Home Exam Met4H18

Introduction

Do politicians in office try to increase their chances of reelection by manipulating fiscal policy in election years? This phenomenon has been called *political budget cycles* (PBC). The name suggests that if indeed politicians might try to manipulate fiscal policy to get reelecter, we might observe some cyclical pattern in fiscal policy, whith policies being special in election years.

There are theoretical models suggesting that we might observe political budget cycles even if voters and politicians are forward looking, but where factors like limited information make it hard for voters to disentagle fiscal manipulation from competence. Efthyvoulou (2012) section 2.1 contains a brief summary of some key papers on the reseach field.

There are many empirical papers that have looked into the matter. In this home exam, we will partly follow the analysis from Efthyvoulou (2012) and Efthyvoulou (2010) (the oldest one is the working paper version with a few more tables in it). For the home exam we will use a similar dataset with the exception that we include more countries and years, and fewer control variables. Furthermore, we will only analyse budget cycles in *government consumption* (the article also studies taxes and government expenditures). Government consumption is different from government expenditures as government expenditures also includes e.g. pensions, unemployment assitance etc. See the data sources table for a precise definition of the variable. Note also that the articles use several techniques that go far beyond the curriculum of Met4.

The table below provides a summary of the sources for the variables in the dataset.

Variable	Source	Description
Y	https://stats.df.org/ (https://stats.df.org/)	Gross domestic product (expenditure approach) , Current prices, current exchange rates
G	https://stats.df.org/ (https://stats.df.org/)	Final consumption expenditure of general government , Current prices, current exchange rates
election	http://www.parlgov.org/data/table/view_election/ (http://www.parlgov.org/data/table/view_election/)	1 if a country has a parliamentary election in a given year. Zero otherwise.

Assignment 1

Present descriptive statistics of the dataset. Focus on parts that help you solve the rest of the assignments. Take care to also provide summary statistics for variables you may use later in your submissions.

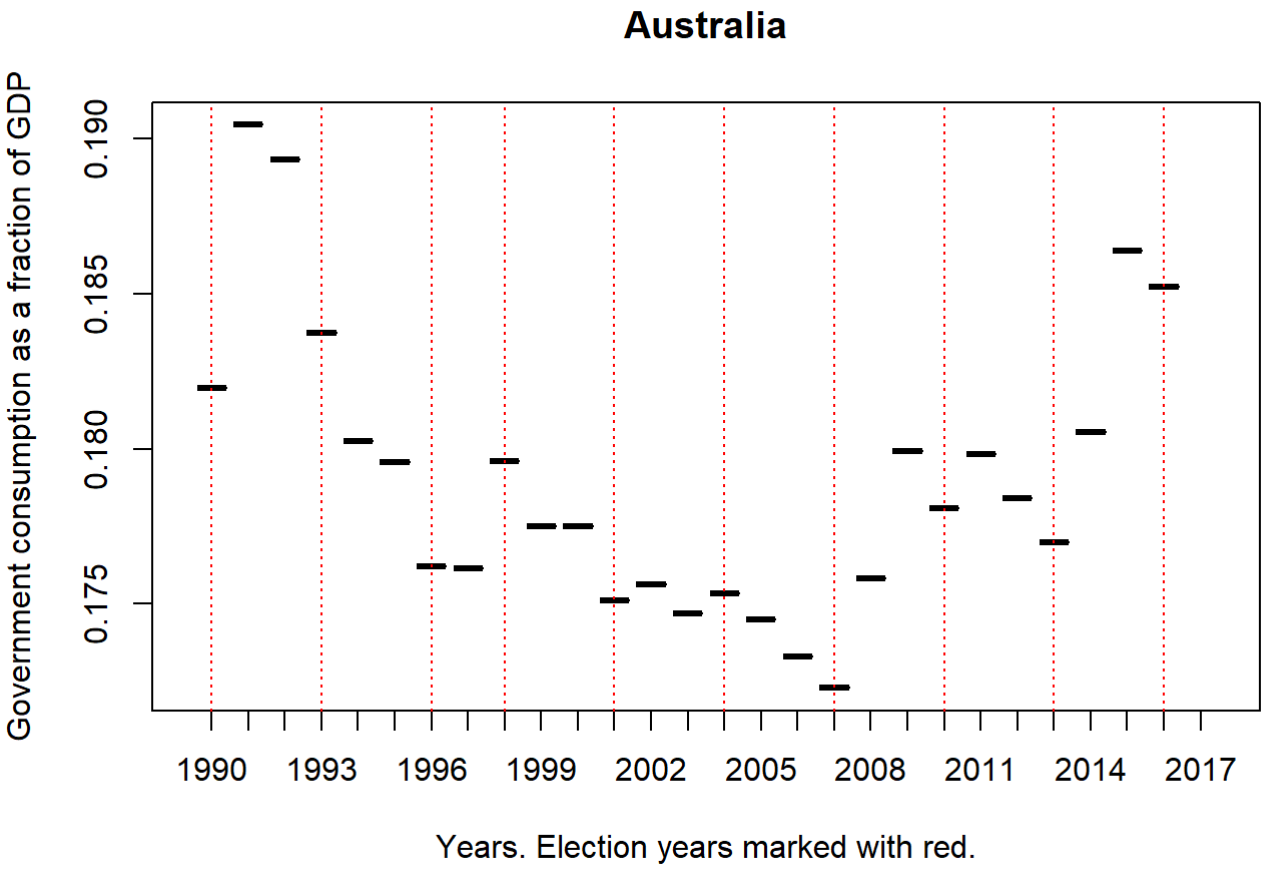
Solution proposal

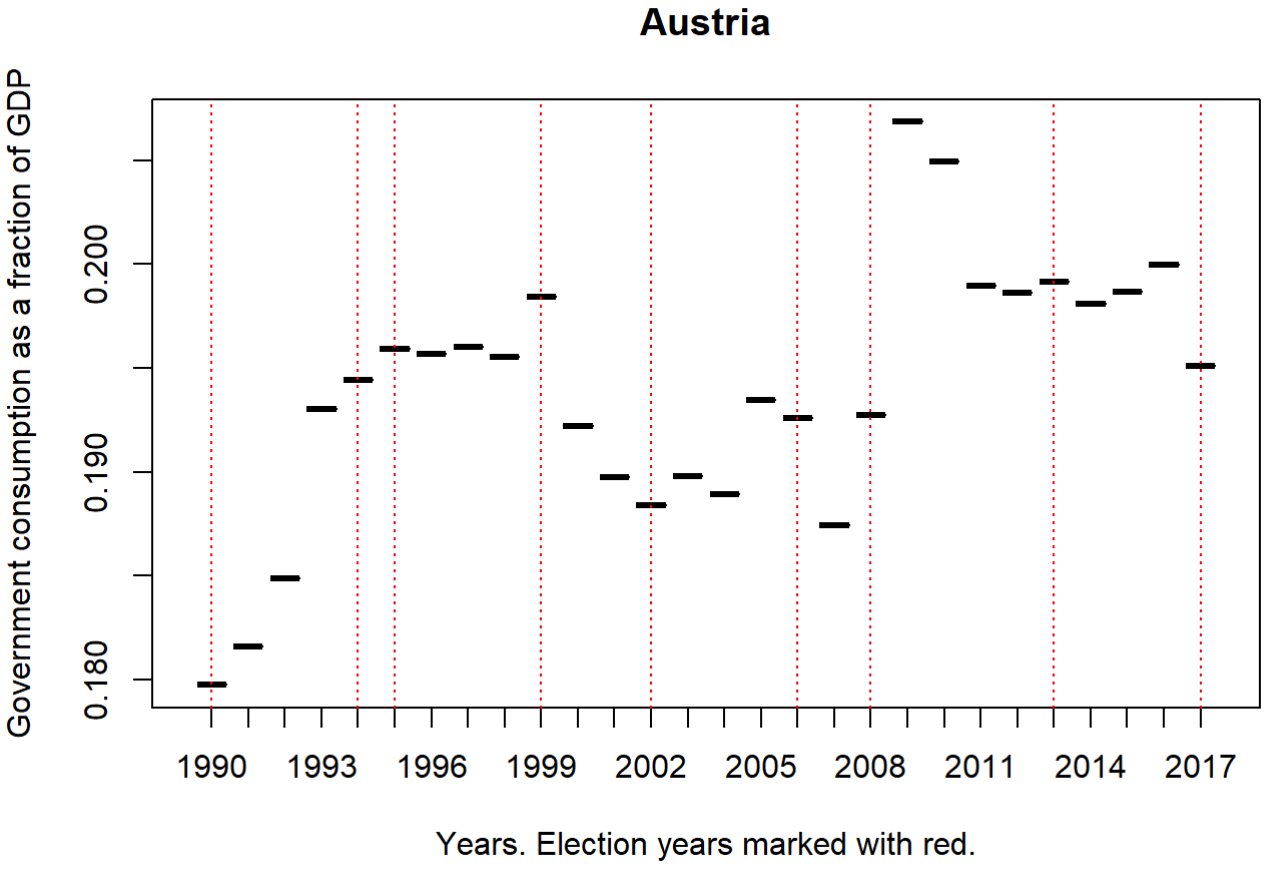
The following creates the most important variables and display some simple summary statistics. Good submissions might also create figures over e.g. government consumption over time. Given the 10-page restriction, the figures below can't fit easily in a submission. However, some takeaways that are useful for the rest of the analysis i: The *average* level of government consumption to GDP varies quite a bit across countries, and ii: There are some common time shocks, where e.g. G/Y is lower in the years right before the financial crisies, and higher after.

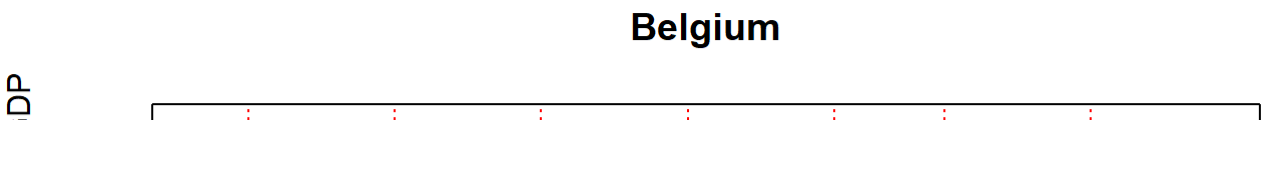
```
df %<>%
  pdata.frame(index = c("country","year"))

df$growth <- log(df$Y/plm::lag(df$Y))
df$g <- df$G/df$Y

stargazer(df, summary = T, rownames = F, type="text")
```

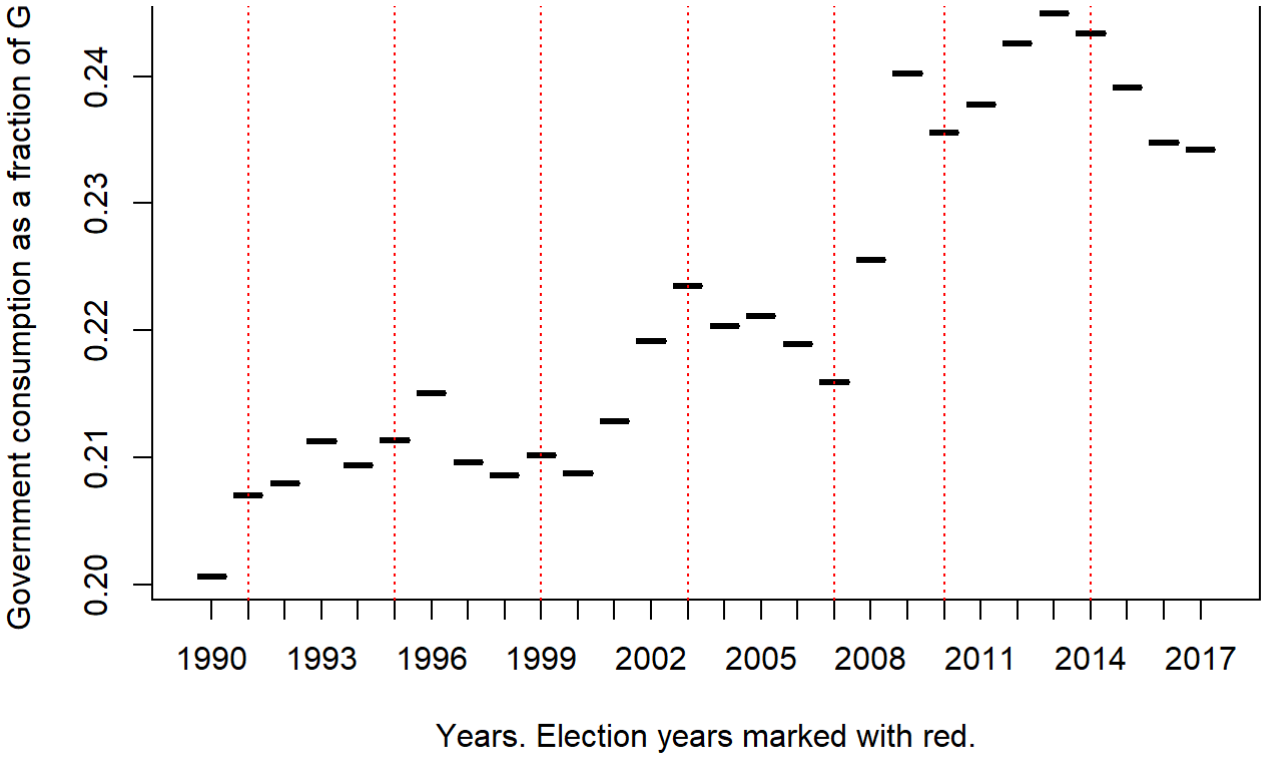
```
##
## ================================================================================================
## Statistic  N     Mean       St. Dev.       Min     Pctl(25)    Pctl(75)        Max
## ------------------------------------------------------------------------------------------------
## Y         802 719,045.600 1,069,201.000 1,742.351 120,701.100 754,028.500 6,203,213.000
## G         802 138,943.700  202,728.200   377.833  23,892.550  141,755.900 1,256,302.000
## election  802    0.274        0.446         0          0           1            1
## growth    773    0.044        0.101      -0.323     -0.013       0.107        0.443
## g         802    0.197        0.035       0.090      0.178       0.220        0.279
## ------------------------------------------------------------------------------------------------
```

```
for(i in unique(df$country)){
  df %>%
    filter(country == i) %$% {
    plot(year, g,
         main = i,
         ylab = "Government consumption as a fraction of GDP",
         xlab = "Years. Election years marked with red.")
    abline(v=(year[election==1]), col = "red", lty = 3)
    }
  }
```

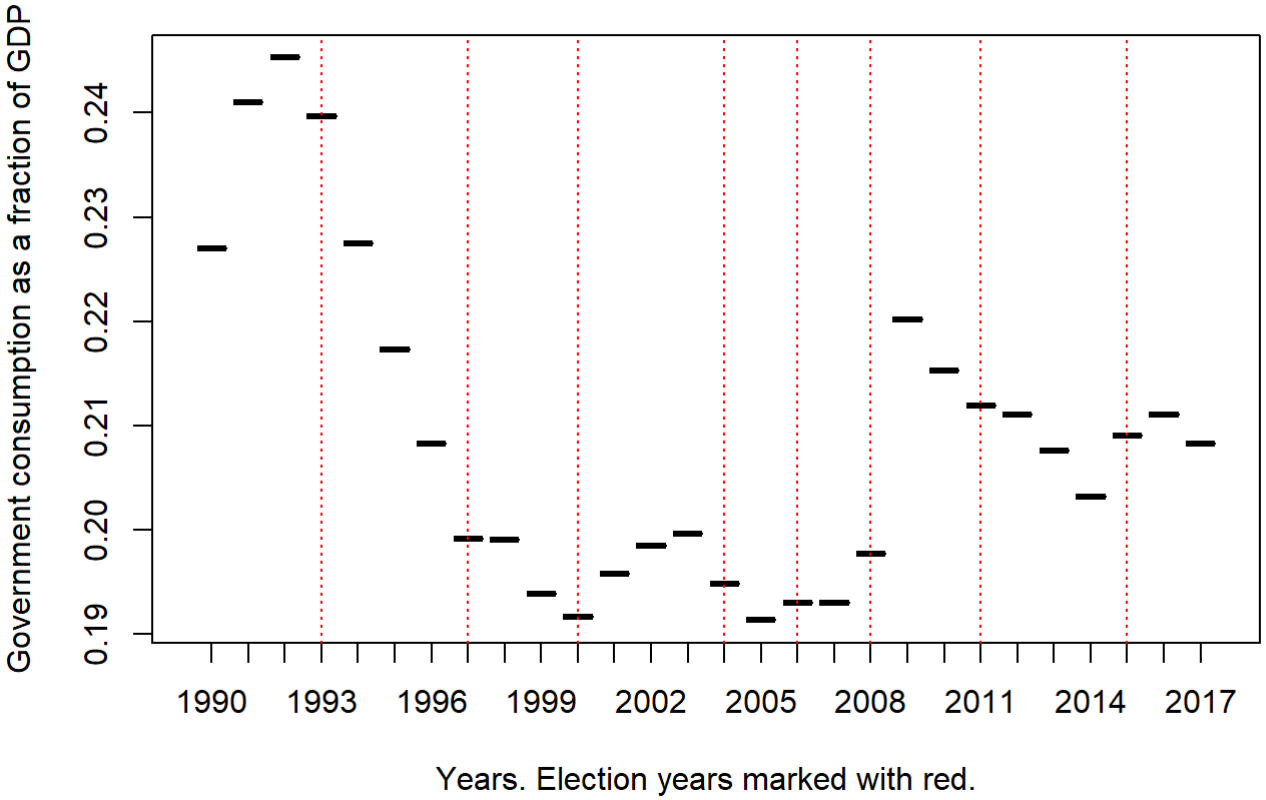

Australia
Government consumption as a fraction of GDP
0.175
0.180
0.185
0.190
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

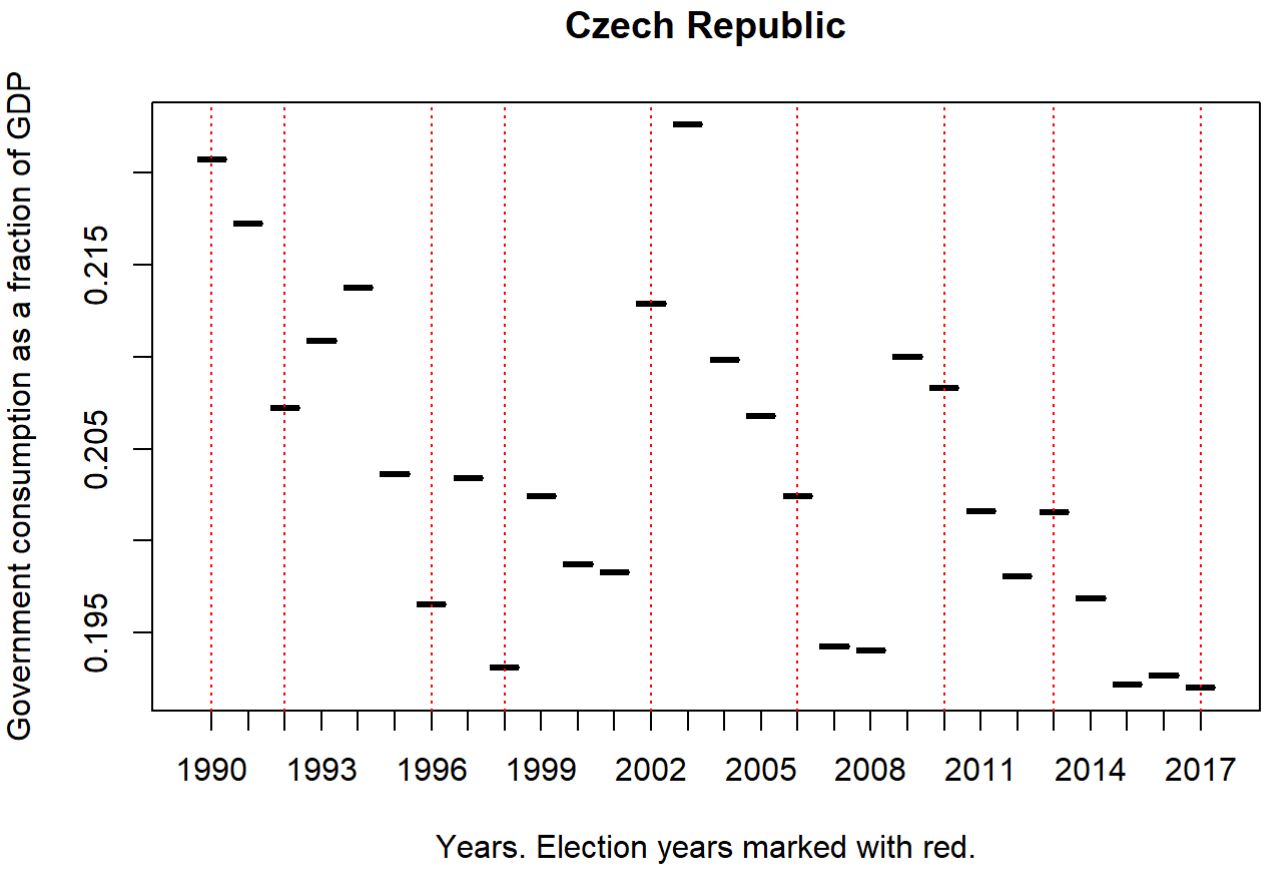

Austria
Government consumption as a fraction of GDP
0.180
0.190
0.200
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

