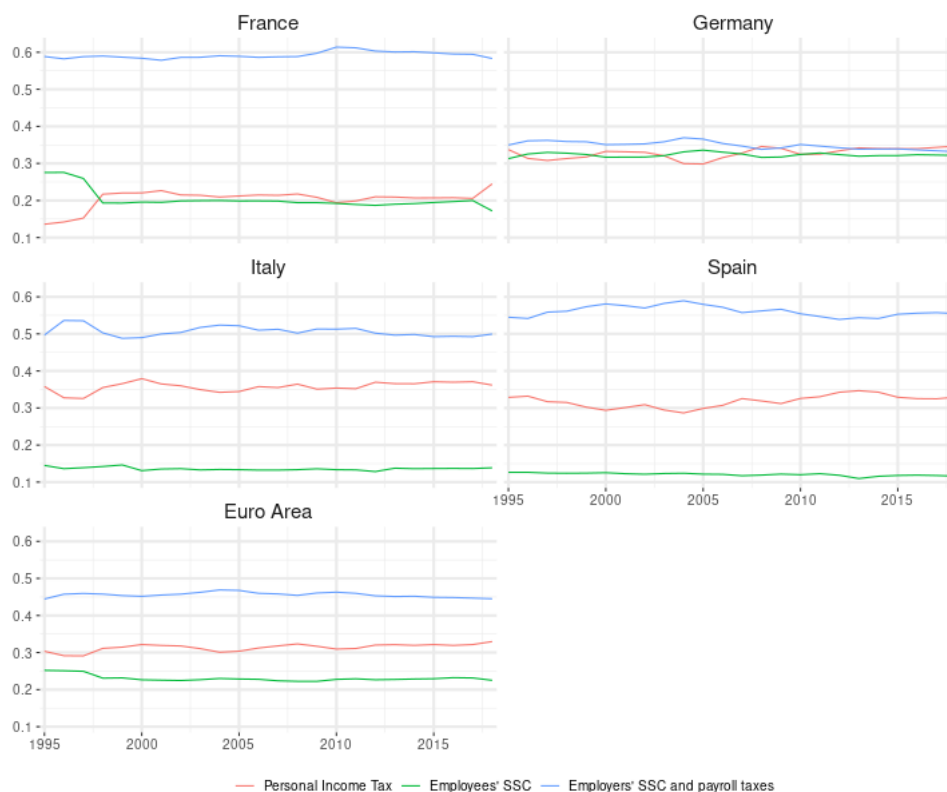
```
ITR_labour_shares <-
  ITR_labour_FIN1 %>%
  transmute(country, period,
    w_pi=ITR_pi/ITR_labour,
    w_essc=ITR_essc/ITR_labour,
    w_esscprt=ITR_esscprt/ITR_labour) %>%
  gather(var, value, -period, -country)

listVar <- list("Personal Income Tax" = "w_pi",
  "Employees' SSC" = "w_essc",
  "Employers' SSC and payroll taxes" = "w_esscprt")

ITR_labour_shares$var <- factor(ITR_labour_shares$var)
levels(ITR_labour_shares$var) <- listVar

ggplot(ITR_labour_shares, aes(period, value, colour=var)) +
  geom_line() +
  facet_wrap(~country, scales = "fixed", ncol = 2) +
  scale_x_date(expand = c(0.01, 0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(plot.title=element_text(size=16),
    legend.title=element_blank()) +
  ggtitle("Personal Income Tax, Employees' SSC and Employers' SSC & payroll taxes
  \n (as a share of the ITR on Labour)")
```

Personal Income Tax, Employees' SSC and Employers' SSC & payroll taxes
(as a share of the ITR on Labour)



The chart below shows the evolution of the composition of the ITR on labour:

