Eurostat R package tutorial (vignette)

2017-03-14

R Tools for Eurostat Open Data

This rOpenGov R package provides tools to access Eurostat database, which you can also browse on-line for the data sets and documentation. For contact information and source code, see the package website.

Installation

Release version (CRAN):

```
install.packages("eurostat")
```

Development version (Github):

```
library(devtools)
install_github("ropengov/eurostat")
```

Overall, the eurostat package includes the following functions:

```
clean_eurostat_cache    Clean Eurostat Cache
cut_to_classes          Cuts the Values Column into Classes and
                        Polishes the Labels
dic_order               Order of Variable Levels from Eurostat
                        Dictionary.
eu_countries            Countries and Country Codes
eurostat-package        R Tools for Eurostat open data
eurotime2date           Date Conversion from Eurostat Time Format
eurotime2num            Conversion of Eurostat Time Format to Numeric
get_eurostat            Read Eurostat Data
get_eurostat_dic        Download Eurostat Dictionary
get_eurostat_geospatial
                        Download Geospatial Data from CISGO
get_eurostat_json       Get Data from Eurostat API in JSON
get_eurostat_raw        Download Data from Eurostat Database
get_eurostat_toc        Download Table of Contents of Eurostat Data
                        Sets
harmonize_country_code
                        Harmonize Country Code
label_eurostat          Get Eurostat Codes
merge_eurostat_geodata
                        Merge Preprocessed Geospatial Data from CISGO
                        with data_frame from Eurostat
search_eurostat         Grep Datasets Titles from Eurostat
```

Finding data

Function `get_eurostat_toc()` downloads a table of contents of eurostat datasets. The values in column 'code' should be used to download a selected dataset.

```
# Load the package
library(eurostat)
library(rvest)

# Get Eurostat data listing
toc <- get_eurostat_toc()

# Check the first items
library(knitr)
kable(head(toc))
```

title	code	type	last update of data	last table structure
Database by themes	data	folder	NA	NA
General and regional statistics	general	folder	NA	NA
European and national indicators for short-term analysis	euroind	folder	NA	NA
Business and consumer surveys (source: DG ECFIN)	ei_bcs	folder	NA	NA
Consumer surveys (source: DG ECFIN)	ei_bcs_cs	folder	NA	NA
Consumers - monthly data	ei_bsco_m	dataset	27.02.2017	27.02.2017

With `search_eurostat()` you can search the table of contents for particular patterns, e.g. all datasets related to *passenger transport*. The kable function to produces nice markdown output. Note that with the `type` argument of this function you could restrict the search to for instance datasets or tables.

```
# info about passengers
kable(head(search_eurostat("passenger transport")))
```

title
Volume of passenger transport relative to GDP
Modal split of passenger transport
Railway transport - Total annual passenger transport (1 000 pass., million pkm)
International railway passenger transport from the reporting country to the country of disembarkation (1 000 passengers)
International railway passenger transport from the country of embarkation to the reporting country (1 000 passengers)
Air passenger transport by reporting country

Codes for the dataset can be searched also from the Eurostat database. The Eurostat database gives codes in the Data Navigation Tree after every dataset in parenthesis.

Downloading data

The package supports two of the Eurostats download methods: the bulk download facility and the Web Services' JSON API. The bulk download facility is the fastest method to download whole datasets. It is also often the only way as the JSON API has limitation of maximum 50 sub-indicators at a time and whole datasets usually exceeds that. To download only a small section of the dataset the JSON API is faster, as it allows to make a data selection before downloading.

A user does not usually have to bother with methods, as both are used via main function `get_eurostat()`. If only the table id is given, the whole table is downloaded from the bulk download facility. If also filters are defined the JSON API is used.

Here an example of indicator 'Modal split of passenger transport'. This is the percentage share of each mode of transport in total inland transport, expressed in passenger-kilometres (pkm) based on transport by

passenger cars, buses and coaches, and trains. All data should be based on movements on national territory, regardless of the nationality of the vehicle. However, the data collection is not harmonized at the EU level.

Pick and print the id of the data set to download:

```
# For the original data, see
# http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdtr210
id <- search_eurostat("Modal split of passenger transport",
                      type = "table")$code[1]
print(id)
```

[1] "tsdtr210"

Get the whole corresponding table. As the table is annual data, it is more convient to use a numeric time variable than use the default date format:

```
dat <- get_eurostat(id, time_format = "num")
```