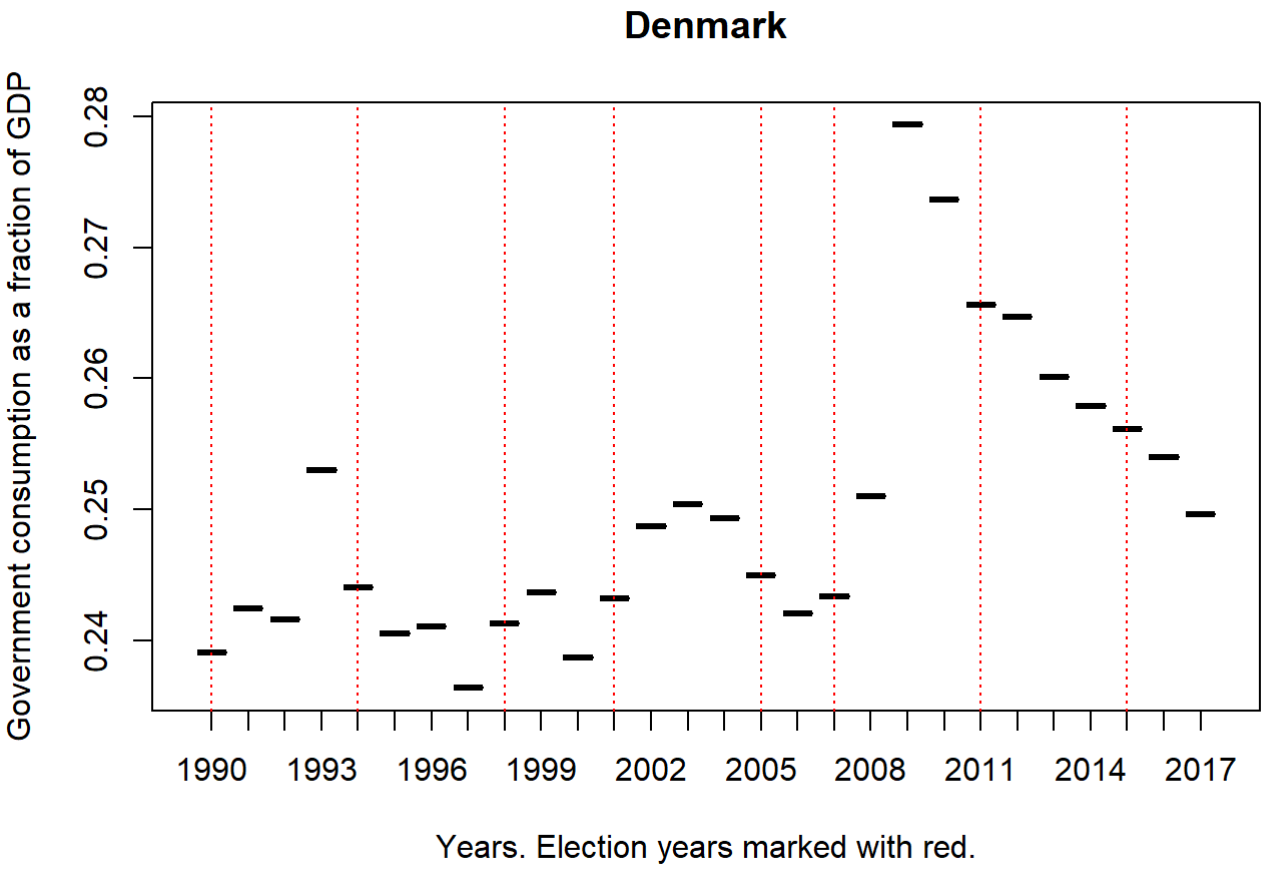

Belgium

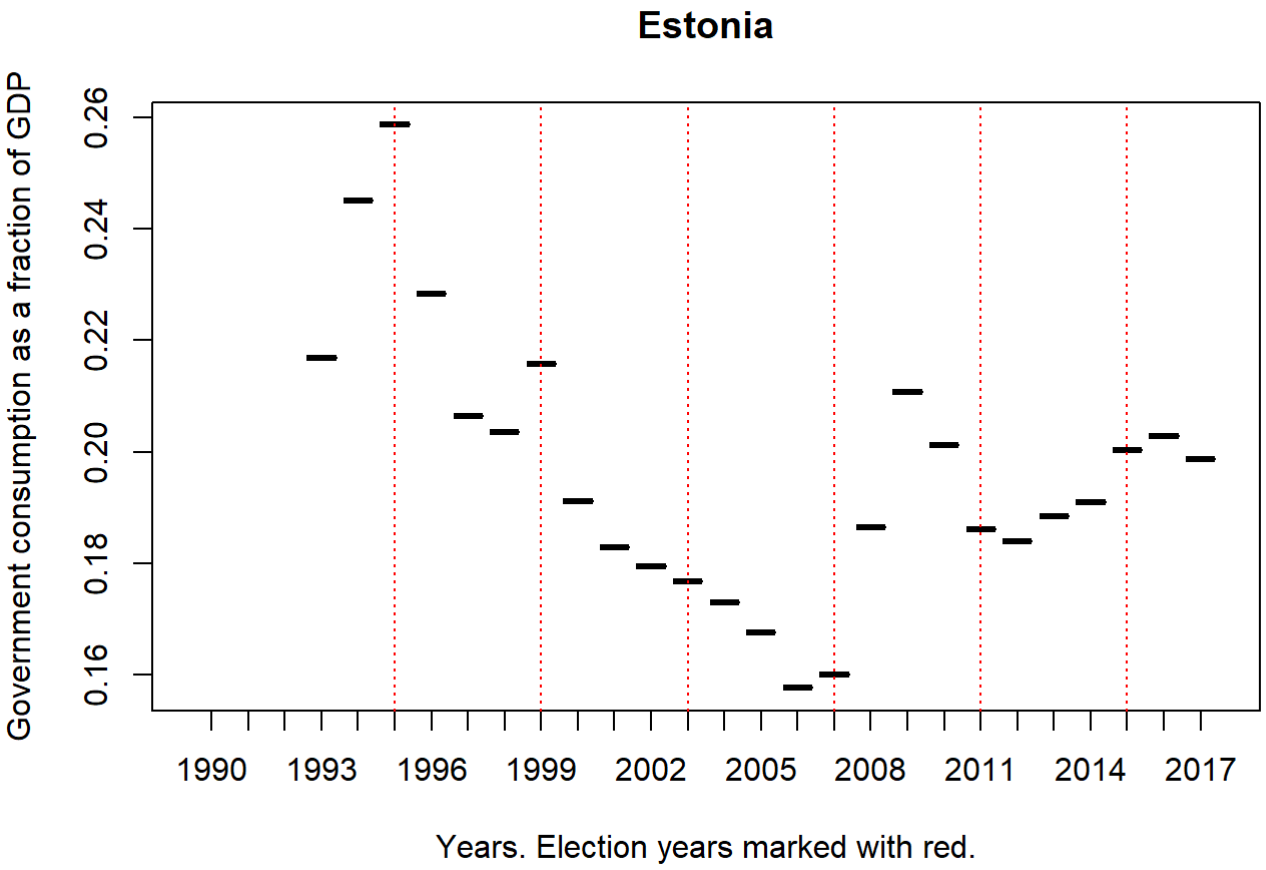

Government consumption as a fraction of G
0.20
0.21
0.22
0.23
0.24
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

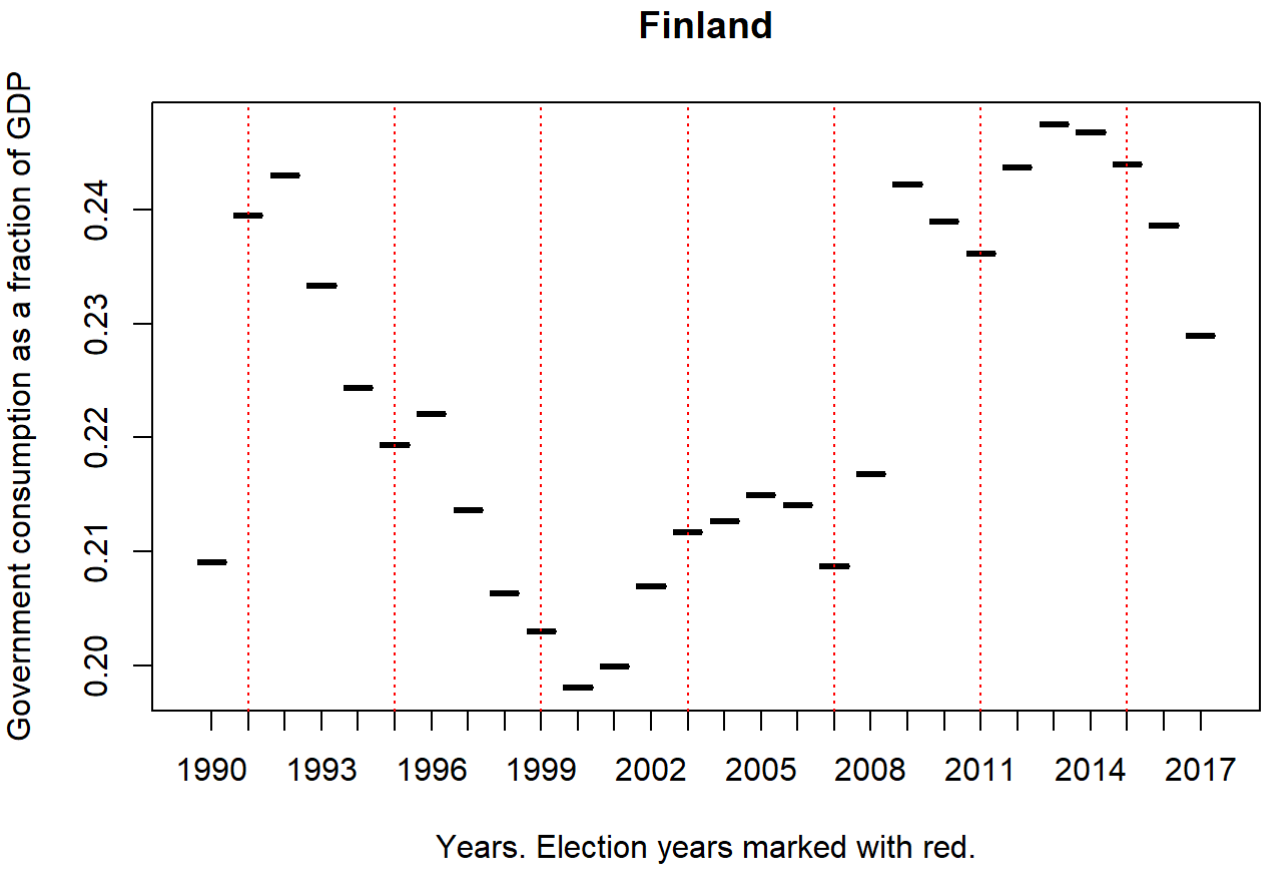
Canada

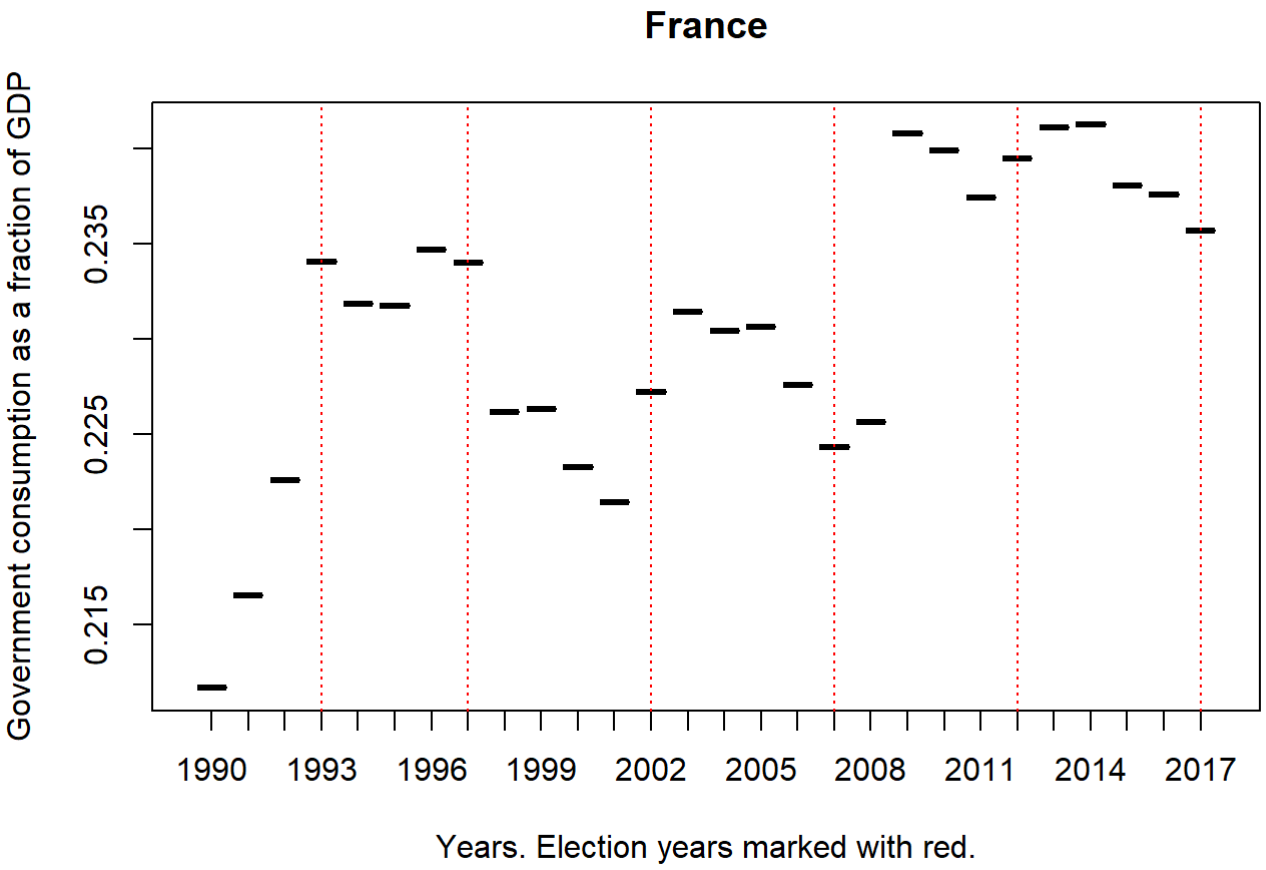

Government consumption as a fraction of GDP
0.19
0.20
0.21
0.22
0.23
0.24
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.


Czech Republic
Government consumption as a fraction of GDP
0.195
0.205
0.215
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

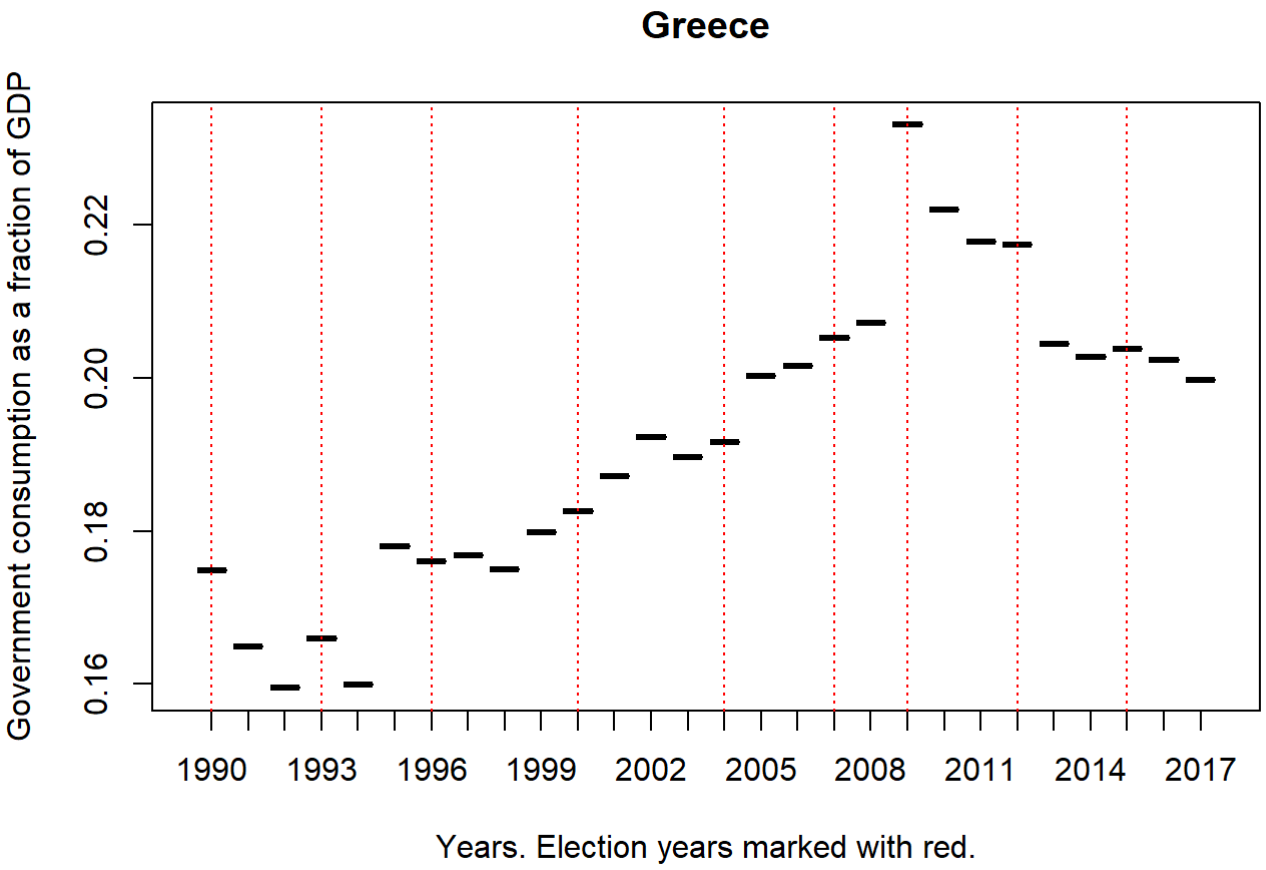

Denmark
Government consumption as a fraction of GDP
0.24
0.25
0.26
0.27
0.28
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

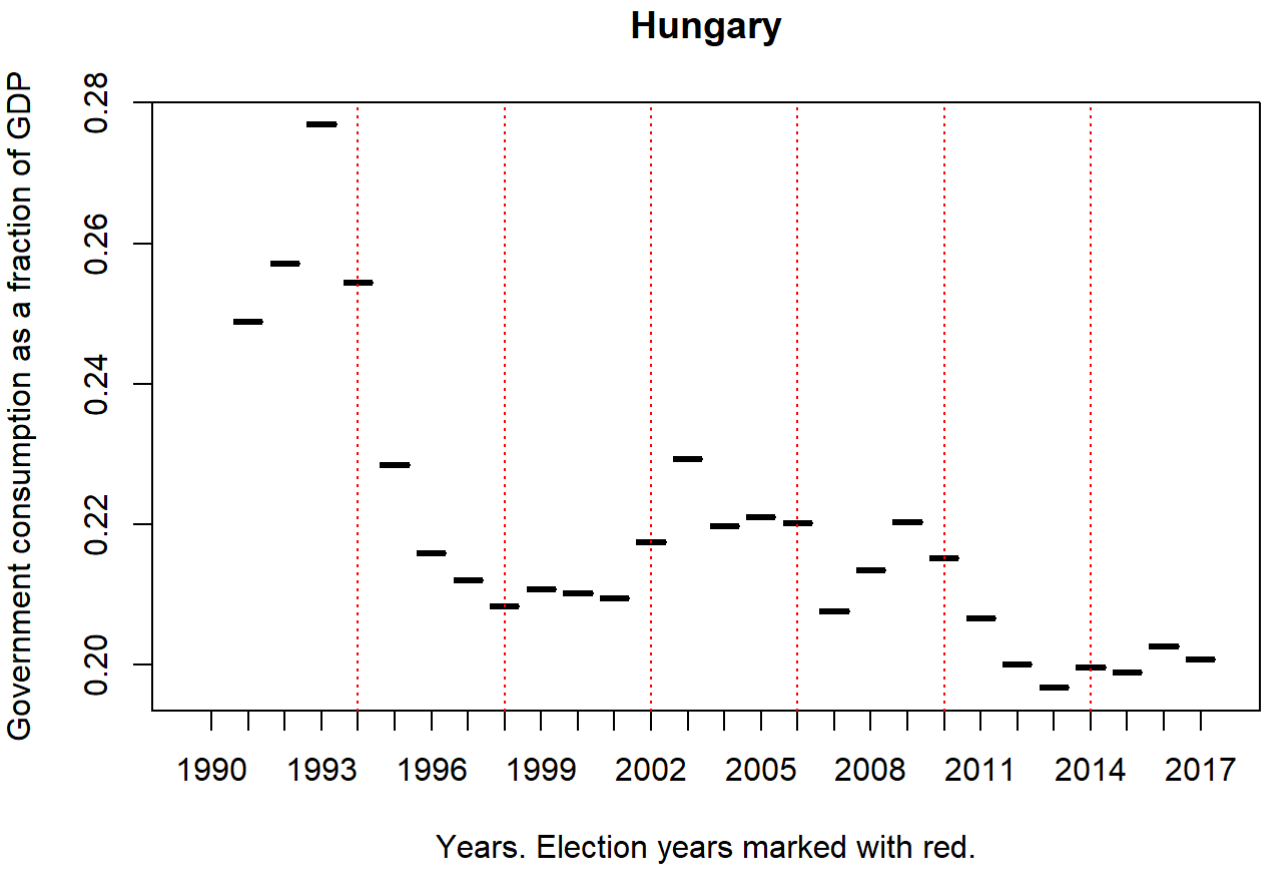

Estonia
Government consumption as a fraction of GDP
0.16
0.18
0.20
0.22
0.24
0.26
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