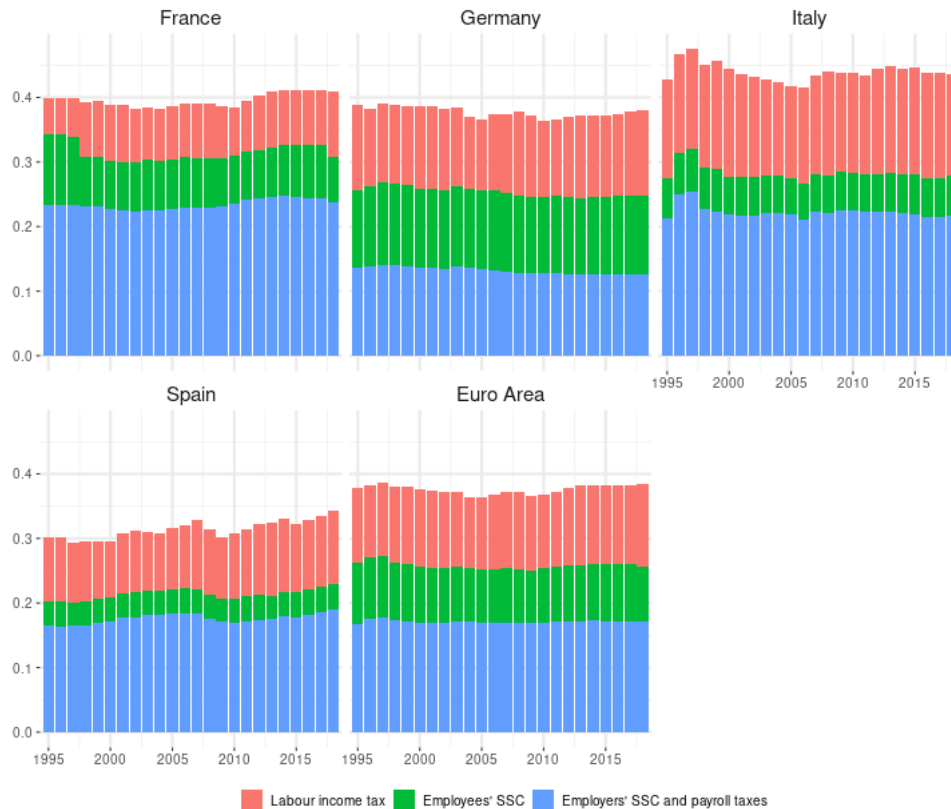
```
ITR_labour_FIN <-
  ITR_labour_FIN1 %>%
  select(-ITR_labour) %>%
  gather(var,value, -period, -country)

listVar <- list("Labour income tax" = "ITR_pi",
               "Employees' SSC" = "ITR_essc",
               "Employers' SSC and payroll taxes" = "ITR_esscprt")

ITR_labour_FIN$var <- factor(ITR_labour_FIN$var)
levels(ITR_labour_FIN$var)<-listVar

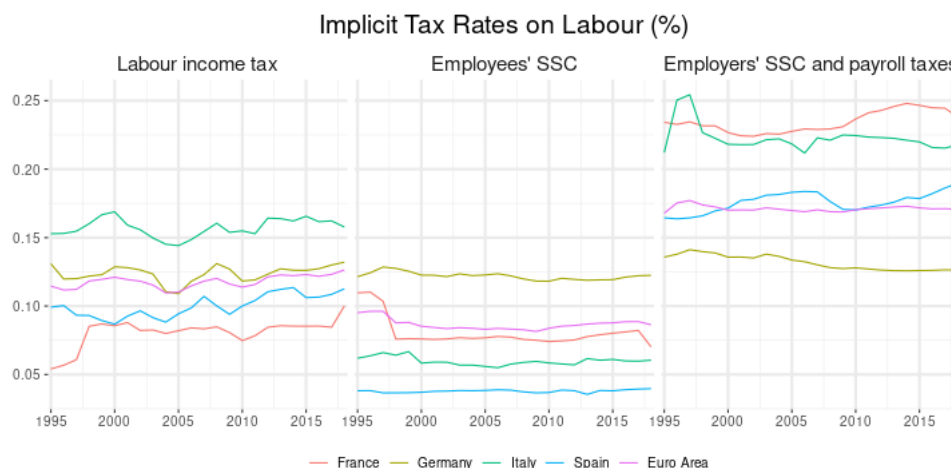
ggplot(ITR_labour_FIN, aes(fill=var, y=value, x=period)) +
  geom_bar(stat="identity")+
  facet_wrap(~country ,scales ="fixed",ncol = 3)+
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Composition of the Implicit Tax Rate on Labour")
```