Investigate the structure of the downloaded data set:

```
str(dat)
```

```
## Classes 'tbl_df', 'tbl' and 'data.frame':    2326 obs. of  5 variables:
##  $ unit   : Factor w/ 1 level "PC": 1 1 1 1 1 1 1 1 1 1 ...
##  $ vehicle: Factor w/ 3 levels "BUS_TOT","CAR",..: 1 1 1 1 1 1 1 1 1 1 ...
##  $ geo    : Factor w/ 35 levels "AT","BE","CH",..: 1 2 3 4 5 6 7 8 9 10 ...
##  $ time   : num  1990 1990 1990 1990 1990 1990 1990 1990 1990 1990 ...
##  $ values : num  11 10.6 3.7 9.1 11.3 32.4 14.9 13.5 6 24.8 ...
```

```
kable(head(dat))
```

unit	vehicle	geo	time	values
PC	BUS_TOT	AT	1990	11.0
PC	BUS_TOT	BE	1990	10.6
PC	BUS_TOT	CH	1990	3.7
PC	BUS_TOT	DE	1990	9.1
PC	BUS_TOT	DK	1990	11.3
PC	BUS_TOT	EL	1990	32.4

Or you can get only a part of the dataset by defining `filters` argument. It should be named list, where names corresponds to variable names (lower case) and values are vectors of codes corresponding desidered series (upper case). For time variable, in addition to a `time`, also a `sinceTimePeriod` and a `lastTimePeriod` can be used.

```
dat2 <- get_eurostat(id, filters = list(geo = c("EU28", "FI"), lastTimePeriod=1), time_format = "num")
kable(dat2)
```

Replacing codes with labels

By default variables are returned as Eurostat codes, but to get human-readable labels instead, use a `type = "label"` argument.

```
dat12 <- get_eurostat(id, filters = list(geo = c("EU28", "FI"),
                                         lastTimePeriod = 1),
                      type = "label", time_format = "num")
kable(head(dat12))
```

Eurostat codes in the downloaded data set can be replaced with human-readable labels from the Eurostat dictionaries with the `label_eurostat()` function.

```
datl <- label_eurostat(dat)
kable(head(datl))
```

unit	vehicle	geo	time	values
Percentage	Motor coaches, buses and trolley buses	Austria	1990	11.0
Percentage	Motor coaches, buses and trolley buses	Belgium	1990	10.6
Percentage	Motor coaches, buses and trolley buses	Switzerland	1990	3.7
Percentage	Motor coaches, buses and trolley buses	Germany (until 1990 former territory of the FRG)	1990	9.1
Percentage	Motor coaches, buses and trolley buses	Denmark	1990	11.3
Percentage	Motor coaches, buses and trolley buses	Greece	1990	32.4

The `label_eurostat()` allows conversion of individual variable vectors or variable names as well.

```
label_eurostat_vars(names(datl))
```

Vehicle information has 3 levels. You can check them now with:

```
levels(datl$vehicle)
```

Selecting and modifying data

EFTA, Eurozone, EU and EU candidate countries

To facilitate smooth visualization of standard European geographic areas, the package provides ready-made lists of the country codes used in the eurostat database for EFTA (efta_countries), Euro area (ea_countries), EU (eu_countries) and EU candidate countries (eu_candidate_countries). These can be used to select specific groups of countries for closer investigation. For conversions with other standard country coding systems, see the countrycode R package. To retrieve the country code list for EFTA, for instance, use:

```
data(efta_countries)
kable(efta_countries)
```

code	name
IS	Iceland
LI	Liechtenstein
NO	Norway
CH	Switzerland

EU data from 2012 in all vehicles:

```
dat_eu12 <- subset(datl, geo == "European Union (28 countries)" & time == 2012)
kable(dat_eu12, row.names = FALSE)
```

unit	vehicle	geo	time	values
Percentage	Motor coaches, buses and trolley buses	European Union (28 countries)	2012	9.3
Percentage	Passenger cars	European Union (28 countries)	2012	83.0

unit	vehicle	geo	time	values
Percentage	Trains	European Union (28 countries)	2012	7.7

EU data from 2000 - 2012 with vehicle types as variables:

Reshaping the data is best done with `spread()` in `tidyr`.

```
library("tidyr")
dat_eu_0012 <- subset(dat, geo == "EU28" & time %in% 2000:2012)
dat_eu_0012_wide <- spread(dat_eu_0012, vehicle, values)
kable(subset(dat_eu_0012_wide, select = -geo), row.names = FALSE)
```

unit	time	BUS_TOT	CAR	TRN
PC	2000	10.4	82.4	7.2
PC	2001	10.2	82.7	7.1
PC	2002	9.9	83.3	6.8
PC	2003	9.9	83.5	6.7
PC	2004	9.8	83.4	6.8
PC	2005	9.9	83.2	6.9
PC	2006	9.7	83.2	7.1
PC	2007	9.8	83.1	7.2
PC	2008	9.7	83.1	7.3
PC	2009	9.2	83.7	7.1
PC	2010	9.2	83.6	7.2
PC	2011	9.2	83.4	7.3
PC	2012	9.3	83.0	7.7

Train passengers for selected EU countries in 2000 - 2012

```
dat_trains <- subset(datl, geo %in% c("Austria", "Belgium", "Finland", "Sweden")
                     & time %in% 2000:2012
                     & vehicle == "Trains")

dat_trains_wide <- spread(dat_trains, geo, values)
kable(subset(dat_trains_wide, select = -vehicle), row.names = FALSE)
```