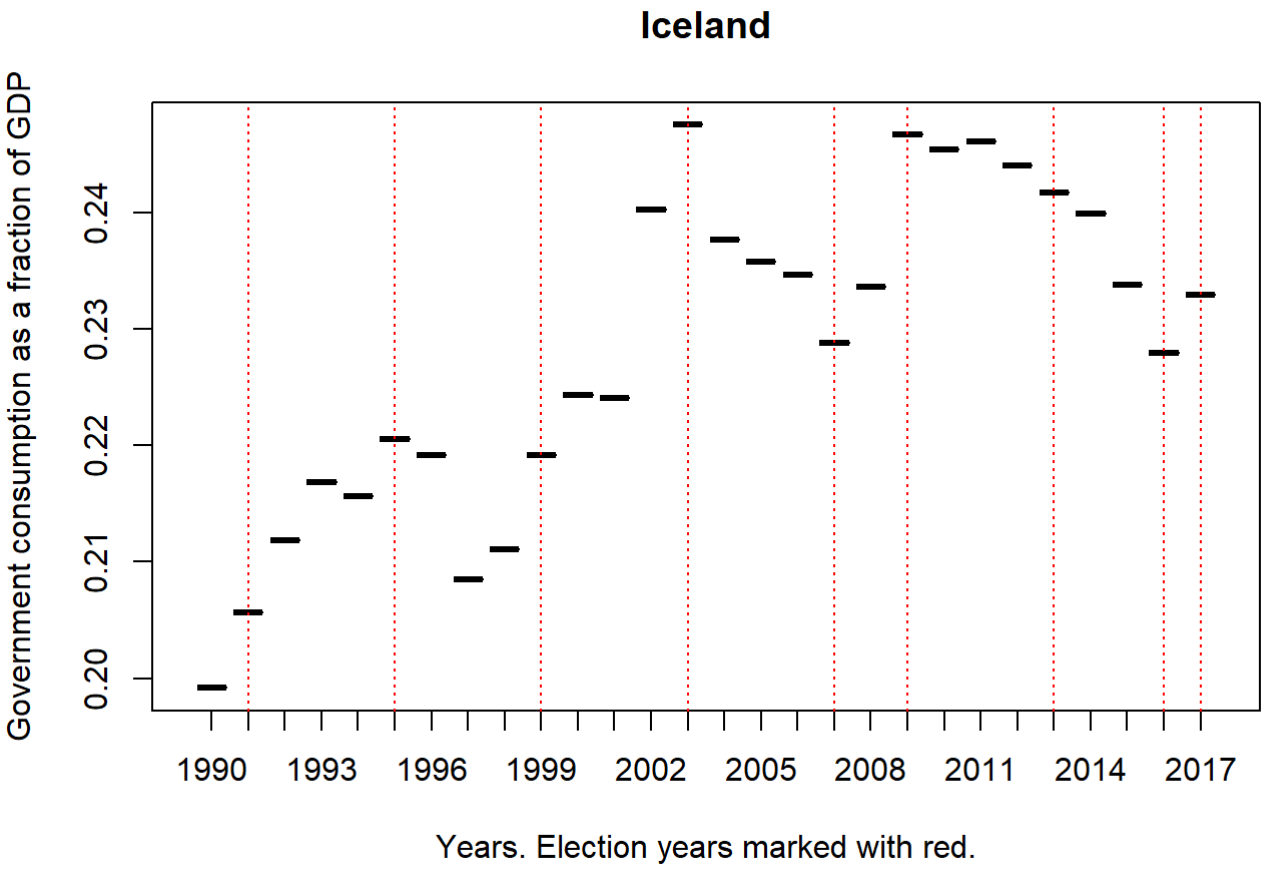

Finland
Government consumption as a fraction of GDP
0.20
0.21
0.22
0.23
0.24
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.


France
Government consumption as a fraction of GDP
0.215
0.225
0.235
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

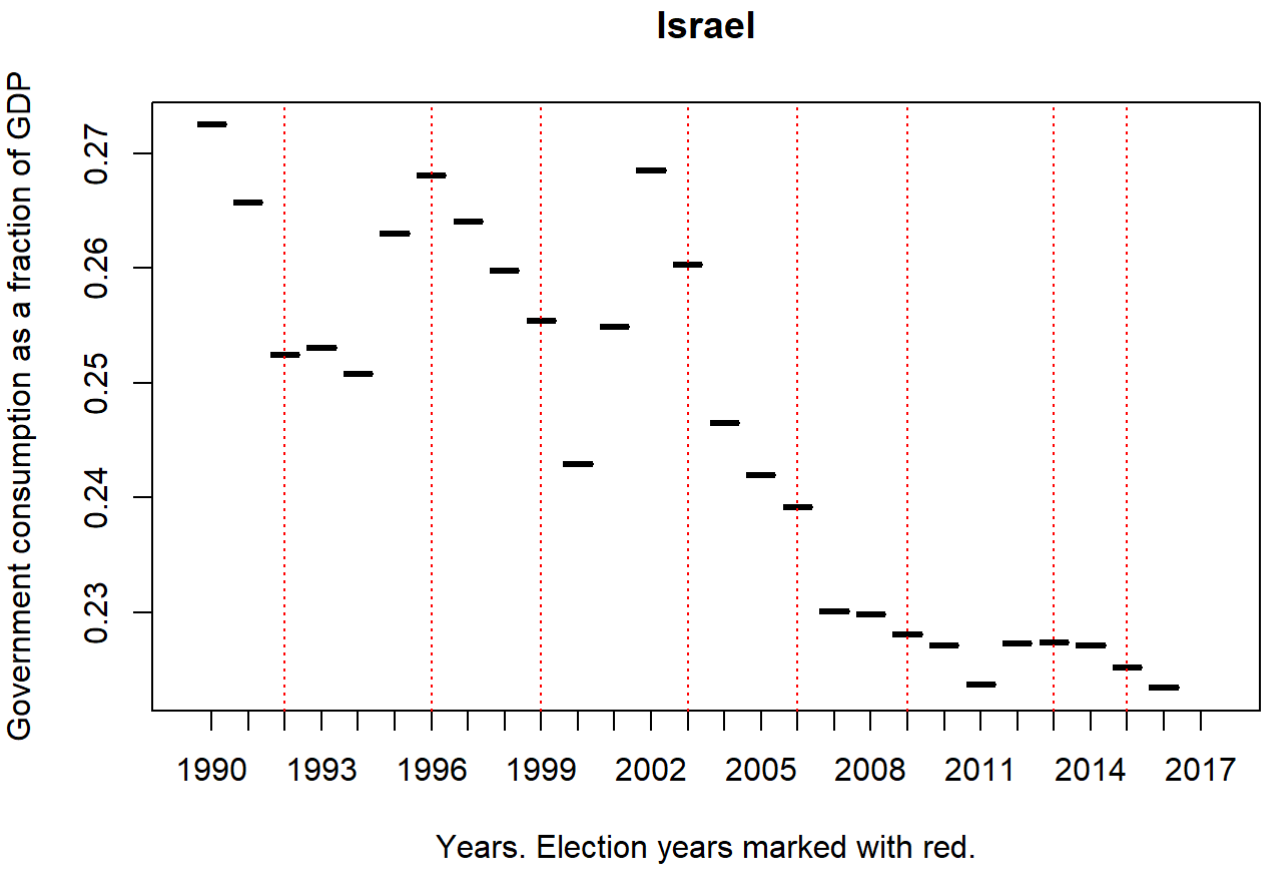

Germany
Government consumption as a fraction of GDP
0.175
0.180
0.185
0.190
0.195
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

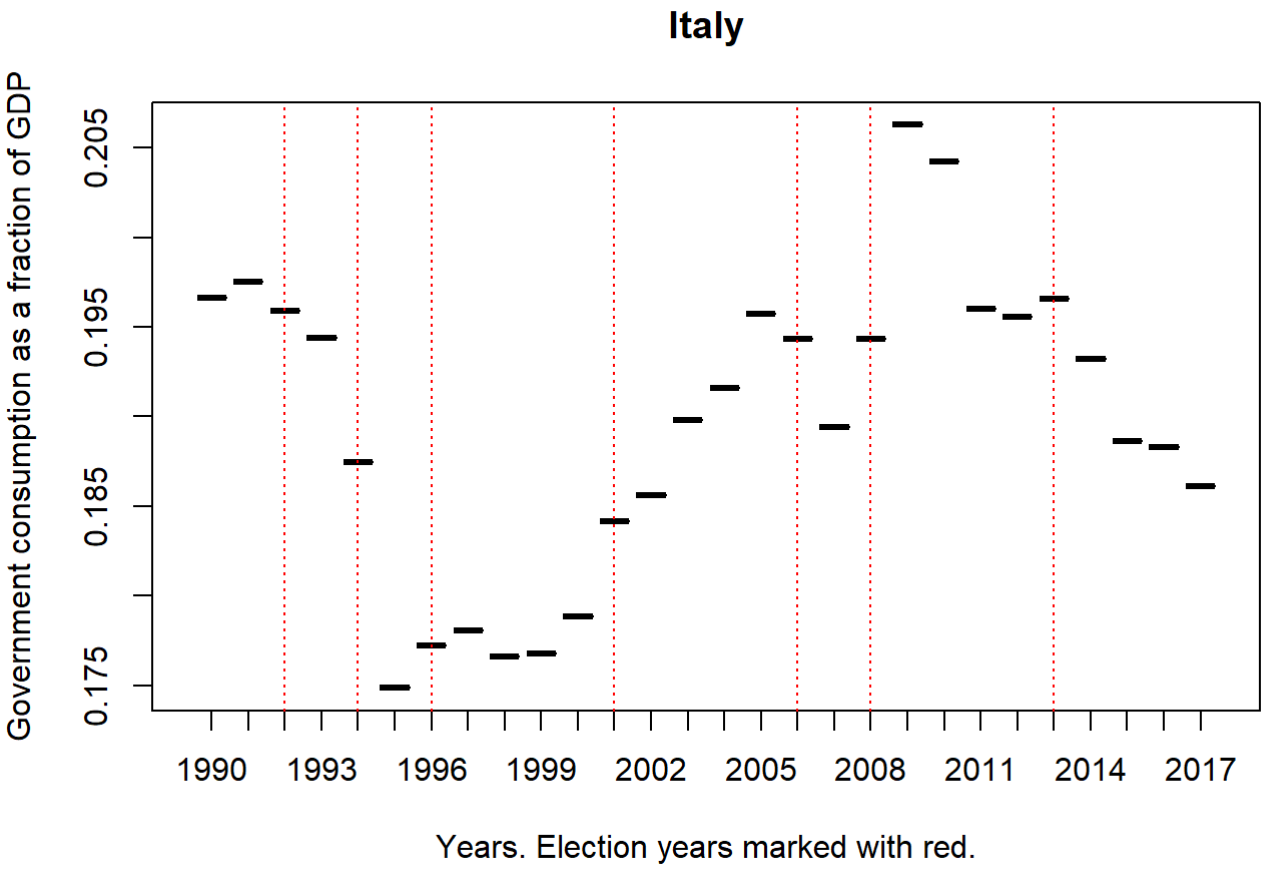

Greece
Government consumption as a fraction of GDP
0.16
0.18
0.20
0.22
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

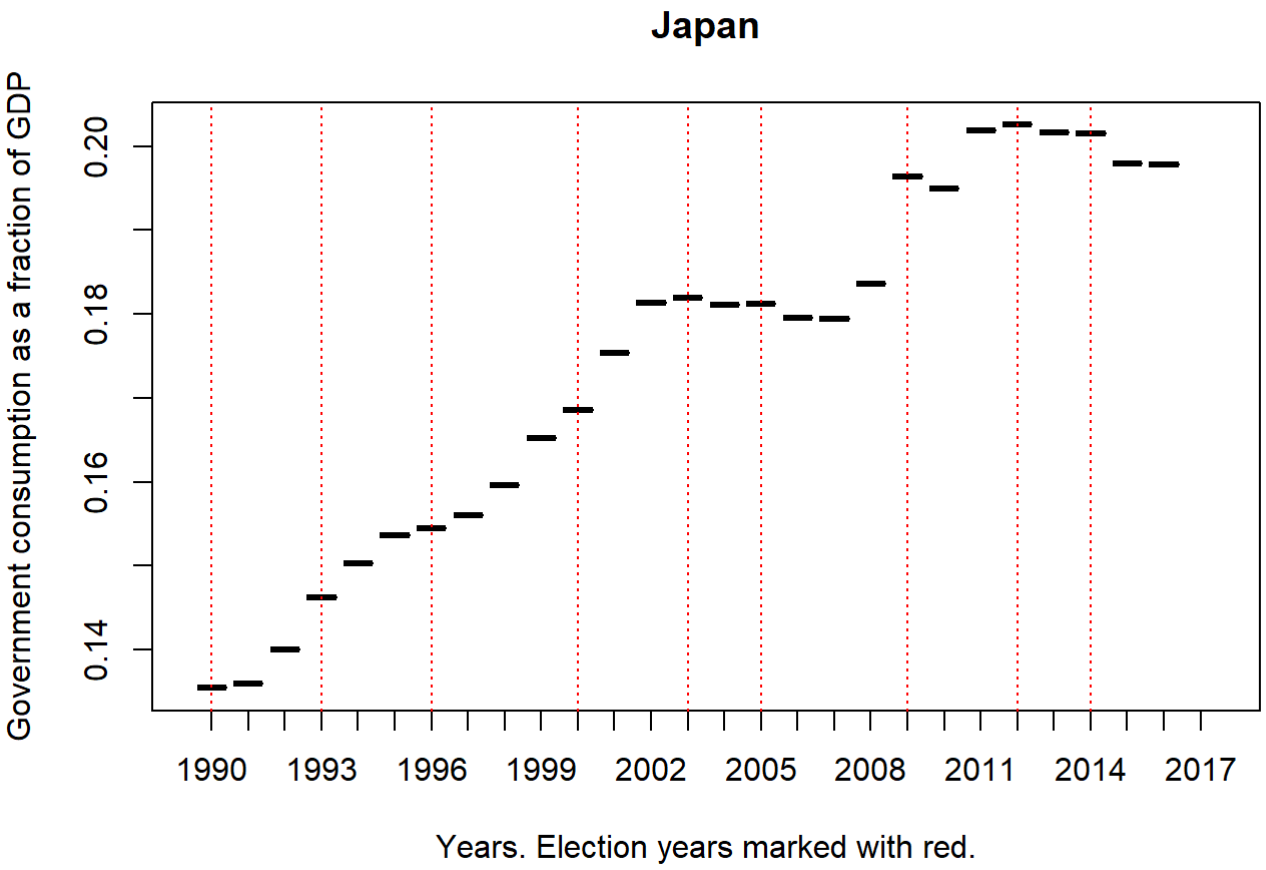

Hungary
Government consumption as a fraction of GDP
0.20
0.22
0.24
0.26
0.28
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

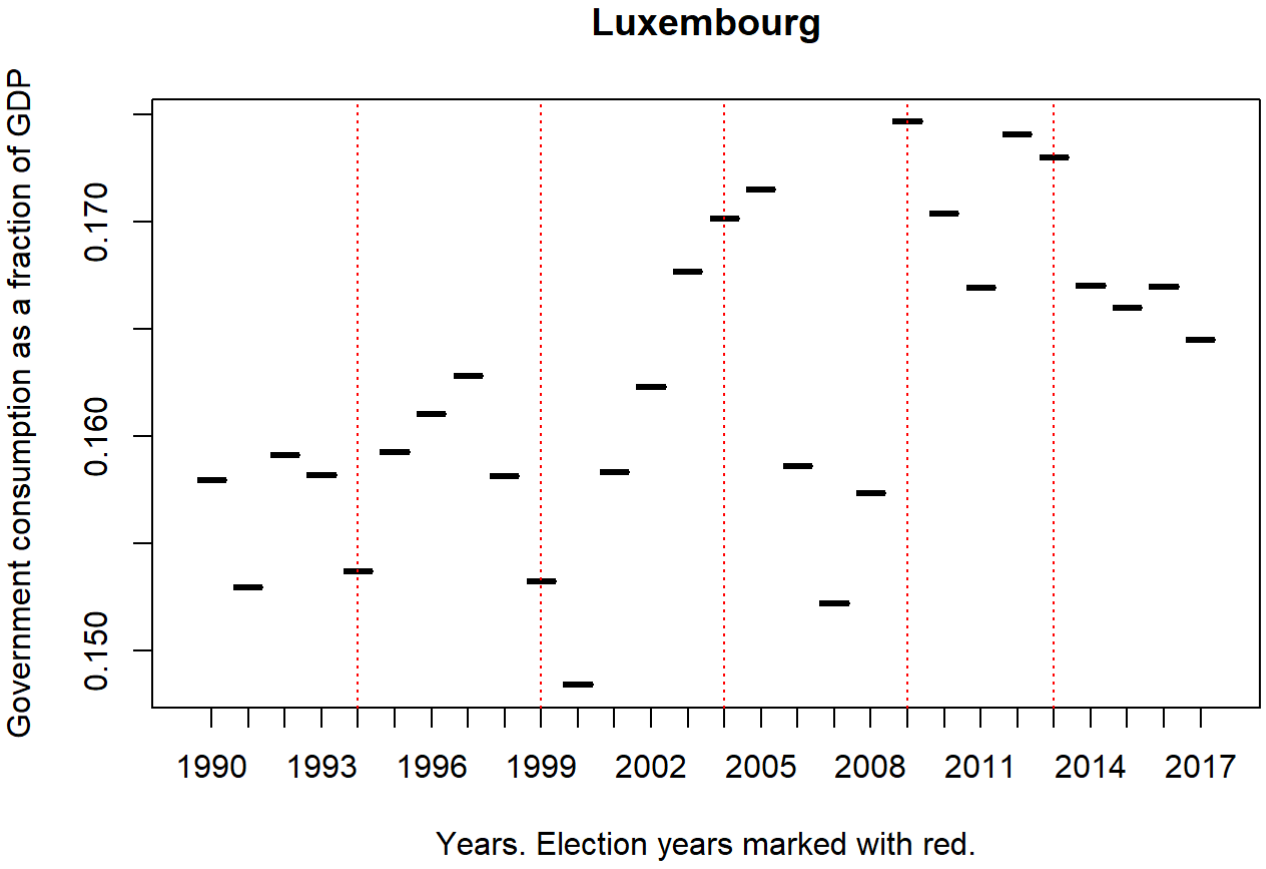

Iceland
Government consumption as a fraction of GDP
0.20
0.21
0.22
0.23
0.24
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

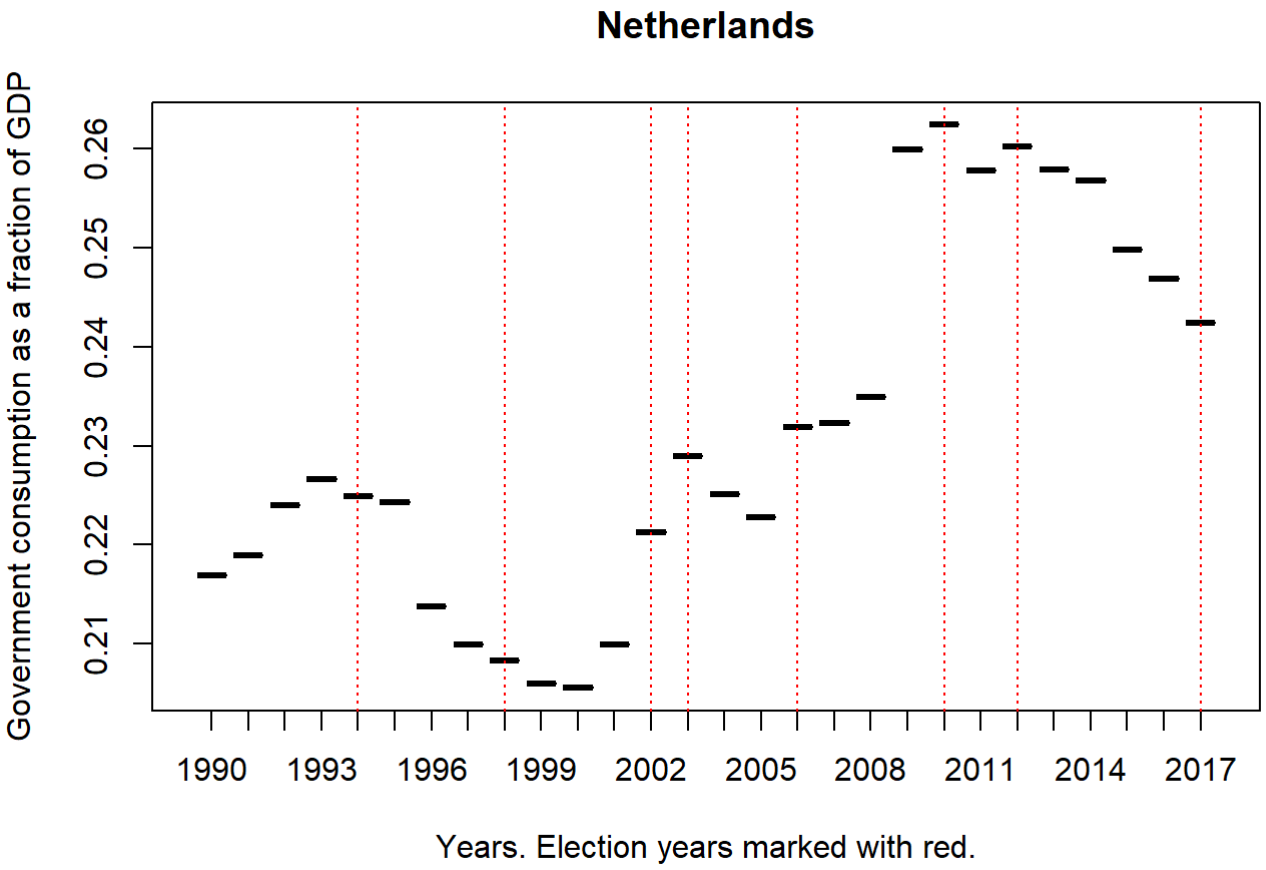

Ireland
Government consumption as a fraction of GDP
0.12
0.14
0.16
0.18
0.20
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