Composition of the Implicit Tax Rate on Labour



And the last chart shows all the ITRs for a multi-country comparison:

```
ggplot(ITR_labour_FIN,aes(period,value,colour=country))+
  geom_line()+
  facet_wrap(~var ,ncol = 3)+
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Implicit Tax Rates on Labour (%)")
```



Implicit tax rate on corporate income

The methodology for calculating the ITR on corporate income that proposes the DG Taxation & Customs Union may exceed the statutory corporate tax rate, for instance, on the payment by corporation of taxes referring to profits earned earlier, or on taxes paid on capital gains (which are not included in the ITR denominator due to a lack of statistics). That is why, in this section we choose the top statutory corporate income tax rate (including surcharges) as a proxy. Data can be downloaded directly from the DG Taxation & Customs Union [here](https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2019_statutory_rates.xlsx)

(https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2019_statutory_rates.xlsx).

Concerning the GDP-weighted average for the Euro Area, we will use these country tax rates and the same weights that were established for the ITR on consumption to constitute it. The chart below shows the final series for France, Germany, Italy, Spain and the Euro Area.

```
ITR_corporate_income <-
  read_csv("ITR_corporate_income.csv") %>%
  gather(period,value,-country) %>%
  transmute(country,period=ymd(period),value=value/100) %>%
  filter(year(period)>=1995 & year(period)<yearmax)

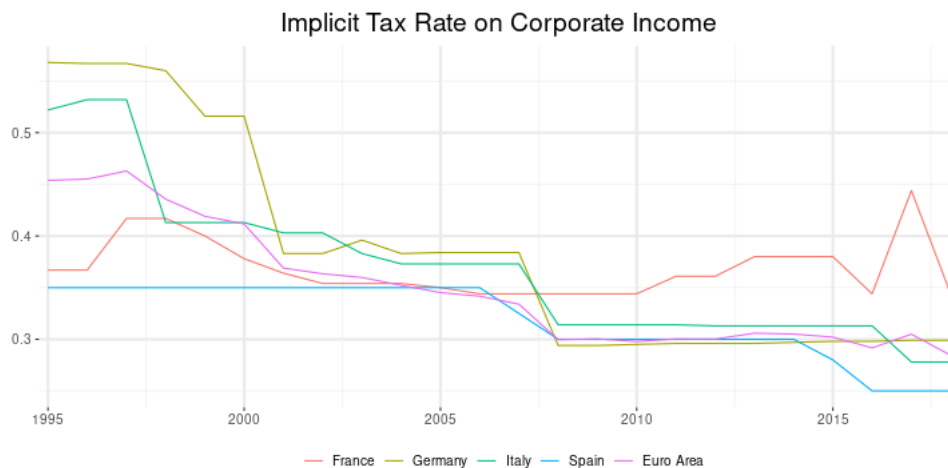
ITR_corporate_income_EA <-
  ITR_corporate_income %>%
  left_join(weights,by=c("country","period")) %>%
  transmute(period,value=value*weight) %>%
  group_by(period) %>%
  summarize(value =sum(value)) %>%
  add_column(country="EA19")

ITR_corporate_income_4 <-
  ITR_corporate_income%>%
  filter(grepl('FR|DE|IT|ES', country))

ITR_corporate_income_FIN <-
  bind_rows(ITR_corporate_income_4,ITR_corporate_income_EA) %>%
  add_column(var="Corporate income tax")

ITR_corporate_income_FIN$country <- factor(ITR_corporate_income_FIN$country)
levels(ITR_corporate_income_FIN$country)<-listcountry

ggplot(ITR_corporate_income_FIN,aes(period,value,colour=country))+
  geom_line()+
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Implicit Tax Rate on Corporate Income")
```



Average values

We summarize the average values of the implicit tax rates in the following table:

```

ITR <-
  bind_rows(ITR_corporate_income_FIN, ITR_labour_FIN, ITR_consumption_FIN) %>%
  na.omit() %>%
  mutate(value=round(value,3))

ss_ITR<-
  ITR %>%
  group_by(var, country) %>%
  summarize(steady_state =mean(value)) %>%
  mutate(steady_state=round(steady_state,3)) %>%
  spread(country, steady_state) %>%
  ungroup()