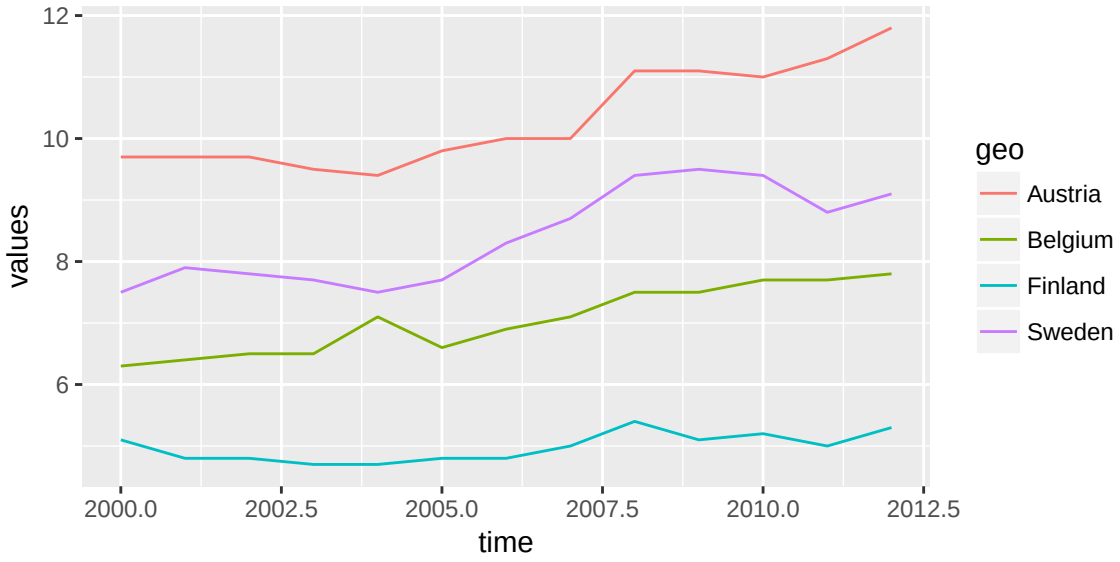
unit	time	Austria	Belgium	Finland	Sweden
Percentage	2000	9.7	6.3	5.1	7.5
Percentage	2001	9.7	6.4	4.8	7.9
Percentage	2002	9.7	6.5	4.8	7.8
Percentage	2003	9.5	6.5	4.7	7.7
Percentage	2004	9.4	7.1	4.7	7.5
Percentage	2005	9.8	6.6	4.8	7.7
Percentage	2006	10.0	6.9	4.8	8.3
Percentage	2007	10.0	7.1	5.0	8.7
Percentage	2008	11.1	7.5	5.4	9.4
Percentage	2009	11.1	7.5	5.1	9.5
Percentage	2010	11.0	7.7	5.2	9.4
Percentage	2011	11.3	7.7	5.0	8.8

unit	time	Austria	Belgium	Finland	Sweden
Percentage	2012	11.8	7.8	5.3	9.1

Visualization

Visualizing train passenger data with `ggplot2`:

```
library(ggplot2)
p <- ggplot(dat_trains, aes(x = time, y = values, colour = geo))
p <- p + geom_line()
print(p)
```



Triangle plot

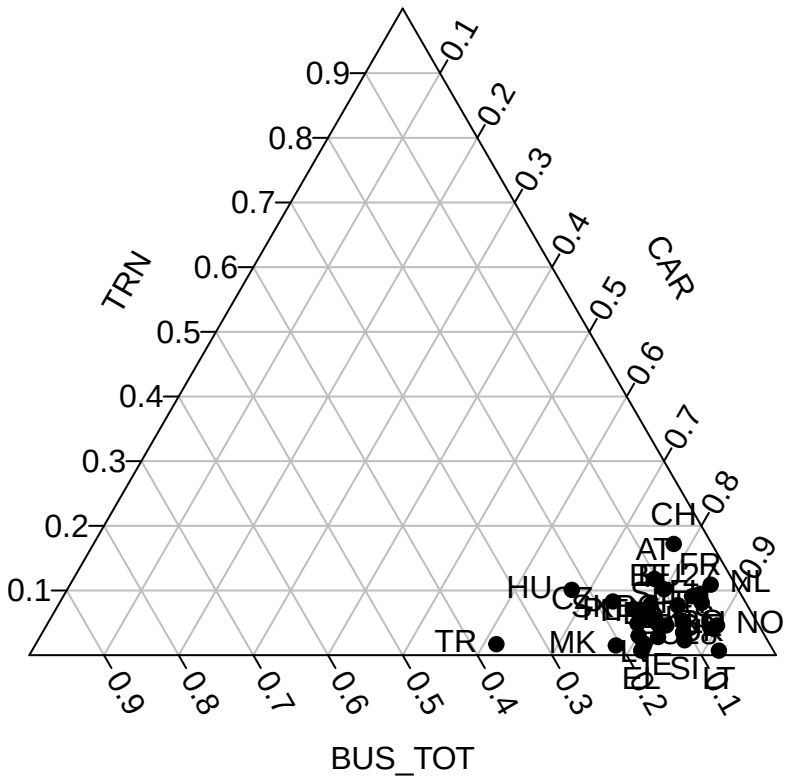
Triangle plot is handy for visualizing data sets with three variables. For instance, the passenger transport distributions across three vehicle types in 2012 for all countries where data is available:

```
library(tidyr)

# Download and modify the transport data
transports <- spread(subset(dat, time == 2012, select = c(geo, vehicle, values)), vehicle, values)

# Remove countries with missing data
transports <- na.omit(transports)

# Use triangle plot to visualize vehicle distributions:
library(plotrix)
triax.plot(transports[, -1], show.grid = TRUE,
           label.points = TRUE, point.labels = transports$geo,
           pch = 19)
```