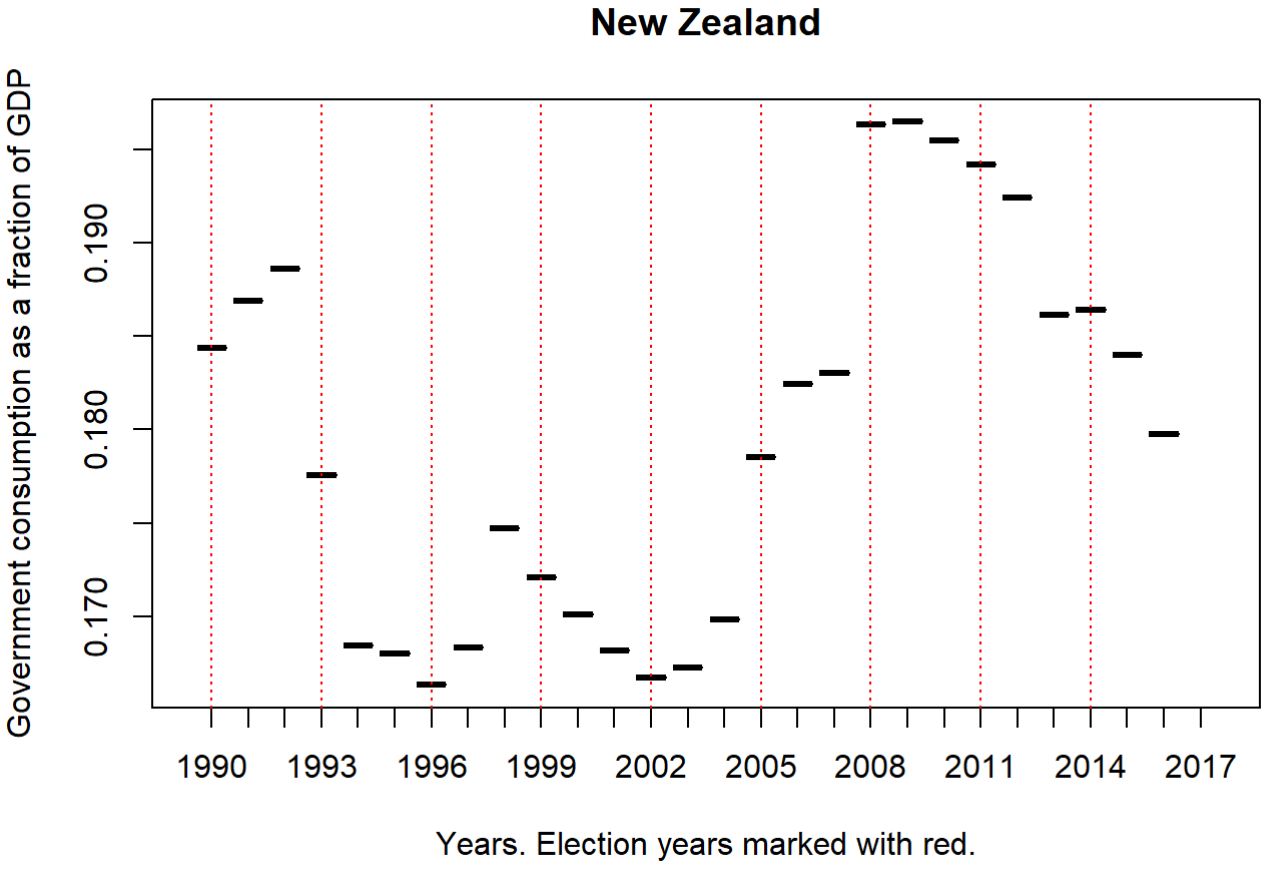

Israel
Government consumption as a fraction of GDP
0.23
0.24
0.25
0.26
0.27
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

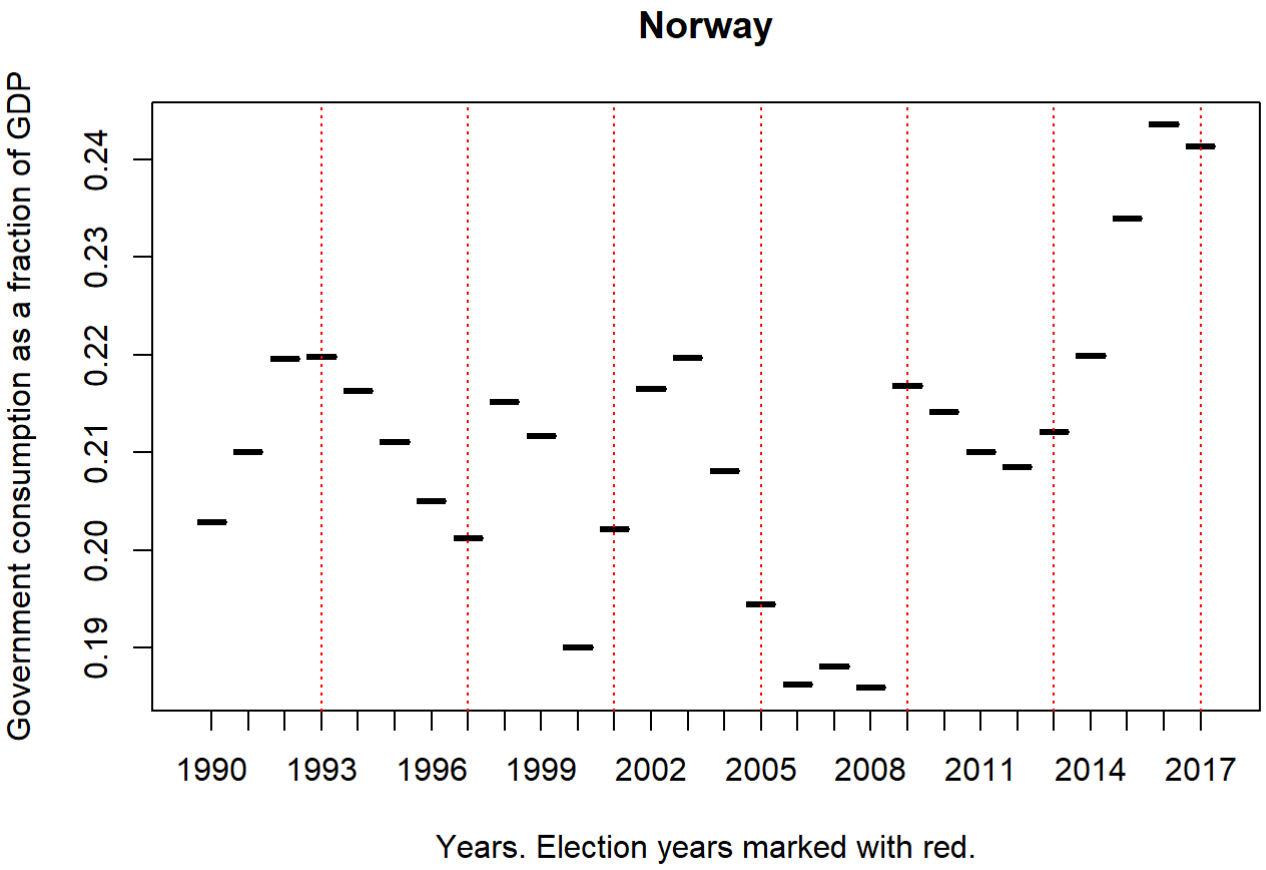

Italy
Government consumption as a fraction of GDP
0.175
0.185
0.195
0.205
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

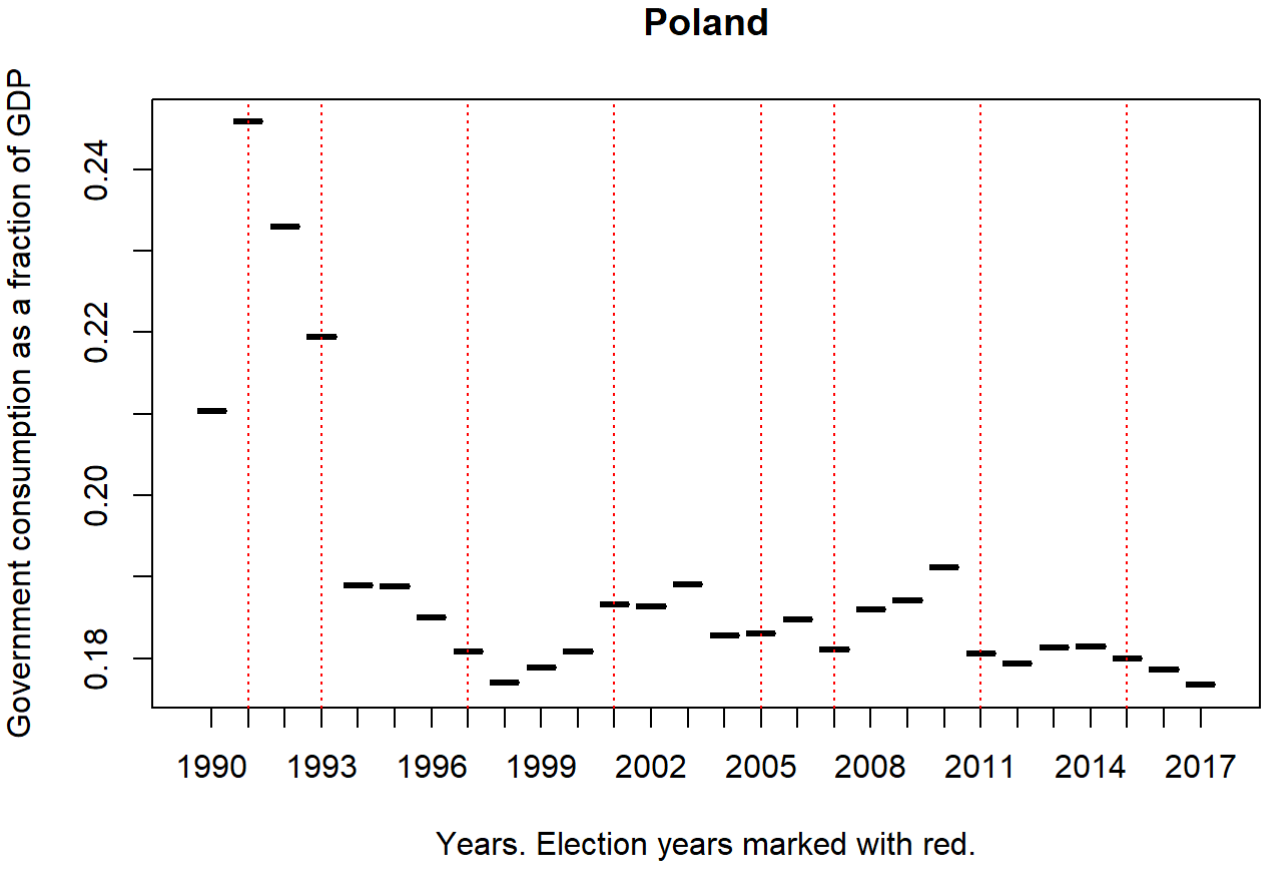

Japan
Government consumption as a fraction of GDP
0.14
0.16
0.18
0.20
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

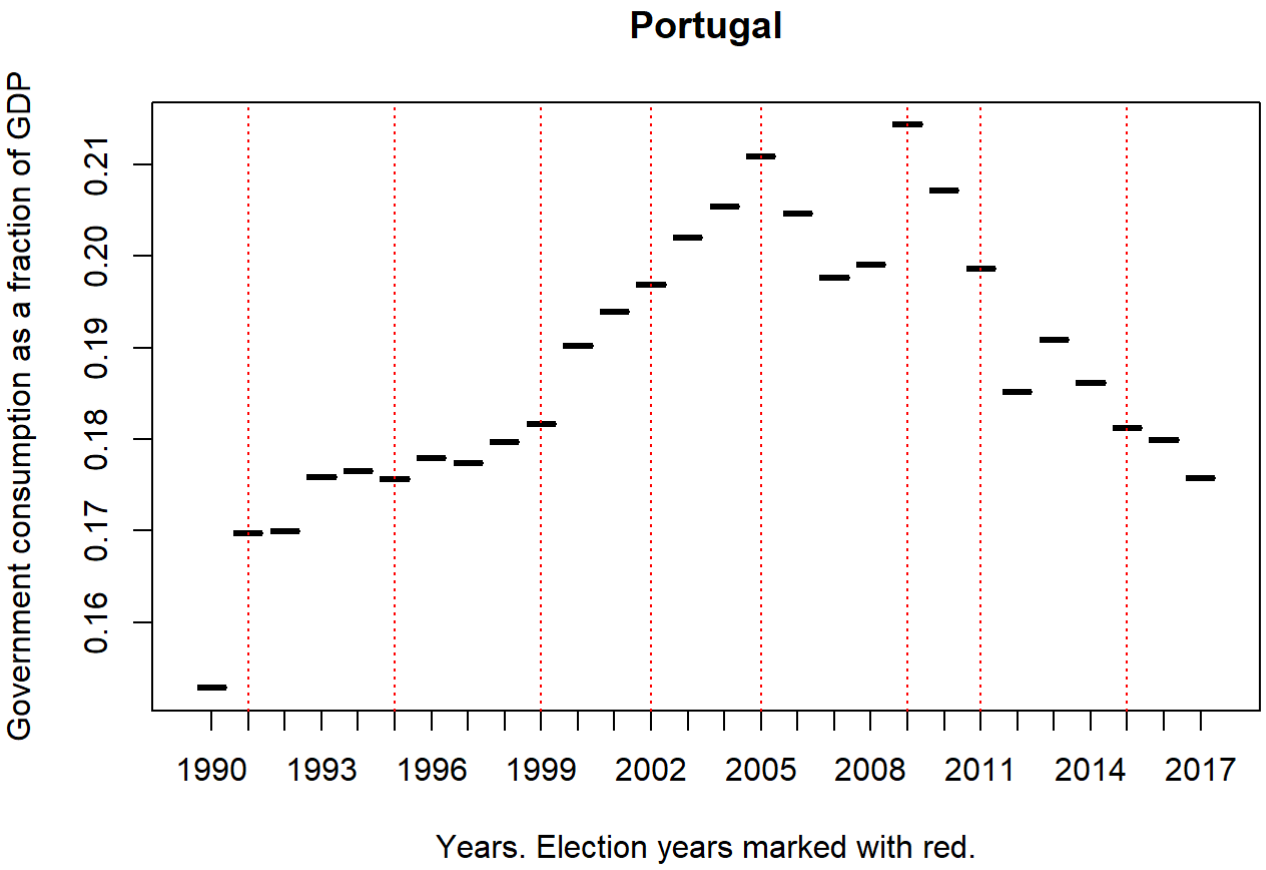

Luxembourg
Government consumption as a fraction of GDP
0.150
0.160
0.170
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

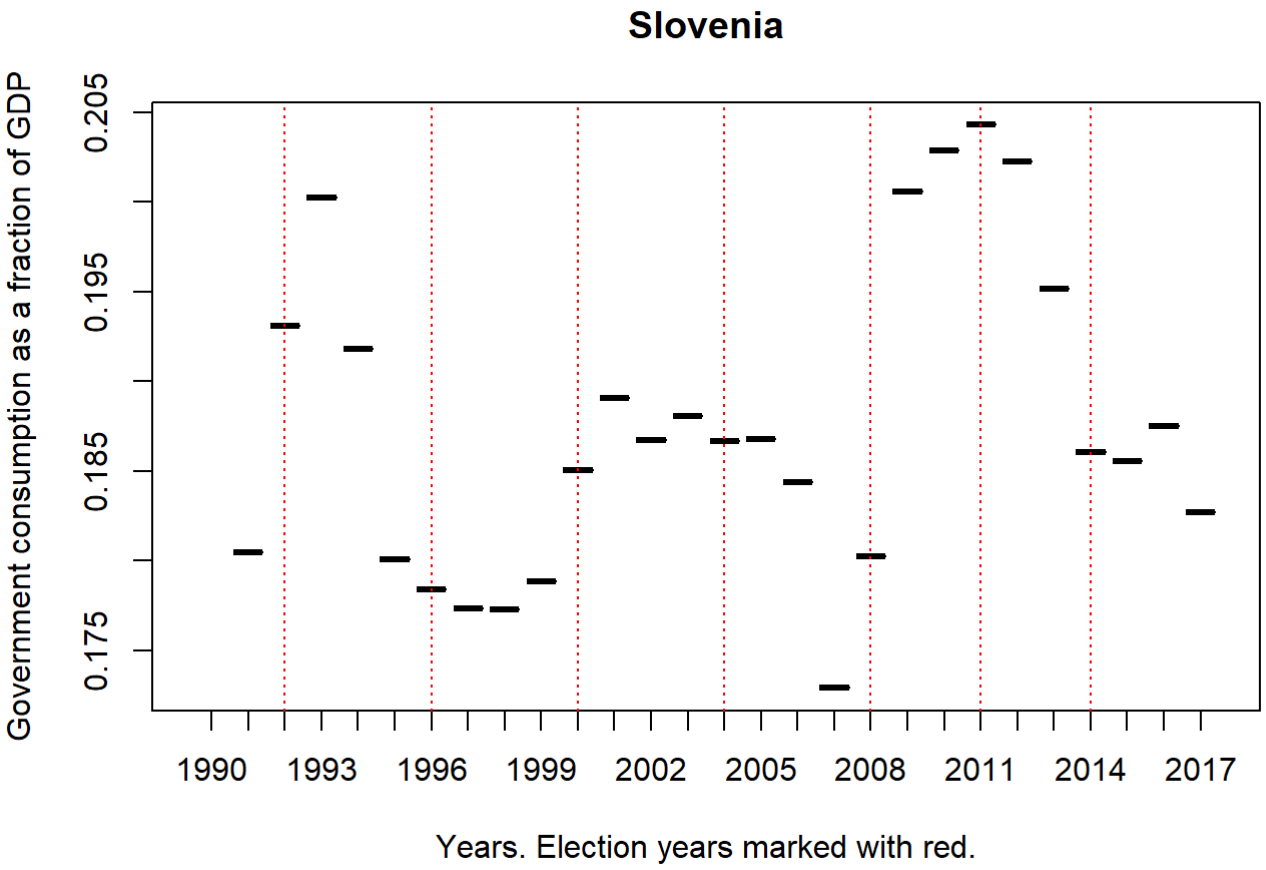

Netherlands
Government consumption as a fraction of GDP
0.21
0.22
0.23
0.24
0.25
0.26
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