```

Implicit tax rates - average values

var	France	Germany	Italy	Spain	Euro Area
Consumption tax	0.212	0.196	0.175	0.146	0.193
Corporate income tax	0.368	0.386	0.370	0.319	0.350
Employees' SSC	0.081	0.122	0.060	0.038	0.087
Employers' SSC and payroll taxes	0.235	0.132	0.223	0.176	0.171
Labour income tax	0.081	0.124	0.157	0.100	0.118

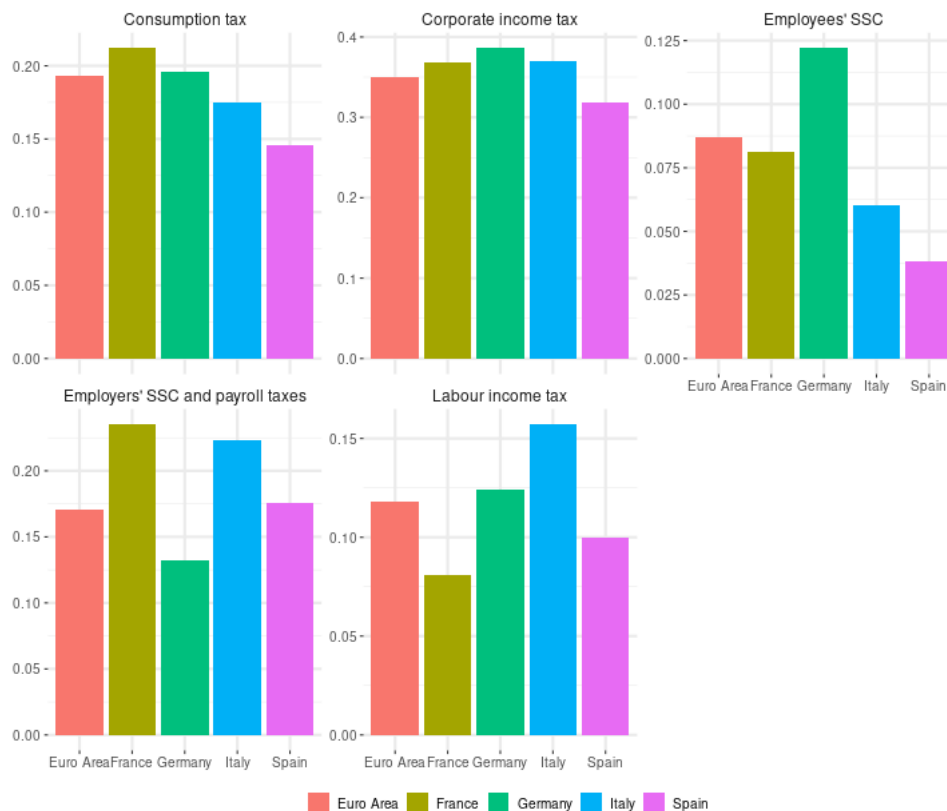
```

ss_ITR_plot <-
  ss_ITR %>%
  gather(country, value, -var)

ggplot(ss_ITR_plot, aes(country, value, fill=country)) +
  geom_bar(stat="identity") +
  facet_wrap(~var, scales="free_y", ncol=3) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank(),
        strip.text=element_text(size=12)) +
  ggtitle("Implicit tax rates - average values")

```

Implicit tax rates - average values



We can download ready-to-use data for France, Germany, Italy, Spain and the Euro Area in csv format [here \(http://shiny.nomics.world/data/ITR_eurodata.csv\)](http://shiny.nomics.world/data/ITR_eurodata.csv).


```
listtau <- list("taun" = "Labour income tax" ,
              "tauwh" = "Employees' SSC",
              "tauwf" = "Employers' SSC and payroll taxes",
              "tauc" = "Consumption tax",
              "tauk" = "Corporate income tax")

list_country <- list("FR"="France",
                  "DE"="Germany",
                  "IT"="Italy",
                  "ES"= "Spain",
                  "EA"="Euro Area")

ITR$country <- factor(ITR$country)
levels(ITR$country)<-list_country

ITR$var <- factor(ITR$var)
levels(ITR$var)<-listtau

ITR_eurodata <-
  ITR %>%
  unite("var",c("country","var")) %>%
  mutate(period=year(period)) %>%
  spread(var,value)

write.csv(ITR_eurodata,"ITR_eurodata.csv",row.names = FALSE)
```