Maps

Disposable income of private households by NUTS 2 regions at 1:60mln resolution using ggplot2

```
library(eurostat)
library(dplyr)
library(ggplot2)
# Data from Eurostat
eurostat::get_eurostat("tgs00026", time_format = "raw") %>%
  # subset to have only a single row per geo
  dplyr::filter(time == 2010, nchar(as.character(geo)) == 4) %>%
  # categorise
  dplyr::mutate(cat = cut_to_classes(values, n = 5)) %>%
  # merge with geodata
  merge_eurostat_geodata(data=.,geocolumn="geo",resolution = "60", output_class = "df", all_regions = T
  # plot map
  ggplot(data=., aes(x=long,y=lat,group=group)) +
  geom_polygon(aes(fill=cat),color="white", size=.1) +
  scale_fill_brewer(palette ="Oranges")
```

```
## Reading cache file /tmp/RtmpwCTq1B/eurostat/tgs00026_raw_code_TF.rds
```

```
## Table  tgs00026  read from cache file:  /tmp/RtmpwCTq1B/eurostat/tgs00026_raw_code_TF.rds
```

```
##
##       COPYRIGHT NOTICE
##
```

```
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##

## Reading cache file /tmp/RtmpwCTq1B/eurostat/df60.RData

## data_frame at resolution 1: 60  read from cache file:  /tmp/RtmpwCTq1B/eurostat/df60.RData
```