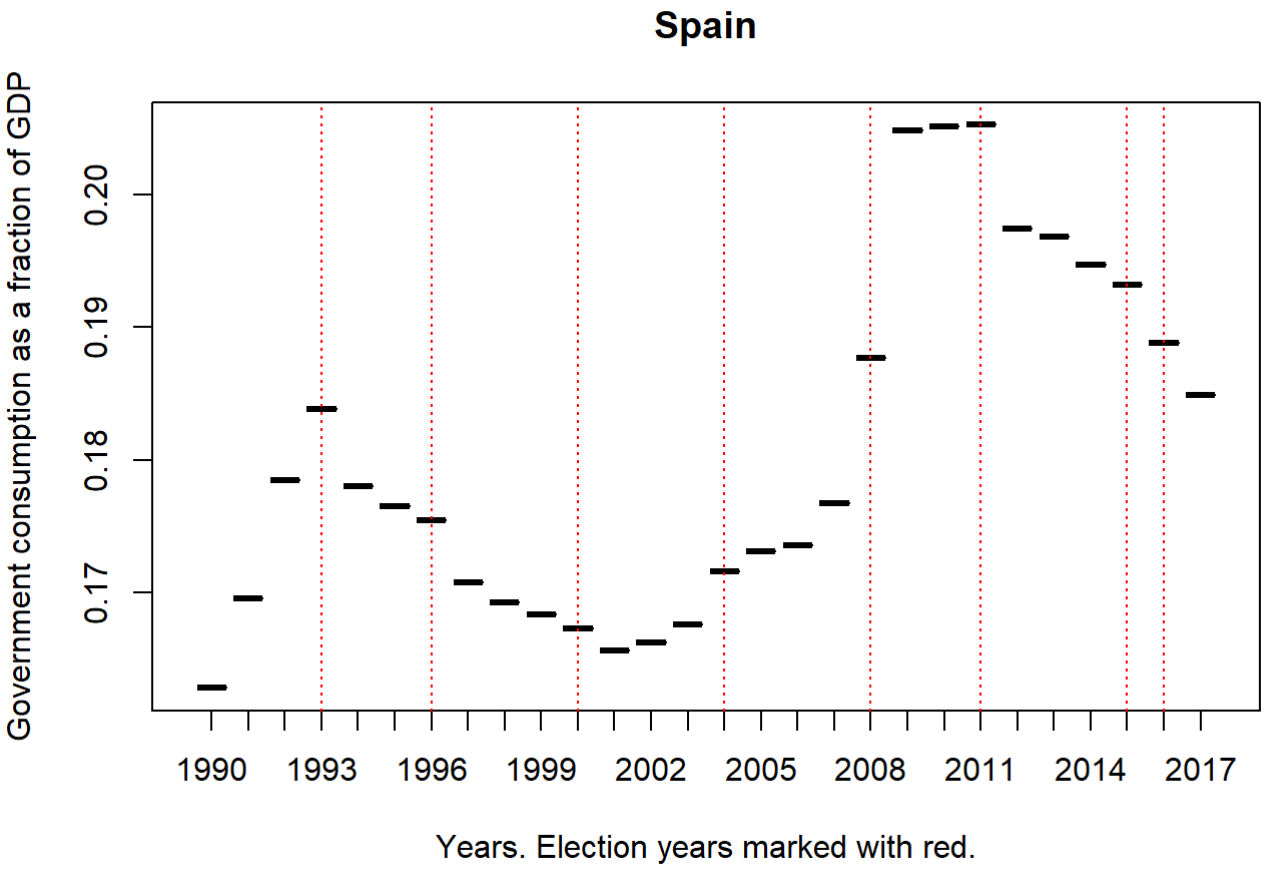

New Zealand
Government consumption as a fraction of GDP
0.170
0.180
0.190
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

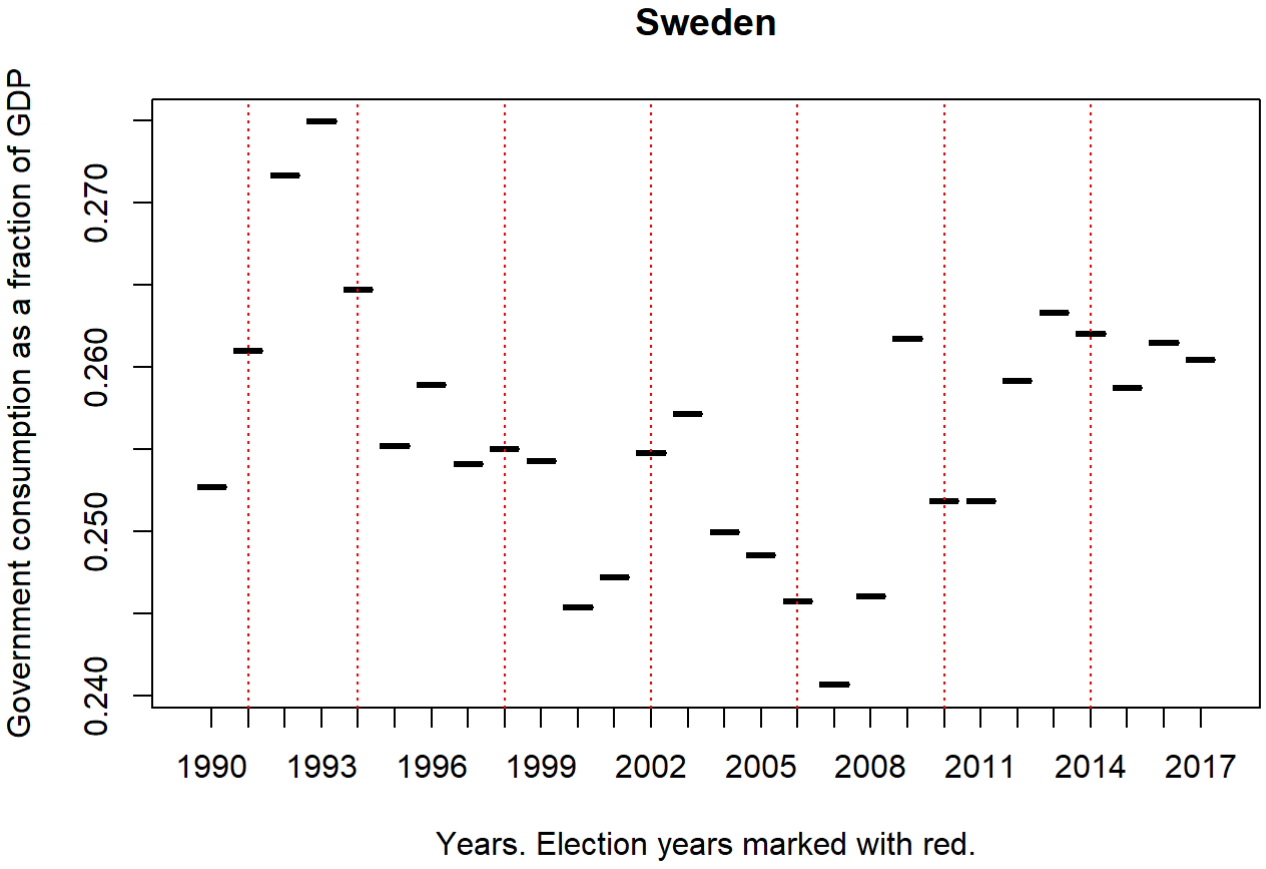

Norway
Government consumption as a fraction of GDP
0.19
0.20
0.21
0.22
0.23
0.24
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

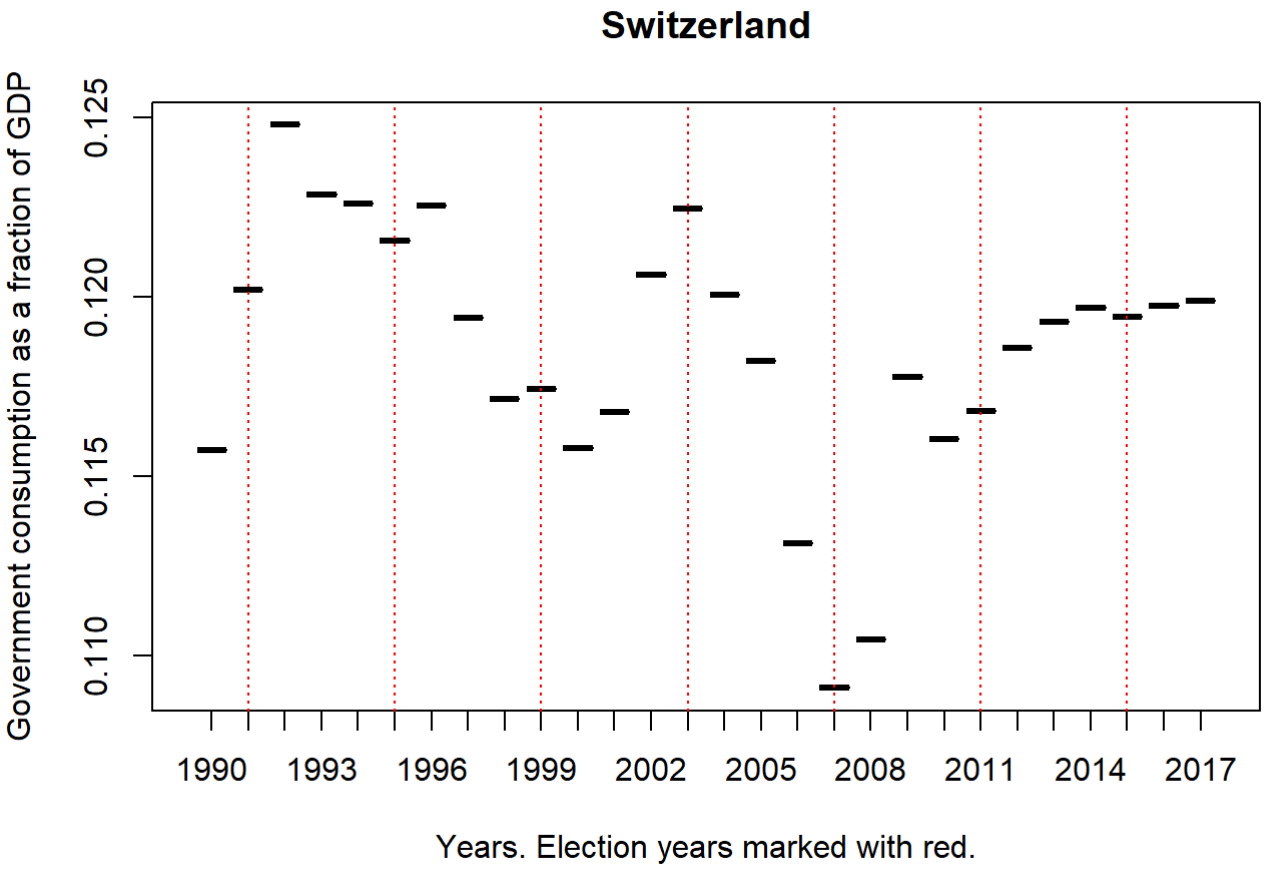

Poland
Government consumption as a fraction of GDP
0.18
0.20
0.22
0.24
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

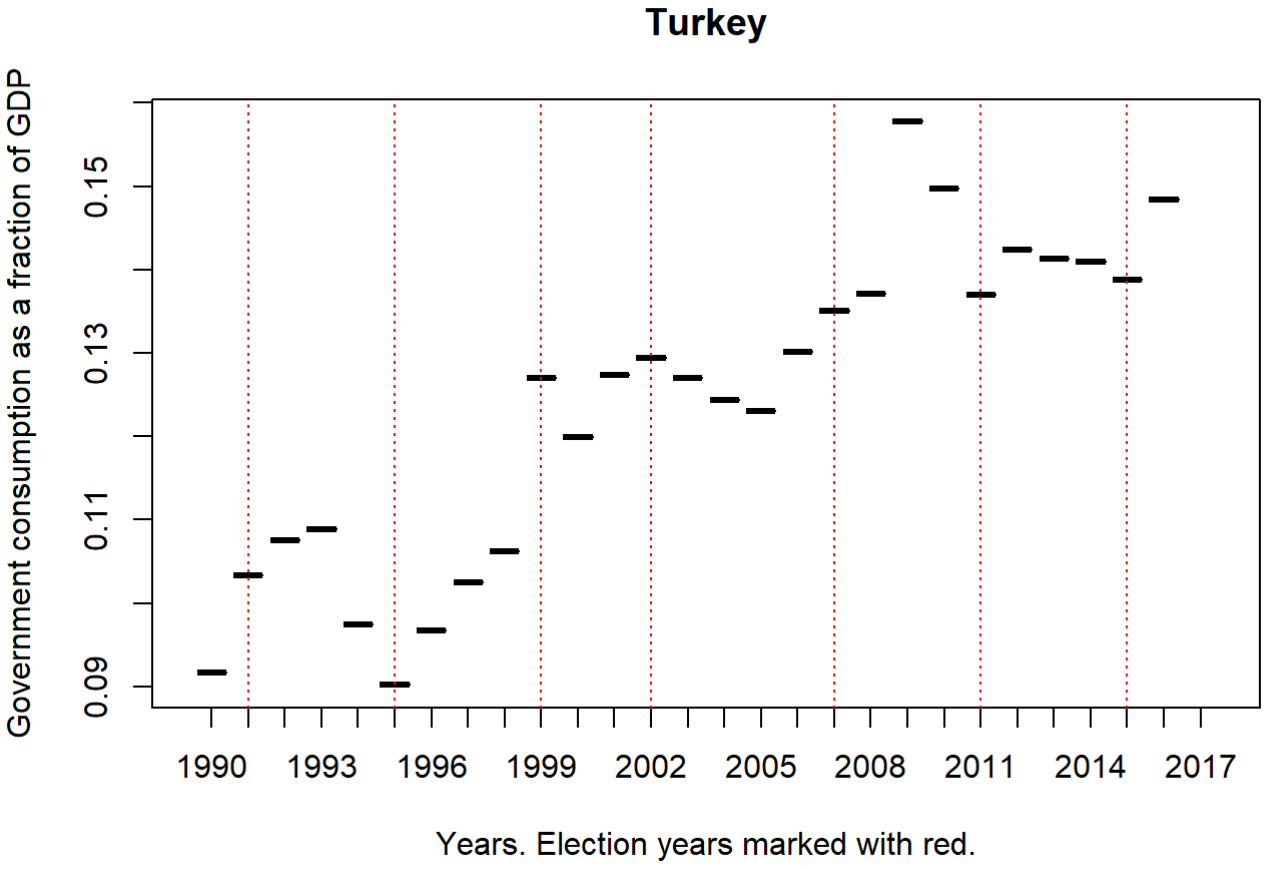

Portugal
Government consumption as a fraction of GDP
0.16
0.17
0.18
0.19
0.20
0.21
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.

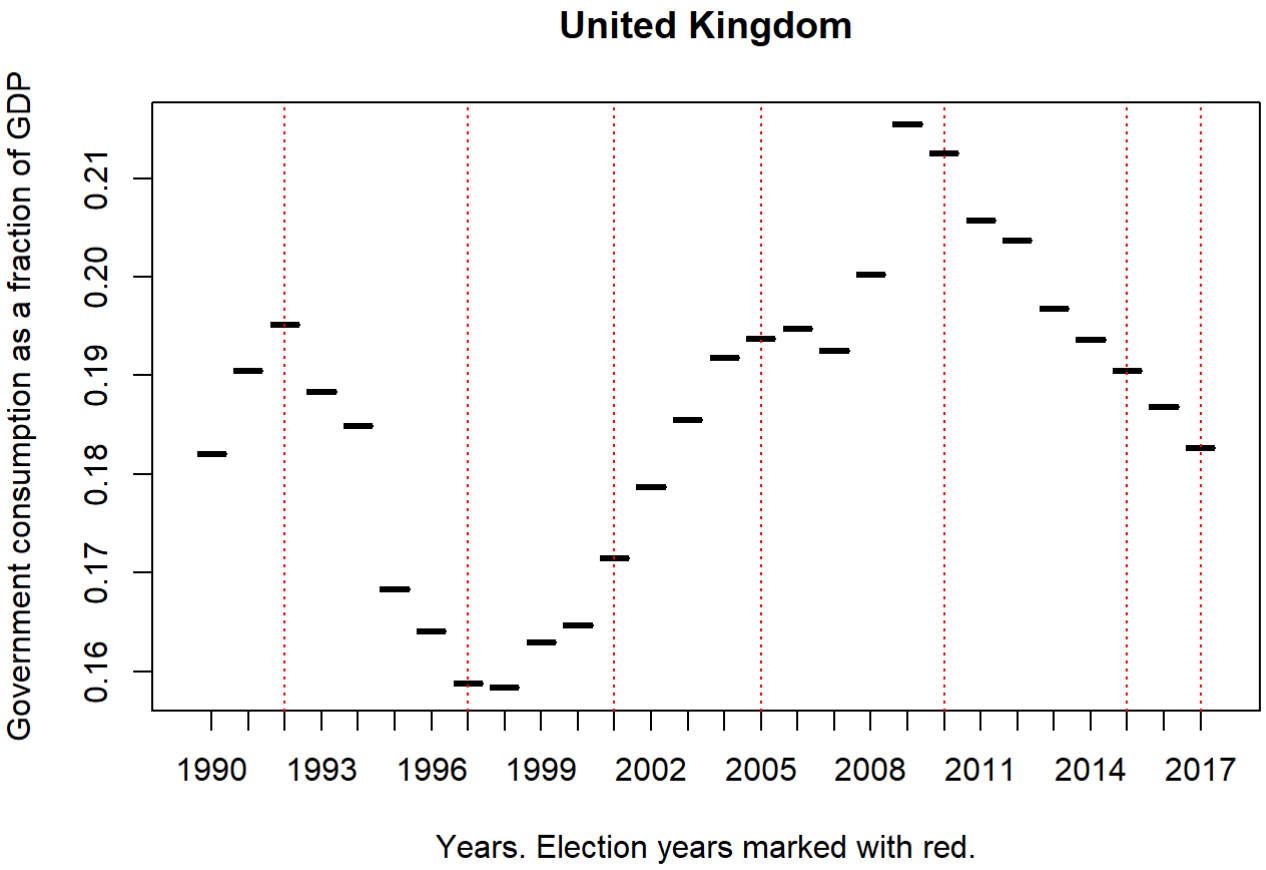

Slovenia
Government consumption as a fraction of GDP
0.175
0.185
0.195
0.205
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.


Spain
Government consumption as a fraction of GDP
0.17
0.18
0.19
0.20
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.


Sweden
Government consumption as a fraction of GDP
0.240
0.250
0.260
0.270
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.


Switzerland
Government consumption as a fraction of GDP
0.110
0.115
0.120
0.125
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.


Turkey
Government consumption as a fraction of GDP
0.09
0.11
0.13
0.15
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
Years. Election years marked with red.



Assignment 2

Estimate the regression model

$$\frac{G_{NO,t}}{Y_{NO,t}} = \mu + \beta_1 \frac{G_{NO,t-1}}{Y_{NO,t-1}} + \beta_2 \texttt{Election}_{NO,t} + \beta_3 \texttt{Growth}_{NO,t} + \epsilon_{NO,t},$$

where $t \in \{1990, \ldots, 2017\}$ denotes years, NO denotes "Norway", and $\texttt{Growth}_{i,t}$ is the growth rate of GDP, i.e. $\ln(Y_{i,t}) - \ln(Y_{i,t-1})$. Interpret the regression model and in particular the coefficients β_1, β_2 and β_3.

Solution proposal

This is a standard OLS-regression, and the interpretation of the coefficients should be straightforward. The coefficient of the lagged value of G/Y implies that there is considerable persistence in the dependent variable. The growth varible has a negative sign, indicating that as GDP grows, government consumption as a share of GDP falls. Finally, the estimated effect of elections on spending is very small and insignificant. *However*, there are many factors affecting G/Y. Given that we only observe seven elections in Norway, it could be that we need more samples to detect a cycle that is small relative to the overall variability of the series. Hence, it is preferrable to use the entire dataset to running regressions on single counries.

```
reg.no <-
  plm(g ~ lag(g) + election + growth,
      data=df,
      subset = country == "Norway",
      model = "pooling")
stargazer(reg.no, type = "text")
```

```
##
## ========================================
##                   Dependent variable:
##               ---------------------------
##                             g
## ----------------------------------------
## lag(g)                 0.766***
##                         (0.122)
##
## election                -0.001
##                         (0.004)
##
## growth                 -0.064***
##                         (0.016)
##
## Constant                0.054**
##                         (0.026)
##
## ----------------------------------------
## Observations              27
## R2                       0.715
## Adjusted R2              0.678
## F Statistic    19.231*** (df = 3; 23)
## ========================================
## Note:        *p<0.1; **p<0.05; ***p<0.01
```

Assignment 3

Estimate a model similar as above, but use all the countries available:

$$\frac{G_{i,t}}{Y_{i,t}} = \mu_i + \beta_1 \frac{G_{i,t-1}}{Y_{i,t-1}} + \beta_2 \texttt{Election}_{i,t} + \beta_3 \texttt{Growth}_{i,t} + \epsilon_{i,t},$$

where i denotes all the countries in the dataset (i.e. `AUSTRALIA,...,UNITED STATES`). Note that μ_i may capture country effects that are fixed over time. Discuss the following:

- Explain your choice of estimator.
- Is your estimate similar to the estimates found in Efthyvoulou (2012)?
- Interpret your findings. What can you conclude on the relationship between elections and government consumption as a fraction of GDP?

Note: It can be shown that an estimation of the equation above is biased using the estimators discussed in Met4. The bias is caused by the inclusion of the lagged dependent variable. There exists methods that could correct for this bias, as described briefly in Efthyvoulou (2012). However, this goes far beyond the curriculum in Met4, and is not necessary for writing a very good submission.

Solution proposal

The likely candidate models here are pooled OLS, fixed effects and a first-difference estimator. Each estimator has its own benefits and drawbacks, and a good submission should make a case for a model. However, a great argument is that it doesn't seem to matter much. All three models give similar estimate.

The estimates here are similar, albeit slightly smaller, relative to Efthyvoulou (2012). From the FE-regression, we find that G/Y increases by .0013 in election years - i.e. .13 percentage points. Efthyvoulou reports his

numbers as 0.36/.19% of GDP depending on which fiscal measure we compara against (he does not mention percentage points, which I find puzzling!)