Comparison

The Directorate-General for Taxation & Customs Union of the European Commission provides data on the implicit tax rates on consumption and labour since 2005, using detailed revenue data provided by member states. You can find this data [here](https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en) (https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en). We compare in this section our series with the ones of the European Commission in the charts below.

The main steps, together with some specificities, allow to recover the general trend of the implicit tax rates. Some differences remain, and they stem mainly from the last [update](https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics) (https://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics) of National Tax Lists, which was on June 2020, whereas the last [update](https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en) (https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en) of the Taxation Trends Report was on February 2020. Other minimal differences could stem from taxes assessed but unlikely to be collected when the data was released, or eventually discretionary adjustments or specificities applied by the DG Taxation and Customs Union.

```
labour_comp <-
  ITR_labour_FIN1%>%
  select(country,period,value=ITR_labour) %>%
  add_column(var="Labour tax")

conso_labour_comp <-
  bind_rows(labour_comp,ITR_consumption_FIN) %>%
  add_column(data_s="Updated")

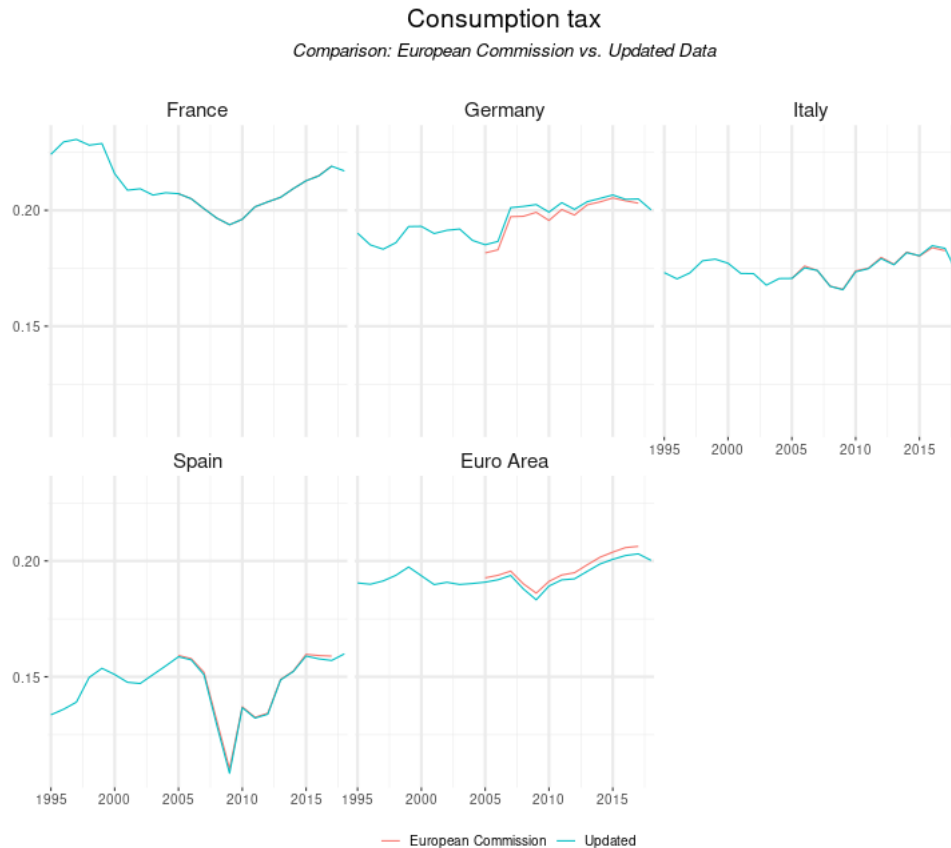
eucom <- read_csv("eucom.csv") %>%
  rename(value=eucom) %>%
  mutate(value=value/100)

eucom$country <- factor(eucom$country)
levels(eucom$country) <- listcountry

comparison <-bind_rows(conso_labour_comp,eucom)
```

```
comparison1 <-
  comparison %>%
  filter(var=="Consumption tax")

ggplot(comparison1,aes(period,value,colour=data_s))+
  geom_line()+
  facet_wrap(~country ,scales ="fixed",ncol = 3)+
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle(expression(atop("Consumption tax", atop(italic("Comparison: European Com
mission vs. Updated Data")), ""))))
```