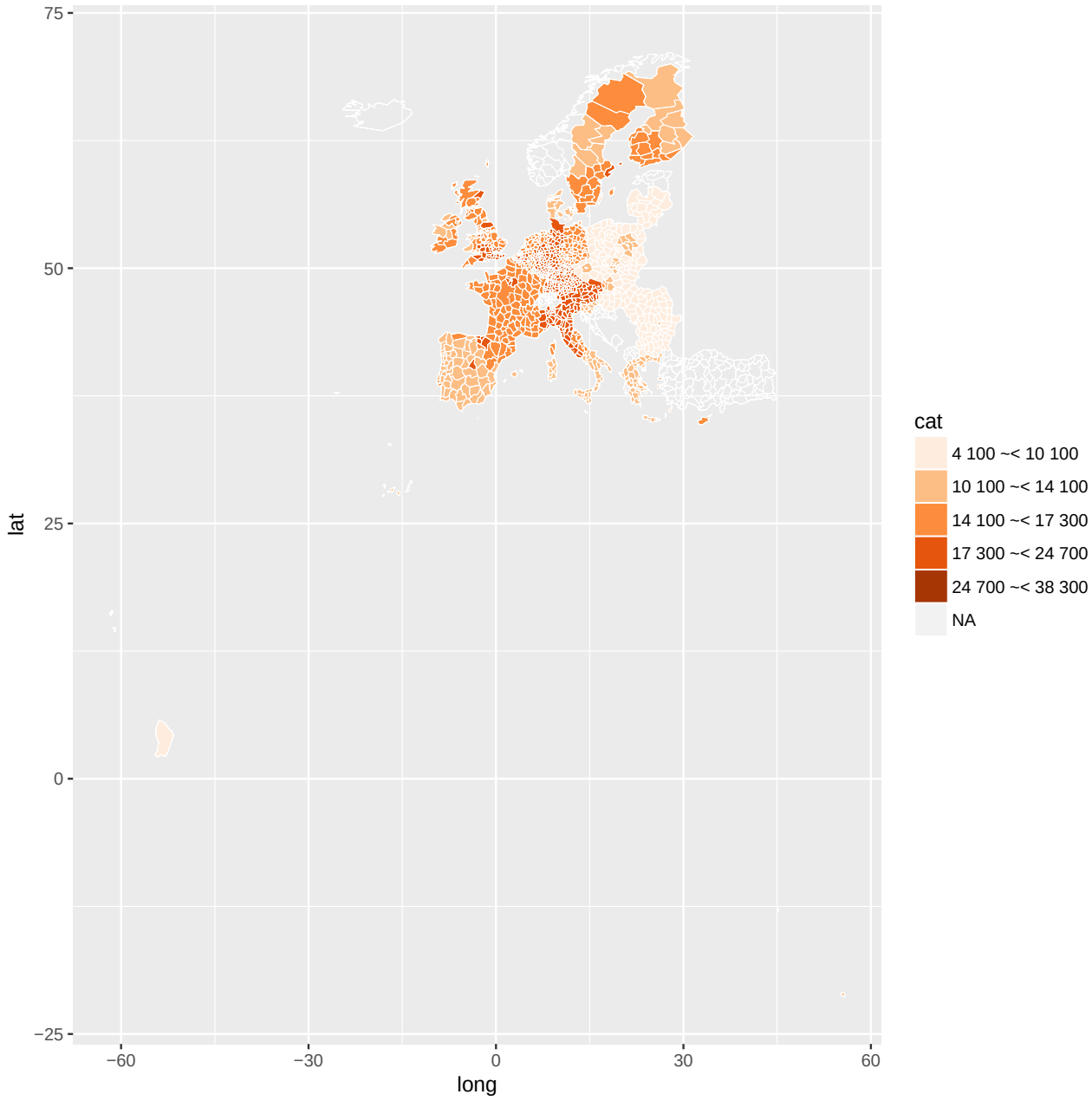

Disposable income of private households by NUTS 2 regions in Poland with labels at 1:1mln resolution using ggplot2

```
library(eurostat)
library(dplyr)
library(ggplot2)
library(RColorBrewer)
# Downloading and manipulating the tabular data
df <- get_eurostat("tgs00026", time_format = "raw") %>%
  # subsetting to year 2005 and NUTS-3 level
  dplyr::filter(time == 2005, nchar(as.character(geo)) == 4, grepl("PL",geo)) %>%
  # label the single geo column
```

```
  mutate(label = label_eurostat(.)[["geo"]],
         cat = cut_to_classes(values)) %>%
  # merge with geodata
  merge_eurostat_geodata(data=.,geocolumn="geo",resolution = "01", all_regions = FALSE, output_class="d
```

```
## Reading cache file /tmp/RtmpwCTq1B/eurostat/tgs00026_raw_code_TF.rds
```

```
## Table  tgs00026  read from cache file:  /tmp/RtmpwCTq1B/eurostat/tgs00026_raw_code_TF.rds
```

```
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##
```

```
## Reading cache file /tmp/RtmpwCTq1B/eurostat/df01.RData
```

```
## data_frame at resolution 1: 01  read from cache file:  /tmp/RtmpwCTq1B/eurostat/df01.RData
```

```
# plot map
p <- ggplot(data=df, aes(long,lat,group=group))
p <- p + geom_polygon(aes(fill = cat),colour="white",size=.8)
p <- p + scale_fill_manual(values=brewer.pal(n = 5, name = "Oranges"))

p <- p + geom_label(data=df %>% group_by(label,values,cat) %>% summarise(long = mean(long),
                                                                         lat = mean(lat)),
                    aes(long, lat, label = paste(label,"\n",values,"€"), group=label,fill=cat),
                    size=3.5, color="white", fontface="bold", lineheight=.8, show.legend=FALSE)
p <- p + labs(title = paste0("Disposable household incomes in 2005"))
p <- p + guides(fill = guide_legend(title = "EUR per Year",title.position = "top", title.hjust=0))
p
```

```
## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6800 €' in 'mbcsToSbcs': dot substituted for <e2>
```

```
## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
```

```
## conversion failure on ' 6800 €' in 'mbcsToSbcs': dot substituted for <82>

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## conversion failure on ' 6300 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6300 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6300 €' in 'mbcsToSbcs': dot substituted for <ac>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 6300 €' in 'mbcsToSbcs': dot substituted for
## <e2>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 6300 €' in 'mbcsToSbcs': dot substituted for
## <82>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 6300 €' in 'mbcsToSbcs': dot substituted for
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## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6200 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6200 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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## conversion failure on ' 6200 €' in 'mbcsToSbcs': dot substituted for <82>

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## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 6200 €' in 'mbcsToSbcs': dot substituted for
## <e2>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 6200 €' in 'mbcsToSbcs': dot substituted for
## <82>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 6200 €' in 'mbcsToSbcs': dot substituted for
## <ac>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for <ac>

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## conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for <e2>
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```
## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for <ac>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for
## <e2>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for
## <82>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 7800 €' in 'mbcsToSbcs': dot substituted for
## <ac>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 5800 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 5800 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 5800 €' in 'mbcsToSbcs': dot substituted for <ac>

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## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 5800 €' in 'mbcsToSbcs': dot substituted for
## <e2>

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## $y, : conversion failure on ' 5800 €' in 'mbcsToSbcs': dot substituted for
## <82>

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## $y, : conversion failure on ' 5800 €' in 'mbcsToSbcs': dot substituted for
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## conversion failure on ' 5300 €' in 'mbcsToSbcs': dot substituted for <e2>

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## conversion failure on ' 5300 €' in 'mbcsToSbcs': dot substituted for <82>
```