You might notice that Efthyvoulou (2012) does not discuss causality directly in his paper. For most countries, elections occur at fixed time intervals. Hence, it is reasonable to conclude that our estimates do indeed capture a causal effect of elections on government consumption (at least this is the argument in Shi and Svennson 2006). It is however *possible* that there is some other factor that correlates with both elections and government consumption, and hence, contaminates our estimates. Realistically, the data and model at hand are some of the better in macroeconomics in terms of pinning down causal relationships, but far from an ideal experiment.

```
reg.pool <- plm(g ~ lag(g) + election + growth, data = df, model = "pooling")
reg.fd   <- plm(g ~ lag(g) + election + growth, data = df, model = "fd"     )
reg.fe   <- plm(g ~ lag(g) + election + growth, data = df, model = "within" )
stargazer(reg.pool,reg.fd, reg.fe, type="text", object.names = T)
```

```
##
## ================================================================================================
##                                          Dependent variable:
##              ------------------------------------------------------------------------------
##                                                   g
##                          (1)                      (2)                      (3)
##                        reg.pool                 reg.fd                   reg.fe
## ------------------------------------------------------------------------------------------------
## lag(g)                 0.971***                 0.204***                 0.844***
##                        (0.007)                  (0.033)                  (0.018)
##
## election               0.001**                  0.001**                  0.001**
##                        (0.001)                 (0.0003)                  (0.001)
##
## growth                -0.013***                -0.016***                -0.013***
##                        (0.003)                  (0.002)                  (0.003)
##
## Constant               0.006***
##                        (0.001)
##
## ------------------------------------------------------------------------------------------------
## Observations             773                      744                      773
## R2                      0.958                    0.119                    0.757
## Adjusted R2             0.958                    0.117                    0.747
## F Statistic  5,915.655*** (df = 3; 769) 49.944*** (df = 2; 741) 770.201*** (df = 3; 741)
## ================================================================================================
## Note:                                                              *p<0.1; **p<0.05; ***p<0.01
```

Assignment 4

Choose a country in the dataset (let's call it country i), and create a figure where you show

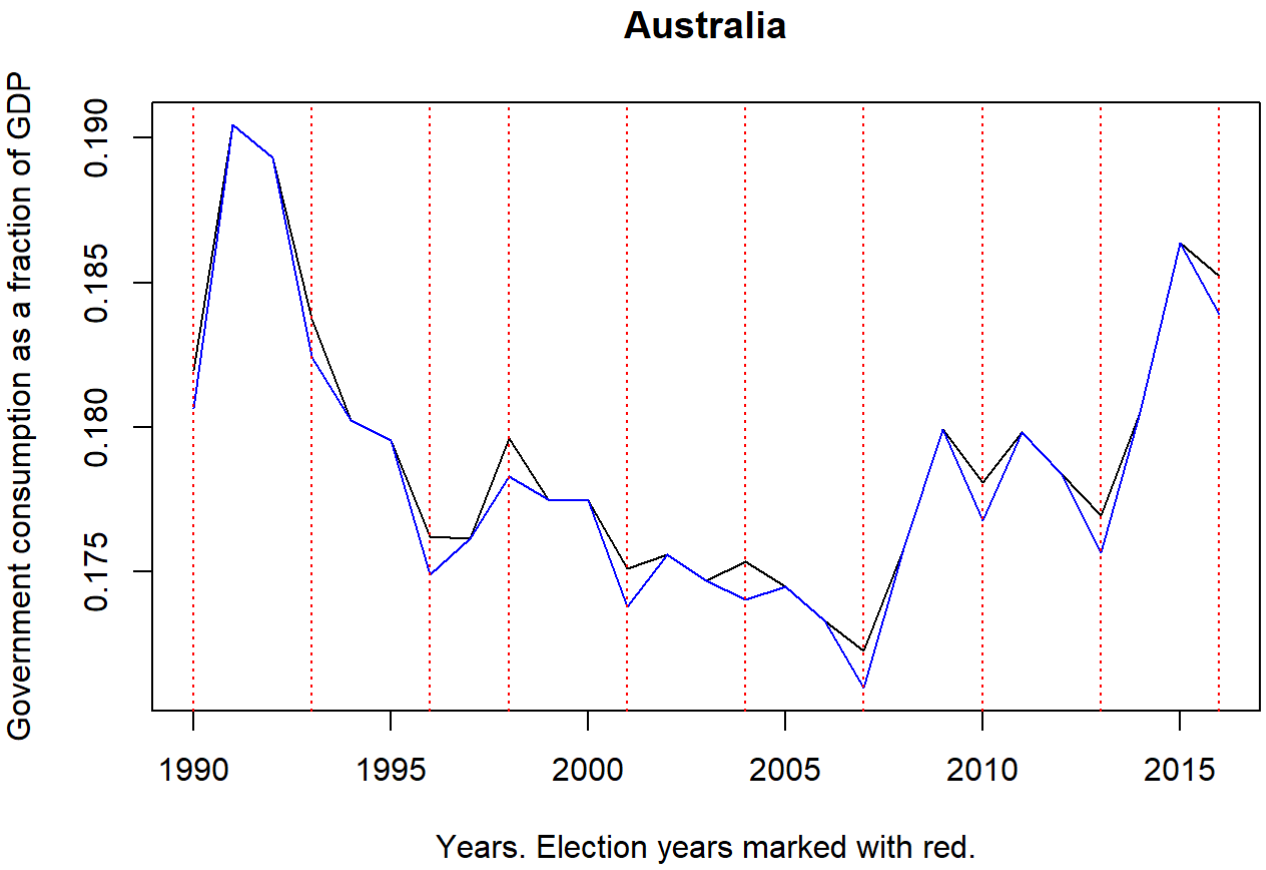
- The original time series of $\frac{G_{i,t}}{Y_{i,t}}$
- A hypothetical series showing What $\frac{G_{i,t}}{Y_{i,t}}$ *would have been* for this country if there were no political budget cycles.

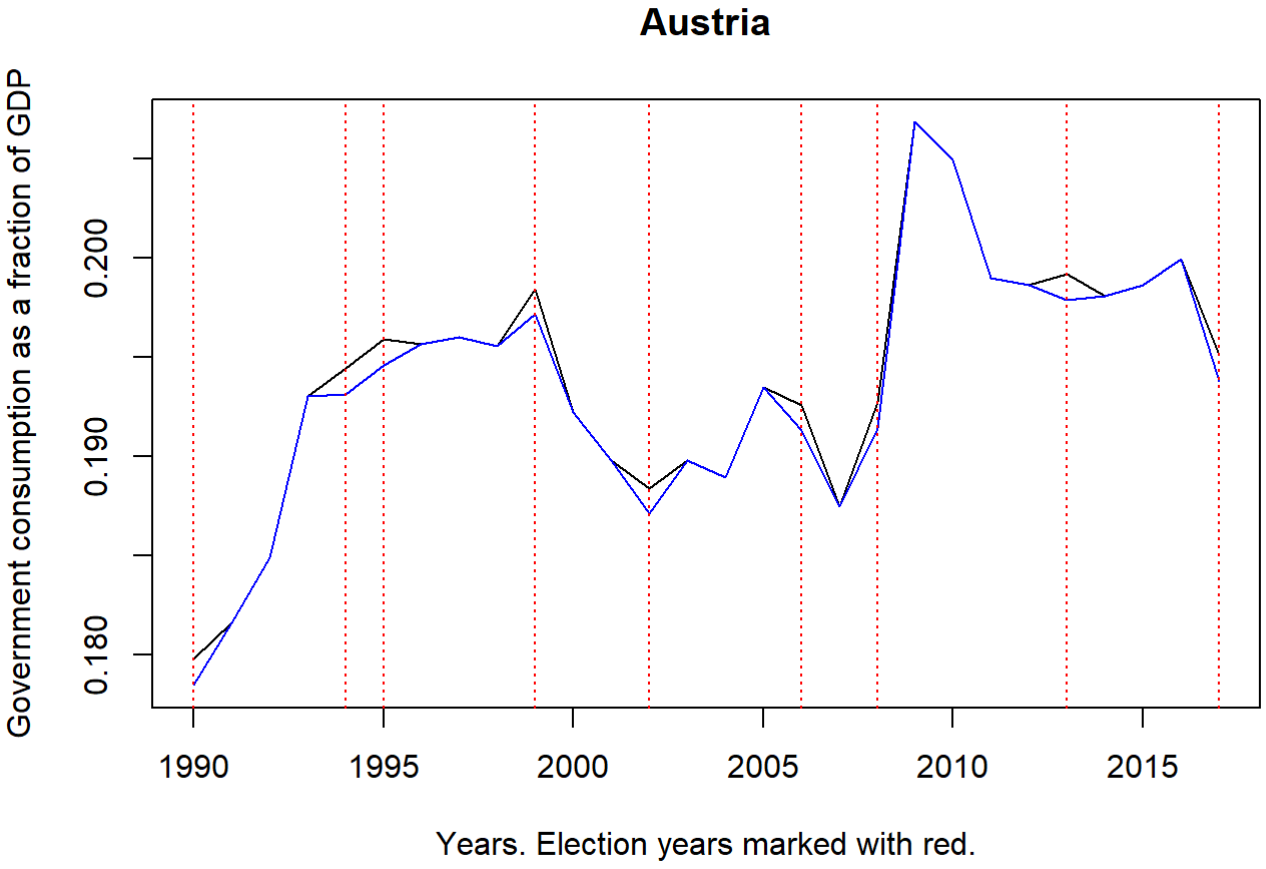
Use a model as you see fit to answer the question. Make simplifications and additional assumptions as necessary, but take care in explaining what you do.

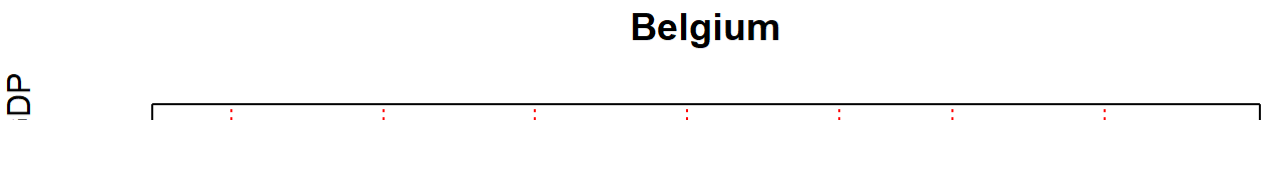
Solution proposal

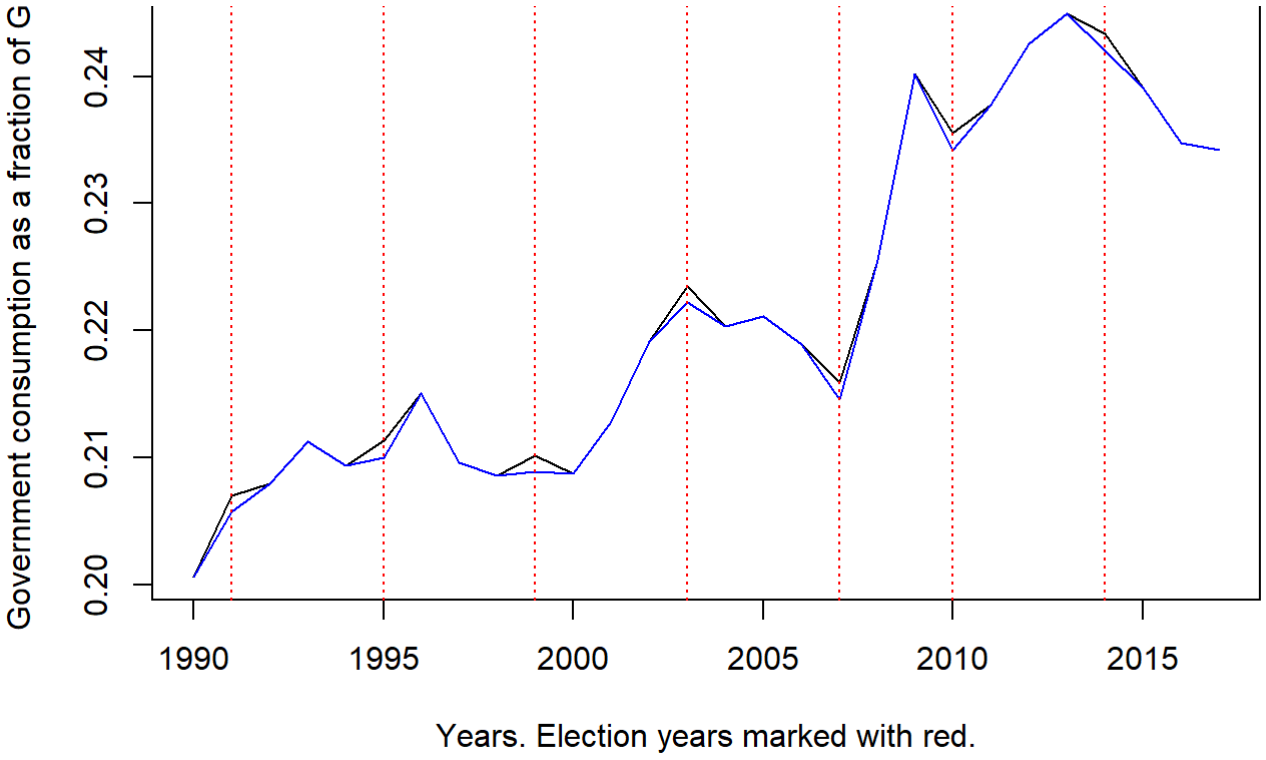
This is a hard assignment, and the students will need to do some thinking on their own to get a sensible answer. The important insight here is that this is a dynamic model, and hence, changing something at some point in the series will most likely cause changes at other points in the series as well. A simple, yet absolutely acceptable solution is to predict the dependent variable with the election variable set to zero in all periods, and taking the lagged dependent variable as given. This ignores the point that the year following (and all future years as well) will also be affected due to the inclusion of the lagged dependent variable in the model. Further, the growth variable would likely be affected by increased spending, which is not captured either by simply predicting G/Y with the election variable set to zero. Thinking beyond the model, we should probably expect the time series of G/Y to be very different if there were no budget cycles. In summary, a simple model is limiting, but perhaps the best we can do in the absence of more data or a better model. This is a fairly open assignment, and other methods for answering it may be acceptable.

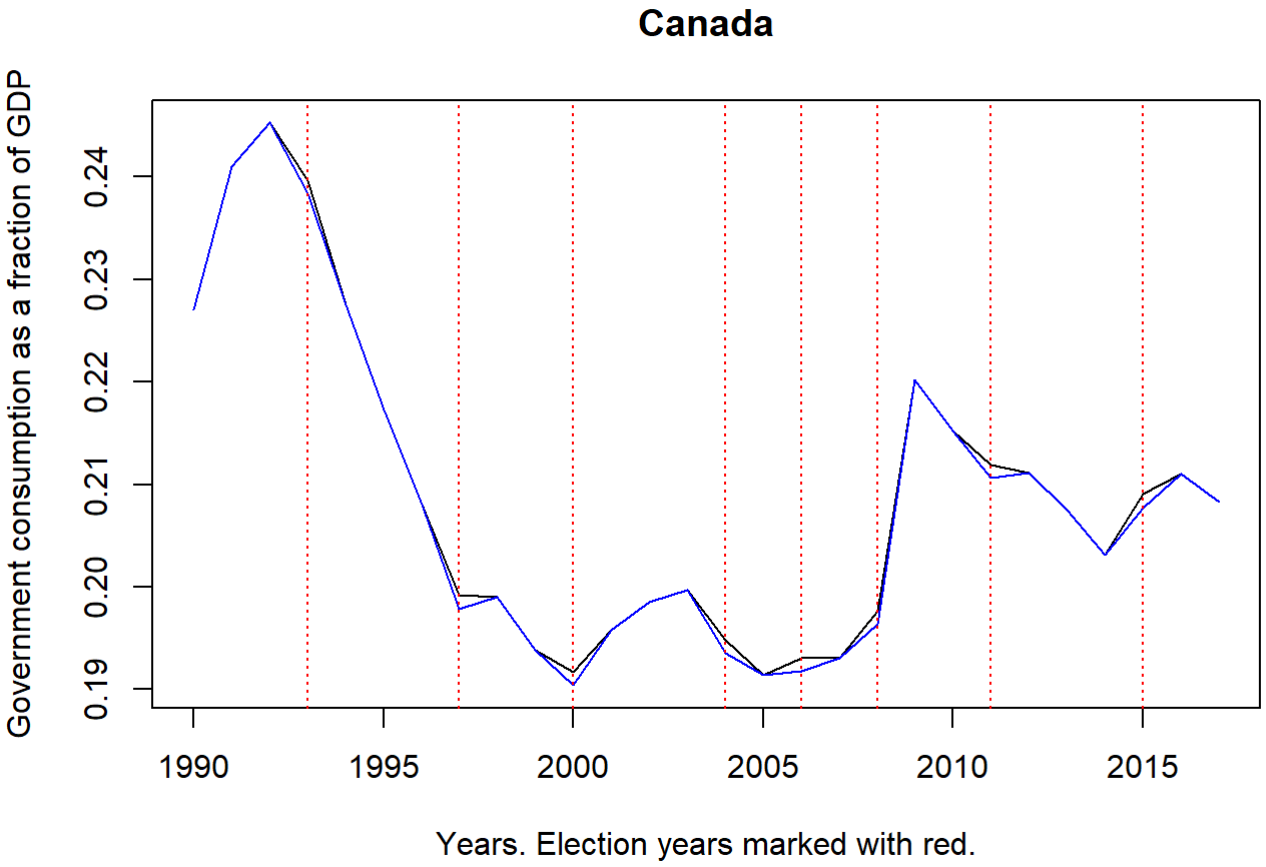
```
df$lag_g = lag(df$g)

reg <- lm(g ~ 0+lag_g + election + growth+country, data = df)
df$prediction <- df$g - df$election*reg$coefficients['election']

df$year <- as.numeric(levels(df$year))[df$year]

for(i in unique(df$country)){
  df %>%
  filter(country == i) %$% {
    plot(year, g,
         main = i,
         ylab = "Government consumption as a fraction of GDP",
         xlab = "Years. Election years marked with red.",
         type="l",
         ylim = range(c(g, prediction), na.rm=T))
    lines(year, prediction, col="blue")
    abline(v=(year[election==1]), col = "red", lty = 3)
    }
  }
```

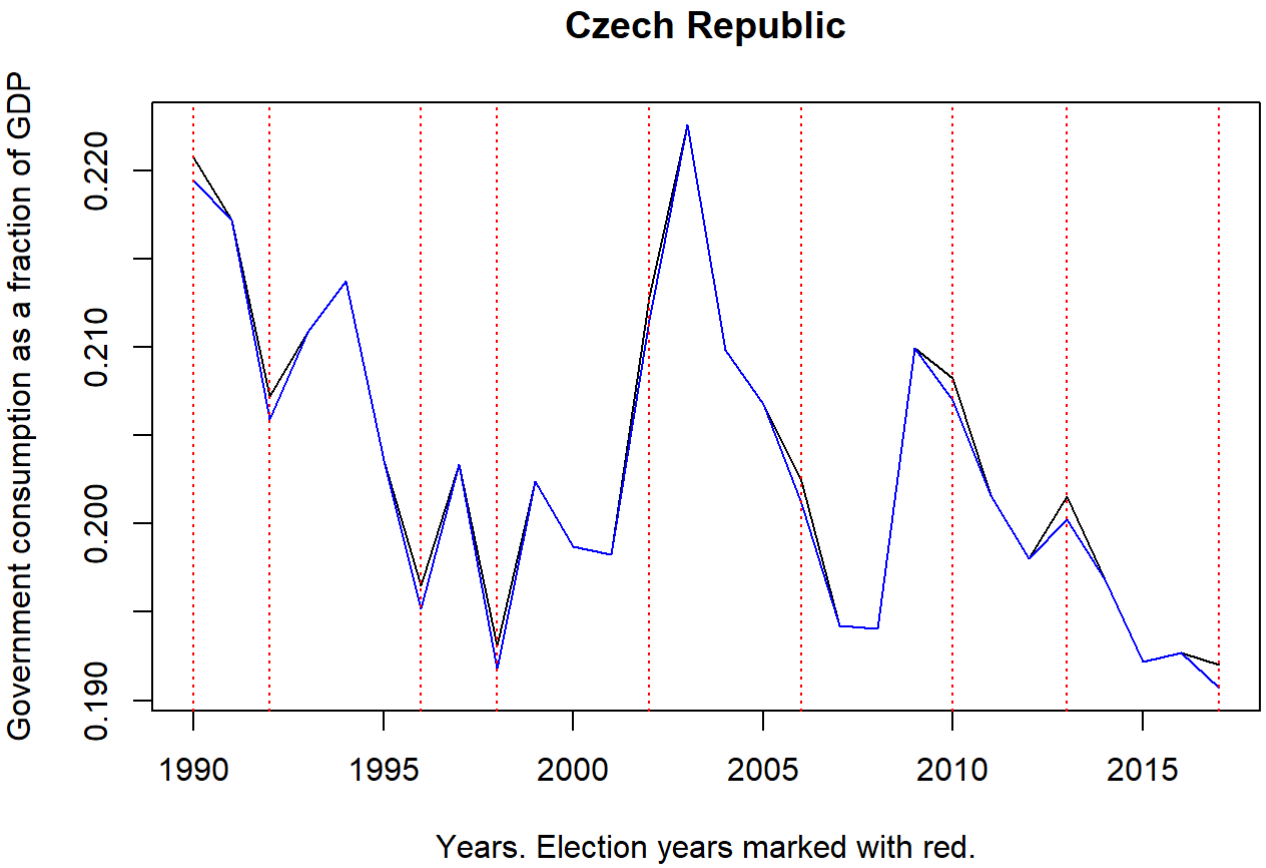

Australia
Government consumption as a fraction of GDP
0.175
0.180
0.185
0.190
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