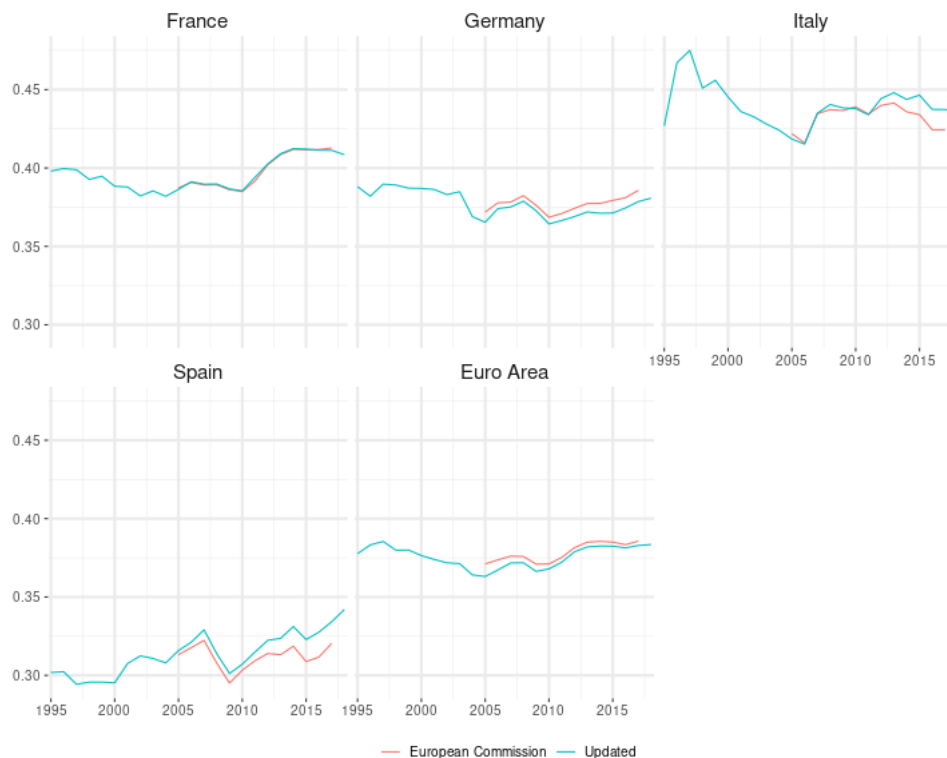


```
comparison2 <-
  comparison %>%
  filter(var=="Labour tax")

ggplot(comparison2,aes(period,value,colour=data_s))+
  geom_line()+
  facet_wrap(~country ,scales ="fixed",ncol = 3)+
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle(expression(atop("Labour tax", atop(italic("Comparison: European Commissi
on vs. Updated Data")), ""))))
```

Labour tax

Comparison: European Commission vs. Updated Data



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(<https://db.nomics.world/>)

► [R-bloggers \(http://www.r-bloggers.com/\)](http://www.r-bloggers.com/)

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VERSION OF PELICAN-BOOTSTRAP3
([HTTPS://GITHUB.COM/DANDYDEV/PELICAN-BOOTSTRAP3](https://github.com/dandydev/pelican-bootstrap3)), PELICAN
([HTTP://DOCS.GETPELICAN.COM/](http://docs.getpelican.com/)), BOOTSTRAP
([HTTP://GETBOOTSTRAP.COM](http://getbootstrap.com))



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