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## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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## $y, : conversion failure on ' 5300 €' in 'mbcsToSbcs': dot substituted for
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## $y, : conversion failure on ' 5300 €' in 'mbcsToSbcs': dot substituted for
## <ac>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 5600 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 5600 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 5600 €' in 'mbcsToSbcs': dot substituted for <ac>

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## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 5600 €' in 'mbcsToSbcs': dot substituted for
## <e2>

## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
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## <ac>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6400 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6400 €' in 'mbcsToSbcs': dot substituted for <82>

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## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 7300 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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## $y, : conversion failure on ' 7000 €' in 'mbcsToSbcs': dot substituted for
## <82>
```

```
## Warning in grid.Call.graphics(L_text, as.graphicsAnnot(x$label), x$x, x
## $y, : conversion failure on ' 7000 €' in 'mbcsToSbcs': dot substituted for
## <ac>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6800 €' in 'mbcsToSbcs': dot substituted for <e2>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
## conversion failure on ' 6800 €' in 'mbcsToSbcs': dot substituted for <82>

## Warning in grid.Call(L_textBounds, as.graphicsAnnot(x$label), x$x, x$y, :
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## $y, : conversion failure on ' 6800 €' in 'mbcsToSbcs': dot substituted for
## <ac>
```

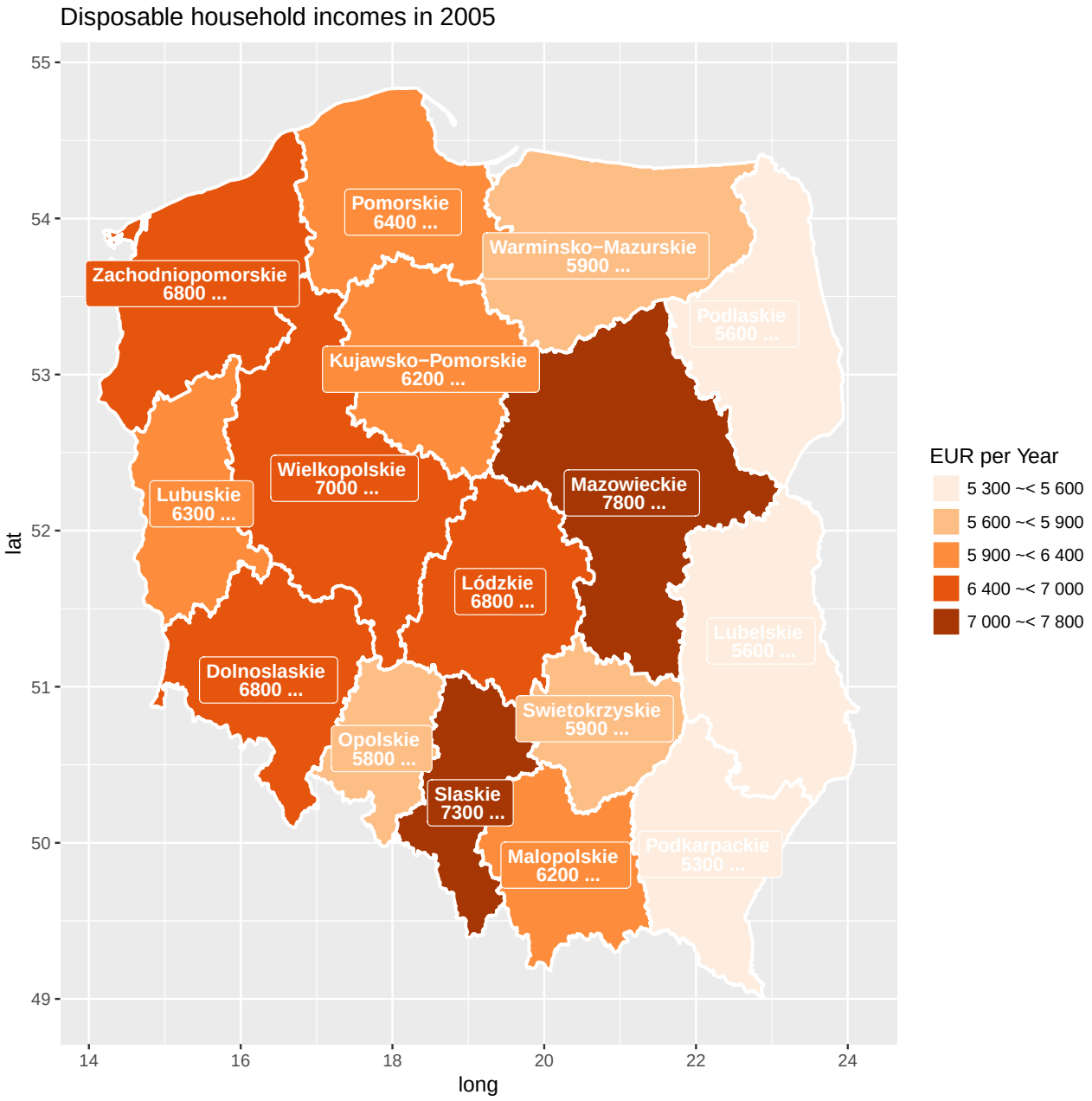

Disposable income of private households by NUTS 2 regions at 1:60mln resolution using spplot