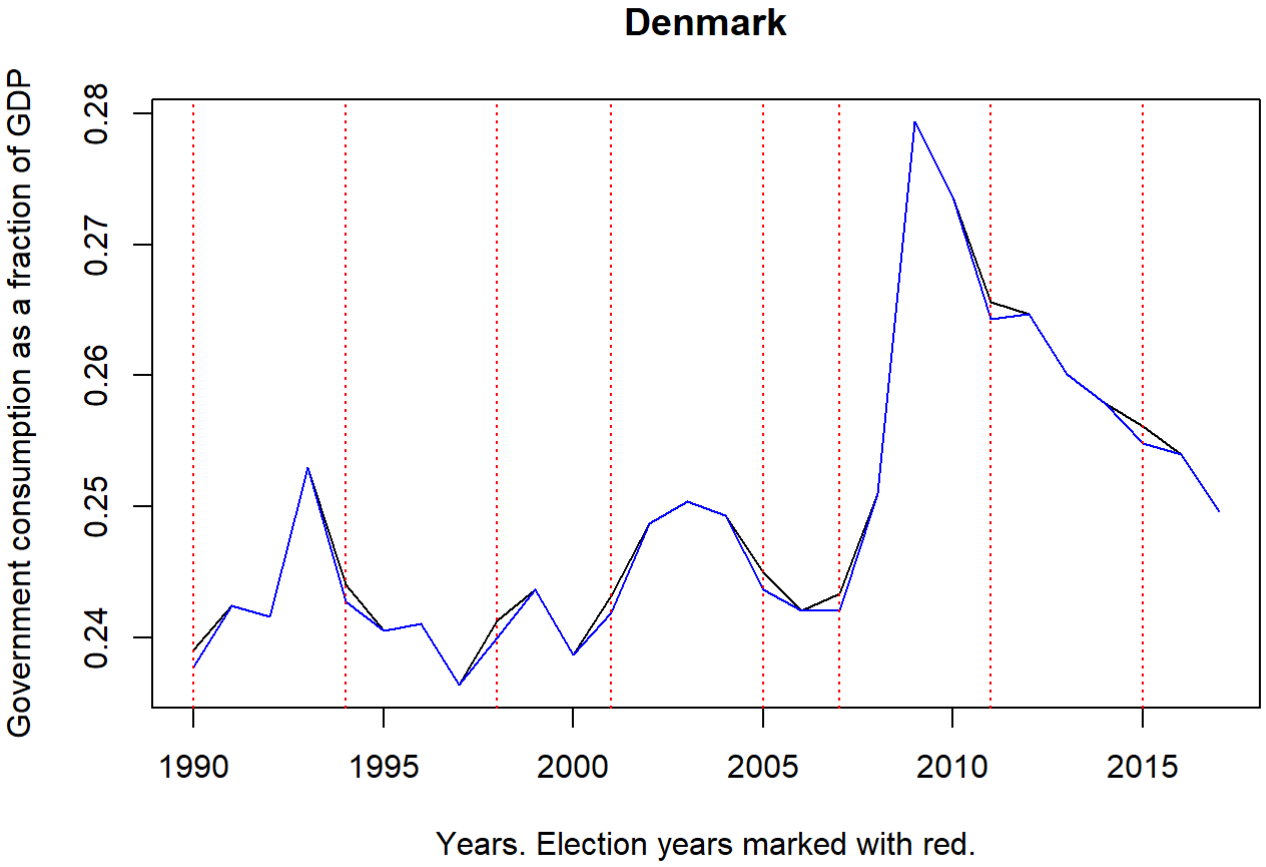

Austria
Government consumption as a fraction of GDP
0.180
0.190
0.200
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

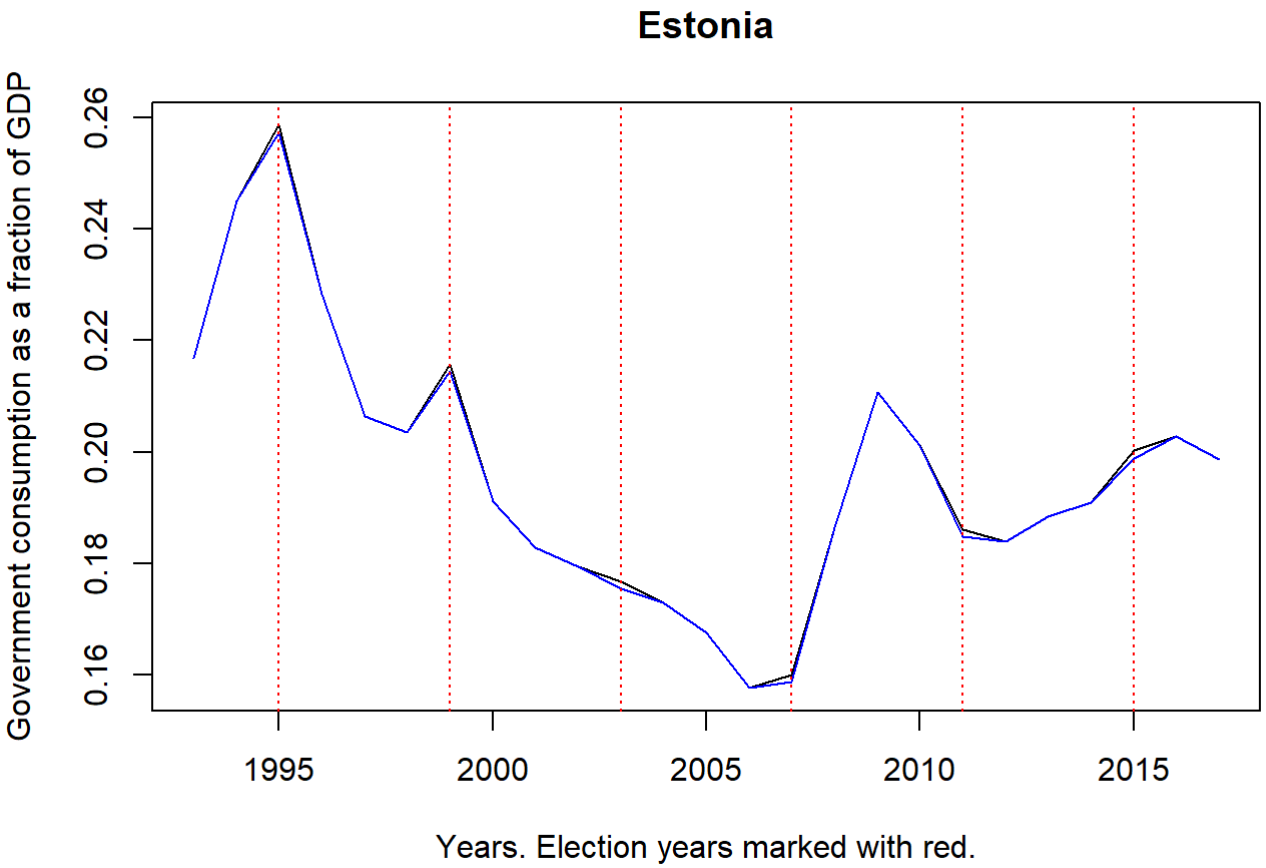

Belgium

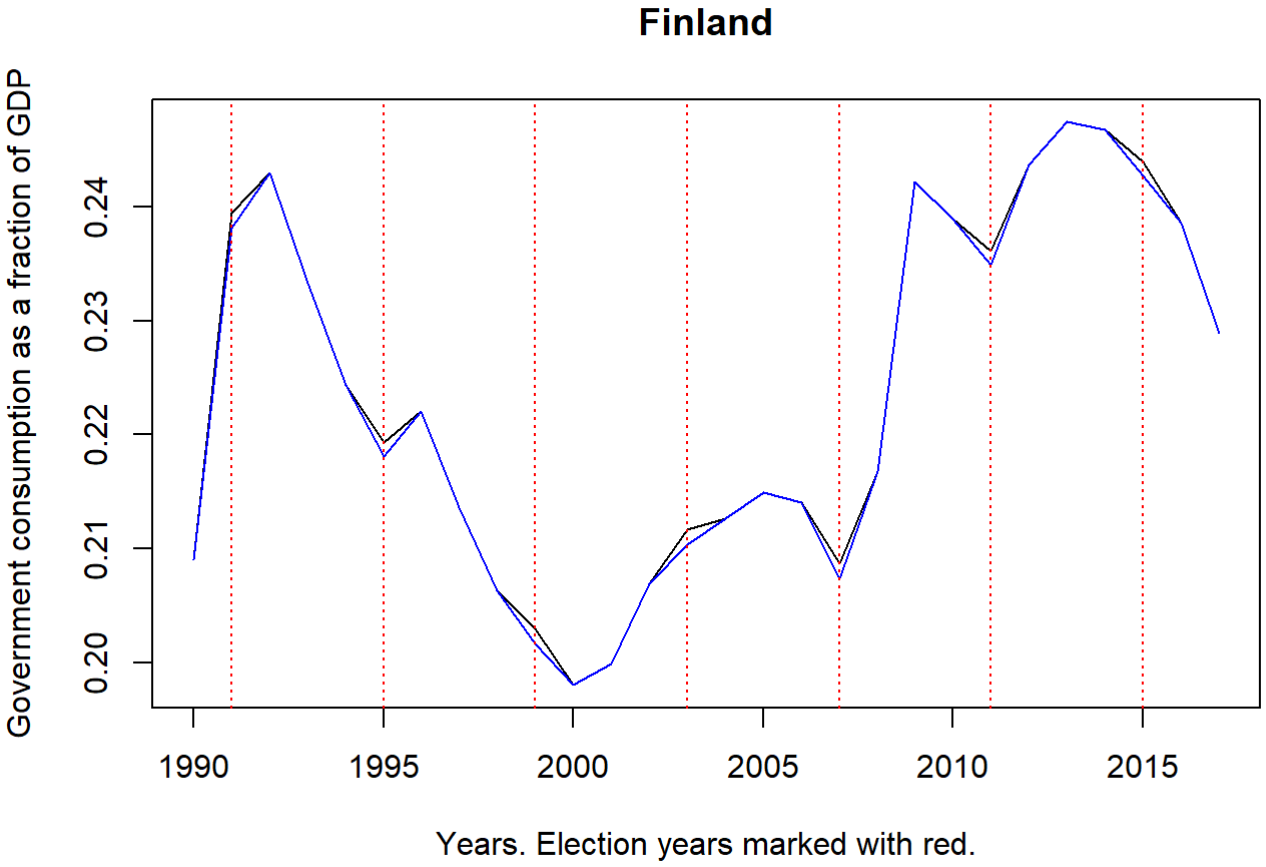

Government consumption as a fraction of G
0.20
0.21
0.22
0.23
0.24
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

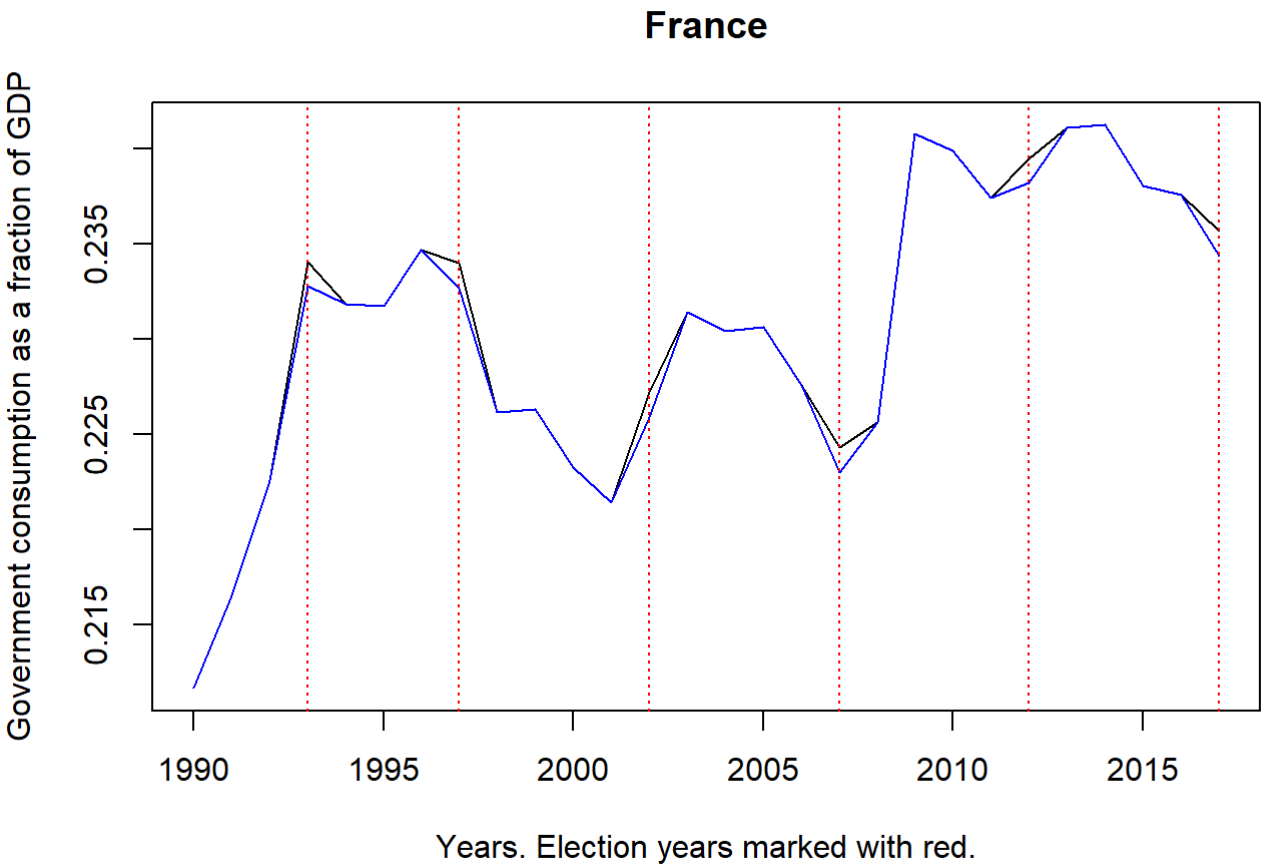

Canada
Government consumption as a fraction of GDP
0.19
0.20
0.21
0.22
0.23
0.24
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

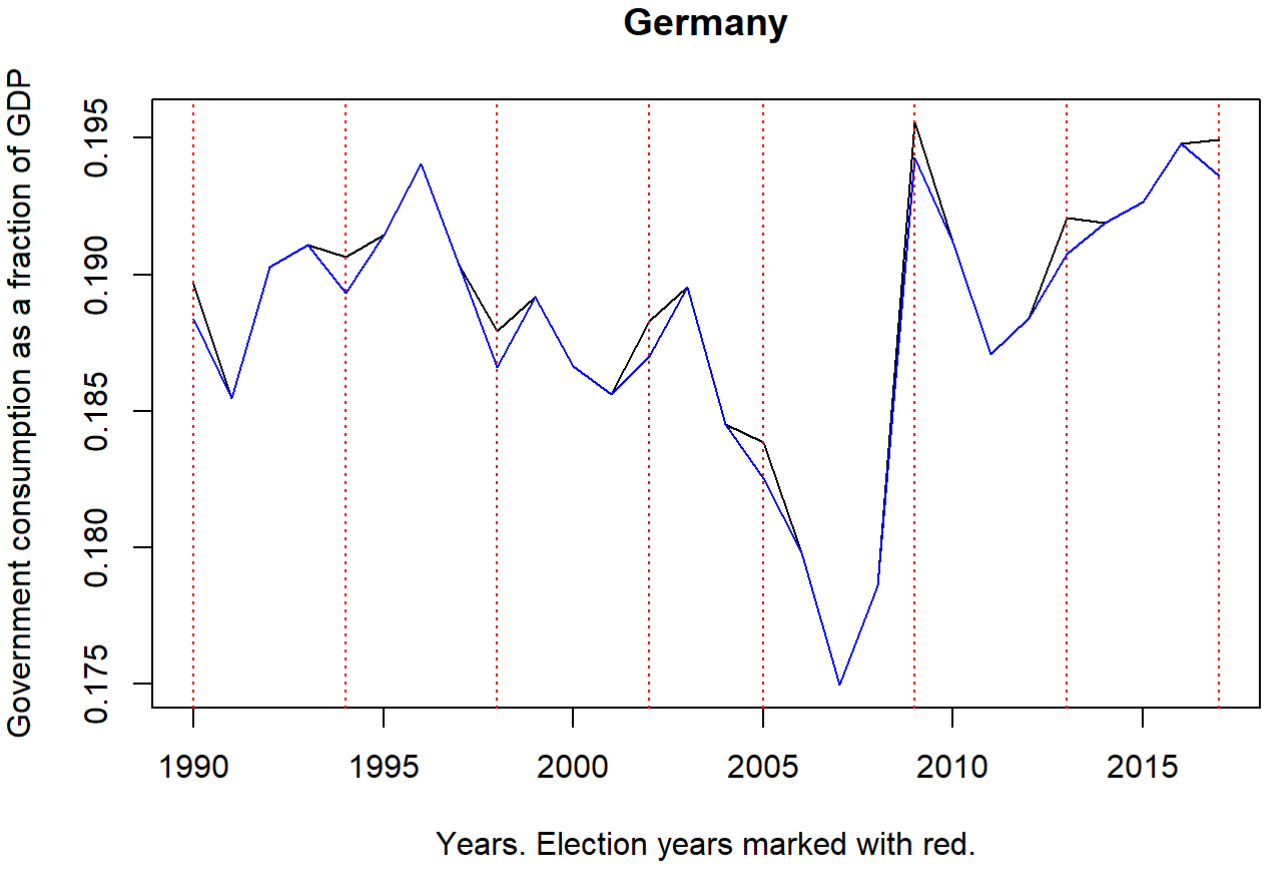

Czech Republic
Government consumption as a fraction of GDP
0.190
0.200
0.210
0.220
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

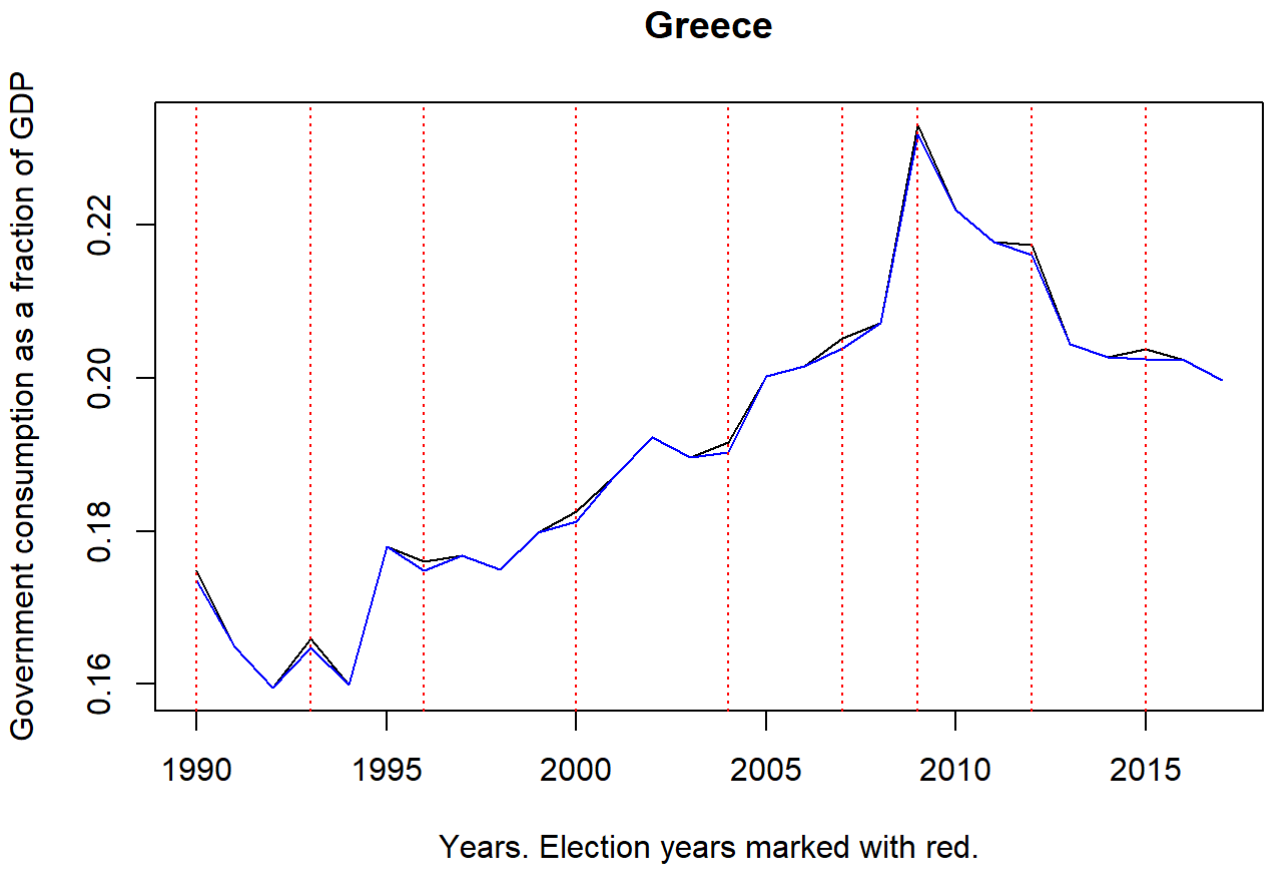

Denmark
Government consumption as a fraction of GDP
0.24
0.25
0.26
0.27
0.28
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