```
library(sp)
library(eurostat)
library(dplyr)
dat <- get_eurostat("tgs00026", time_format = "raw") %>%
  # subsetting to year 2005 and NUTS-3 level
  dplyr::filter(time == 2005, nchar(as.character(geo)) == 4) %>%
  # classifying the values the variable
  dplyr::mutate(cat = cut_to_classes(values)) %>%
  # merge Eurostat data with geodata from Cisco
  merge_eurostat_geodata(data=.,geocolumn="geo",resolution = "10", output_class ="spdf", all_regions=FA
```

```
## Reading cache file /tmp/RtmpwCTq1B/eurostat/tgs00026_raw_code_TF.rds
```

```
## Table  tgs00026  read from cache file:  /tmp/RtmpwCTq1B/eurostat/tgs00026_raw_code_TF.rds
```

```
##
##       COPYRIGHT NOTICE
##
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##
##       If you intend to use the data commercially,
##       please contact EuroGeographics for
##       information regarding their licence agreements.
##
```
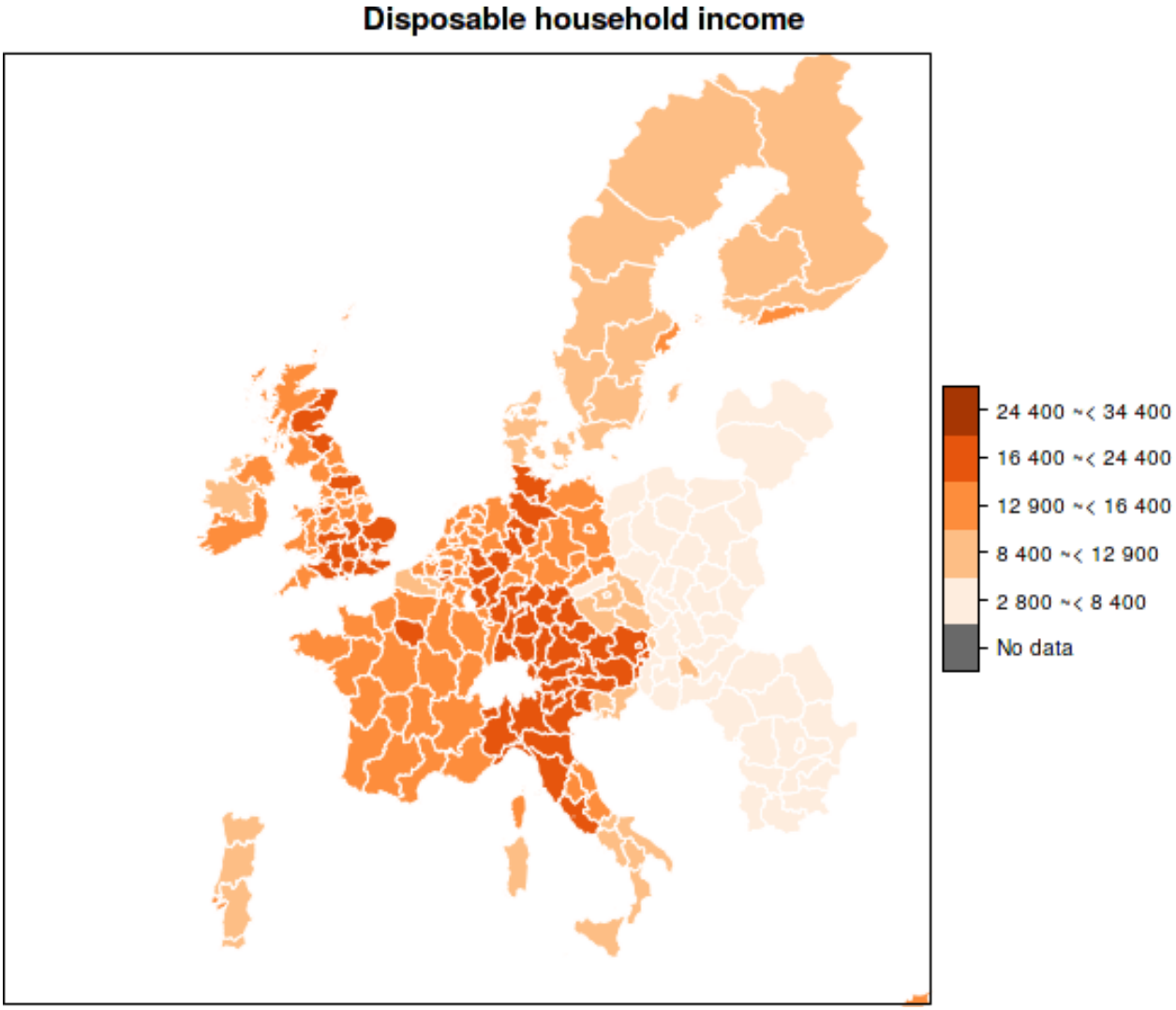

```
## Reading cache file /tmp/RtmpwCTq1B/eurostat/spdf10.RData
```

```
## SpatialPolygonDataFrame at resolution 1: 10  read from cache file:  /tmp/RtmpwCTq1B/eurostat/spdf10.R
```

```
# plot map
sp::spplot(obj = dat, "cat", main = "Disposable household income",
       xlim=c(-22,34), ylim=c(35,70),
           col.regions = c("dim grey", brewer.pal(n = 5, name = "Oranges")),
       col = "white", usePolypath = FALSE)
```



SDMX

Eurostat data is available also in the SDMX format. The eurostat R package does not provide custom tools for this but the generic rsdmx R package can be used to access data in that format when necessary:

```
library(rsdmx)

# Data set URL
url <- "http://ec.europa.eu/eurostat/SDMX/diss-web/rest/data/cdh_e_fos/..PC.FOS1.BE/?startperiod=2005&en

# Read the data from eurostat
d <- readSDMX(url)

# Convert to data frame and show the first entries
df <- as.data.frame(d)

kable(head(df))
```

UNIT	Y_GRAD	FOS07	GEO	FREQ	obsTime	obsValue	OBS_STATUS
PC	TOTAL	FOS1	BE	A	2009	NA	na
PC	TOTAL	FOS1	BE	A	2006	NA	na
PC	Y_GE1990	FOS1	BE	A	2009	43.75	NA
PC	Y_GE1990	FOS1	BE	A	2006	NA	na

Further examples

For further examples, see:

- Blog post
- Journal manuscript

Citations and related work

Citing the data sources

Eurostat data: cite Eurostat.

Administrative boundaries: cite EuroGeographics

Citing the eurostat R package

For main developers and contributors, see the README.

This work can be freely used, modified and distributed under the BSD-2-clause (modified FreeBSD) license:

```
citation("eurostat")
```

```
##
## Kindly cite the eurostat R package as follows:
##
##   (C) Leo Lahti, Janne Huovari, Markus Kainu, Przemyslaw Biecek
##   2014-2017. eurostat R package. R package version 2.3.20001 URL:
##   https://github.com/rOpenGov/eurostat
##
## A BibTeX entry for LaTeX users is
##
##   @Misc{,
##     title = {eurostat R package},
##     author = {Leo Lahti and Janne Huovari and Markus Kainu and Przemyslaw Biecek},
##     year = {2014-2017},
##     url = {https://github.com/rOpenGov/eurostat},
##     note = {R package version 2.3.20001},
##   }
```

Related work

This rOpenGov R package is based on the earlier CRAN packages statfi and smarterpoland.

The independent reurostat package develops related Eurostat tools but seems to be in an experimental stage at the time of writing this tutorial.

The more generic quandl, datamart, and pdfetch packages may provide access to some versions of eurostat data but these packages are more generic and hence, in contrast to the eurostat R package, lack tools that are specifically customized to facilitate eurostat analysis.

Contact

For contact information, see the README.

Version info

This tutorial was created with

```
sessionInfo()
```

```
## R version 3.3.1 (2016-06-21)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 16.10
##
## locale:
##  [1] LC_CTYPE=en_US.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_US.UTF-8        LC_COLLATE=en_US.UTF-8
##  [5] LC_MONETARY=en_US.UTF-8    LC_MESSAGES=en_US.UTF-8
##  [7] LC_PAPER=en_US.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_US.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] rsdmx_0.5-8        sp_1.2-3           RColorBrewer_1.1-2
##  [4] dplyr_0.5.0        plotrix_3.6-3      ggplot2_2.2.1
##  [7] tidyr_0.6.1        rvest_0.3.2        xml2_1.1.1
## [10] eurostat_2.3.20001 rmarkdown_1.3.9004 knitr_1.15.1
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.9.4    highr_0.6        plyr_1.8.4       bitops_1.0-6
##  [5] class_7.3-14     tools_3.3.1      digest_0.6.12    jsonlite_1.3
##  [9] evaluate_0.10    tibble_1.2       gtable_0.2.0     lattice_0.20-34
## [13] DBI_0.5-1        rgdal_1.2-4      yaml_2.1.14      e1071_1.6-7
## [17] httr_1.2.1       stringr_1.2.0    classInt_0.1-23  rprojroot_1.2
## [21] grid_3.3.1       R6_2.2.0         XML_3.98-1.5     readr_1.0.0
## [25] magrittr_1.5     backports_1.0.5  scales_0.4.1     htmltools_0.3.5
## [29] assertthat_0.1   colorspace_1.3-2 labeling_0.3     stringi_1.1.3
## [33] RCurl_1.95-4.8   lazyeval_0.2.0   munsell_0.4.3    Cairo_1.5-9
```