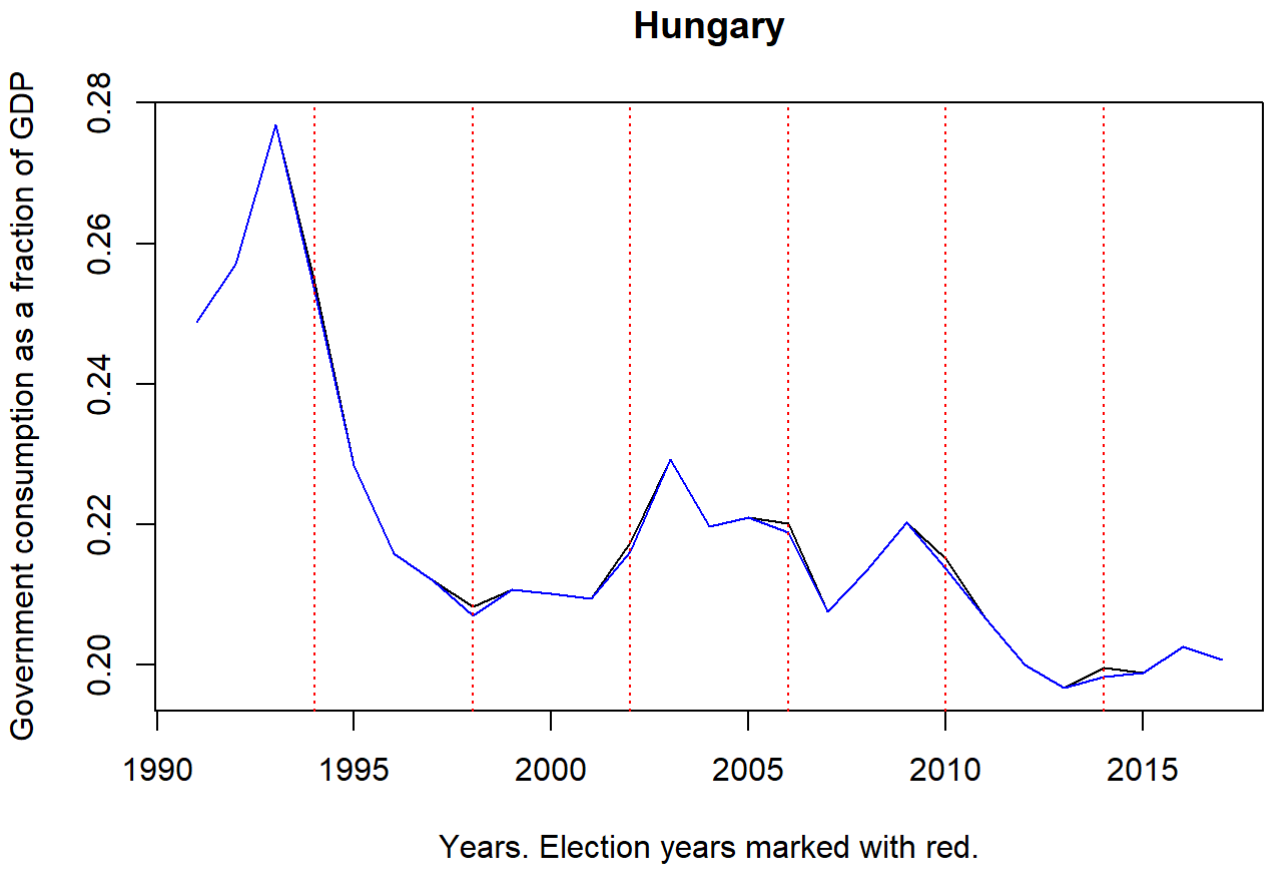

Estonia
Government consumption as a fraction of GDP
0.16
0.18
0.20
0.22
0.24
0.26
1995
2000
2005
2010
2015
Years. Election years marked with red.

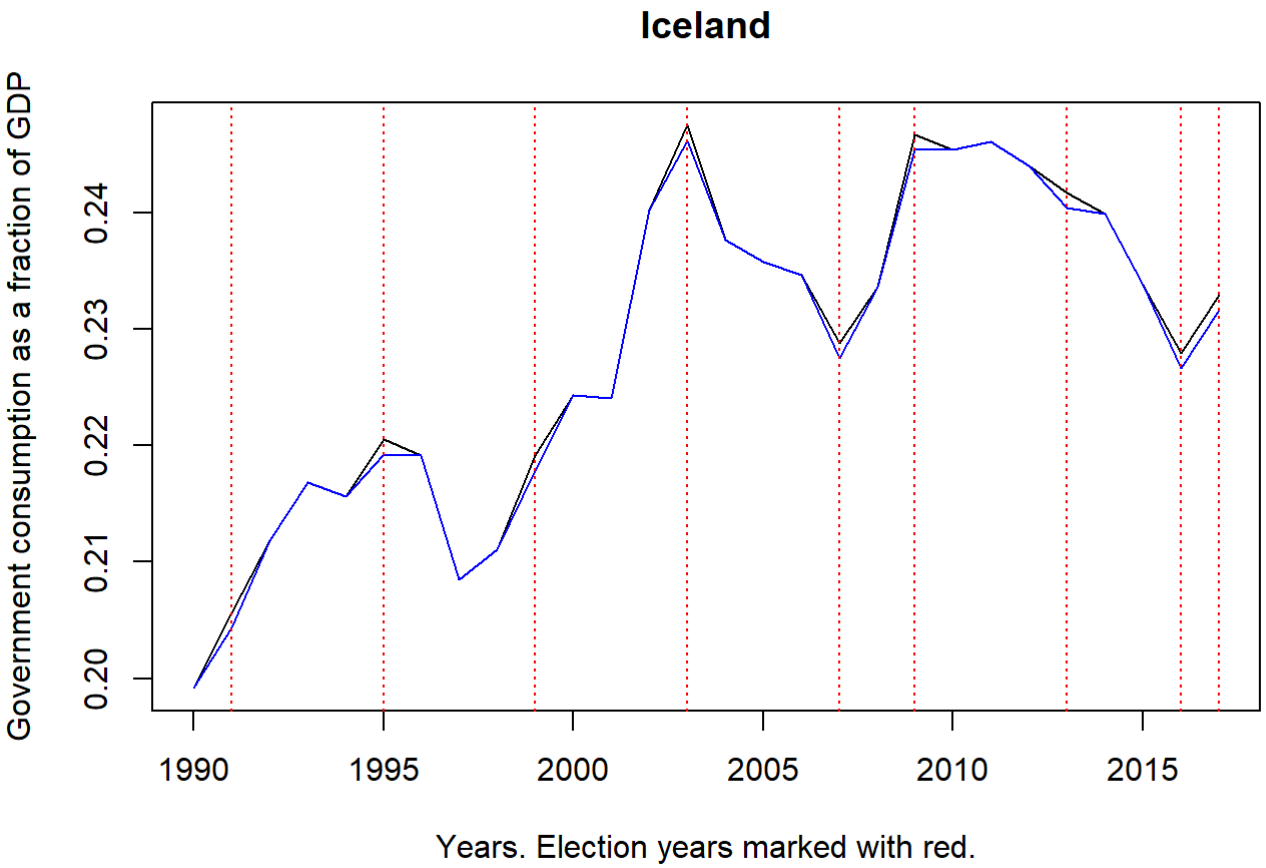

Finland
Government consumption as a fraction of GDP
0.20
0.21
0.22
0.23
0.24
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

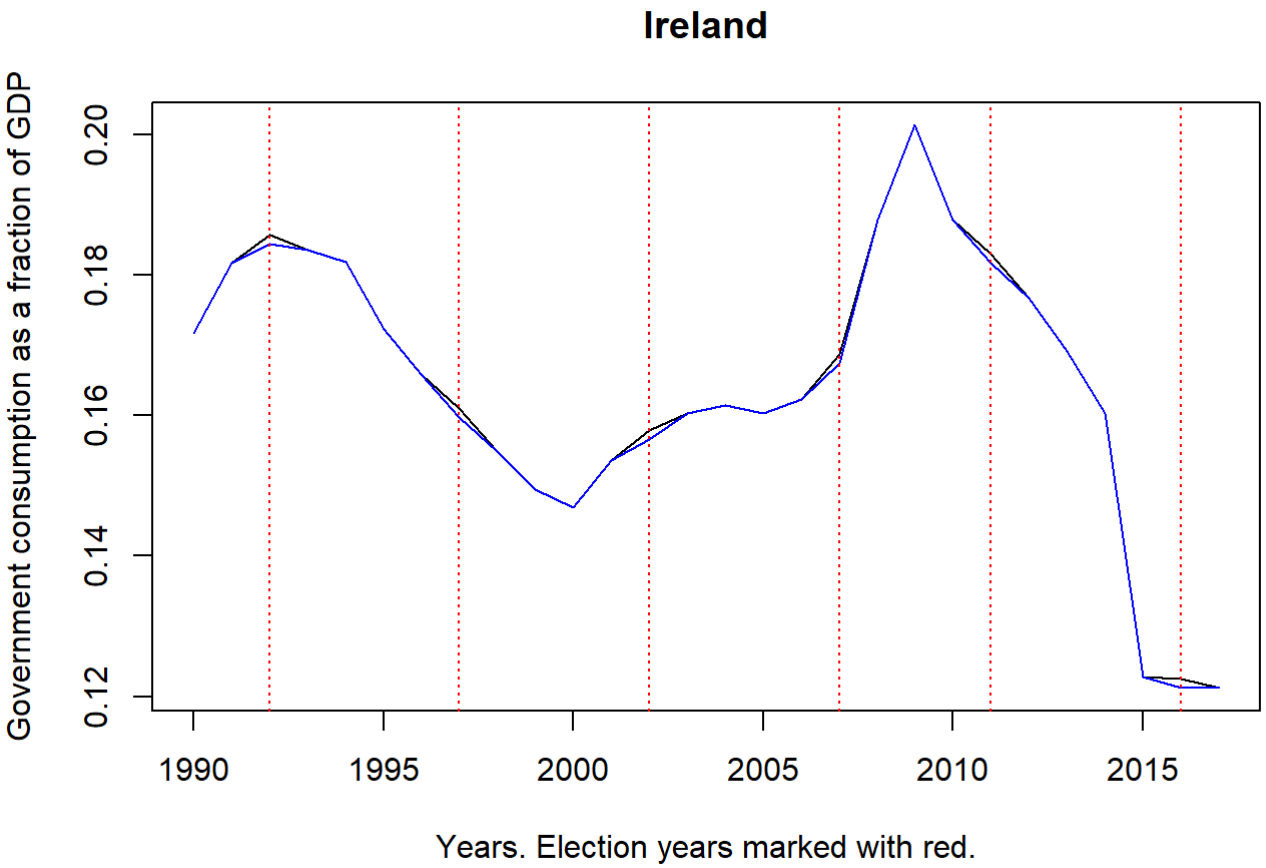

France
Government consumption as a fraction of GDP
0.215
0.225
0.235
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.


Germany
Government consumption as a fraction of GDP
0.175
0.180
0.185
0.190
0.195
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

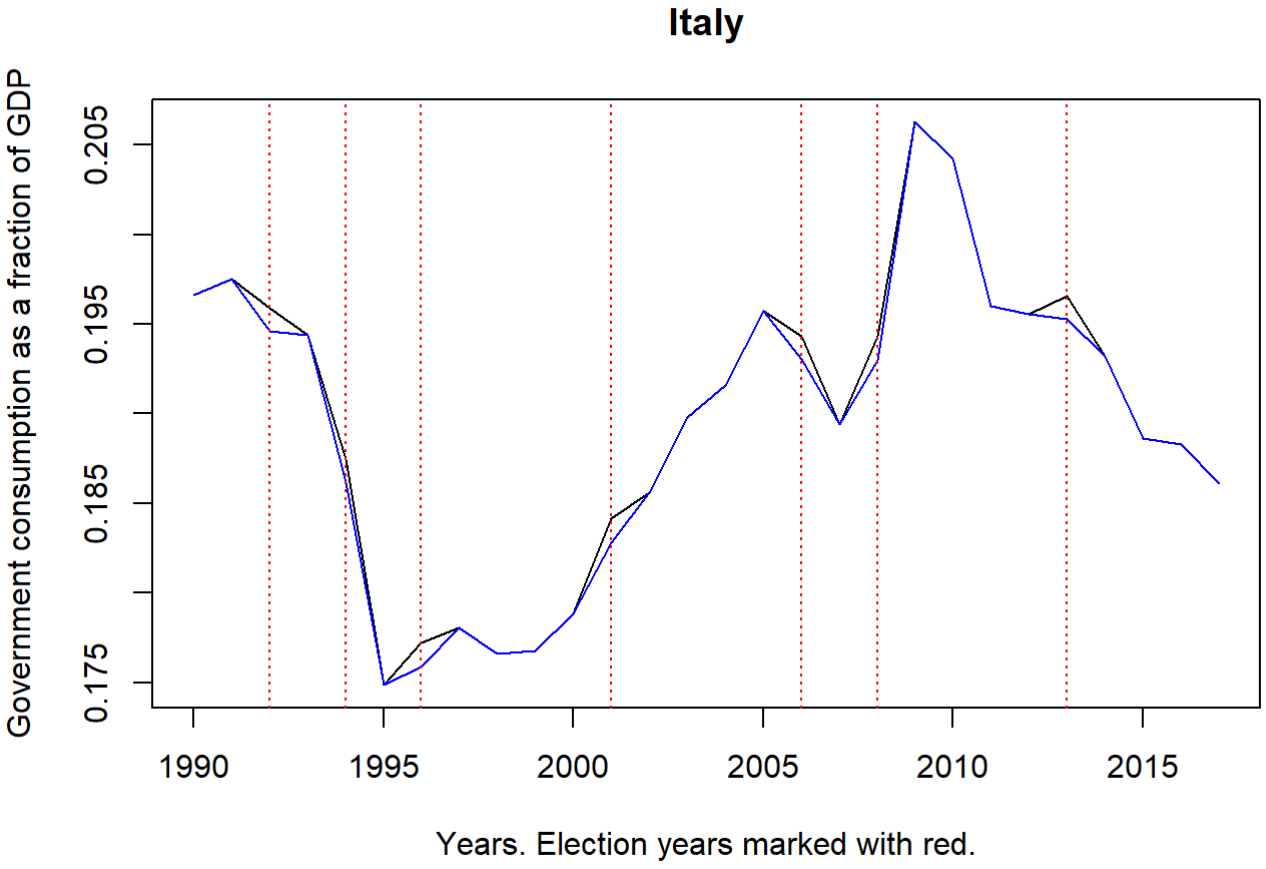

Greece
Government consumption as a fraction of GDP
0.16
0.18
0.20
0.22
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

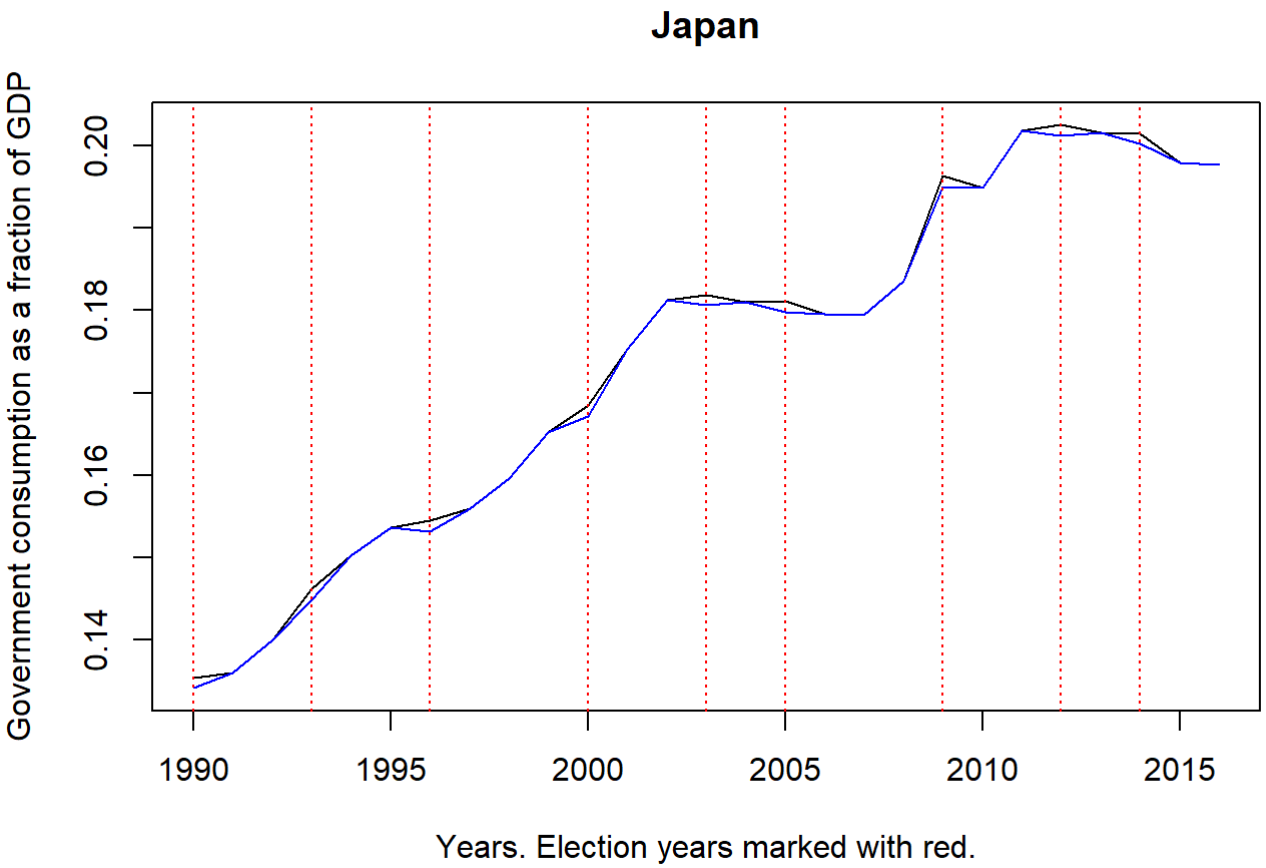

Hungary
Government consumption as a fraction of GDP
0.20
0.22
0.24
0.26
0.28
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

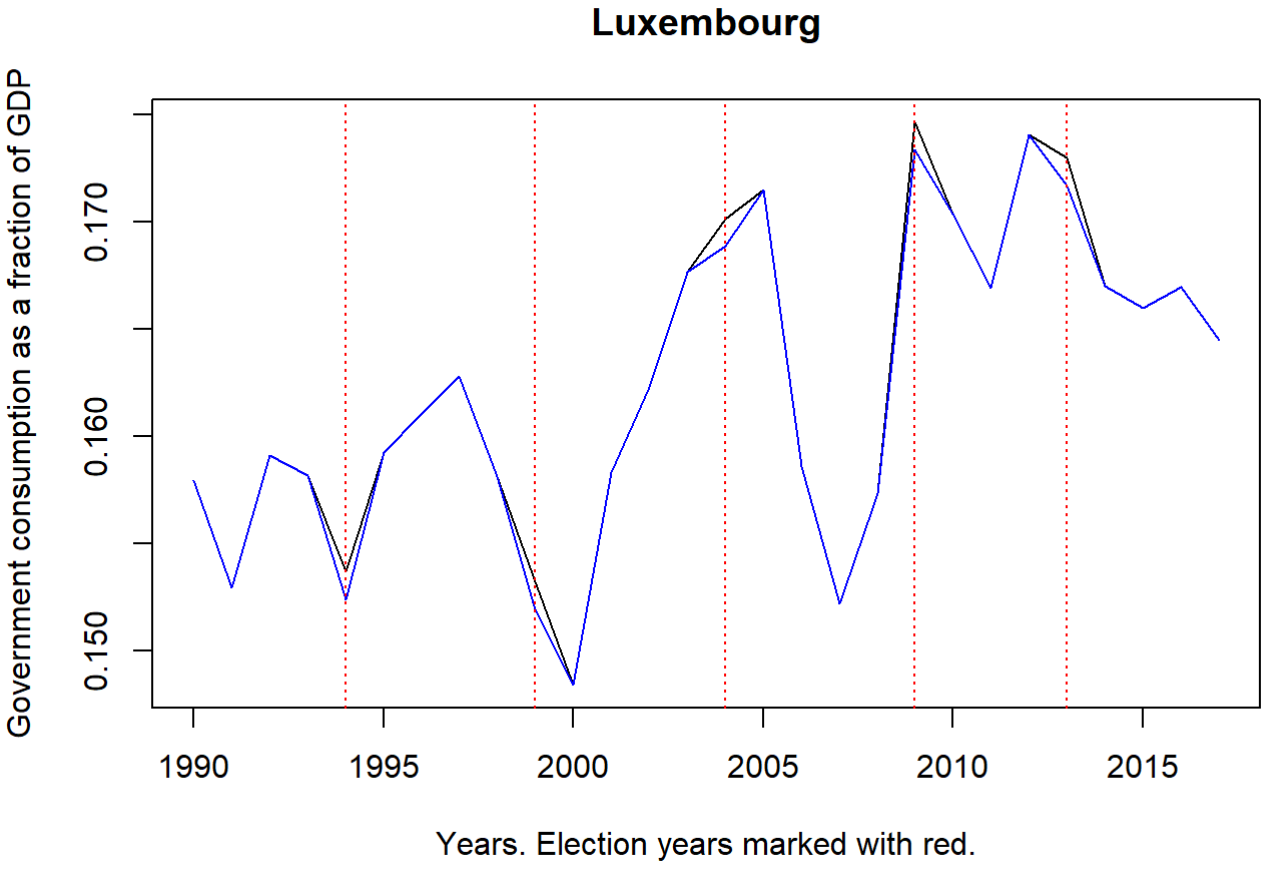

Iceland
Government consumption as a fraction of GDP
0.20
0.21
0.22
0.23
0.24
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

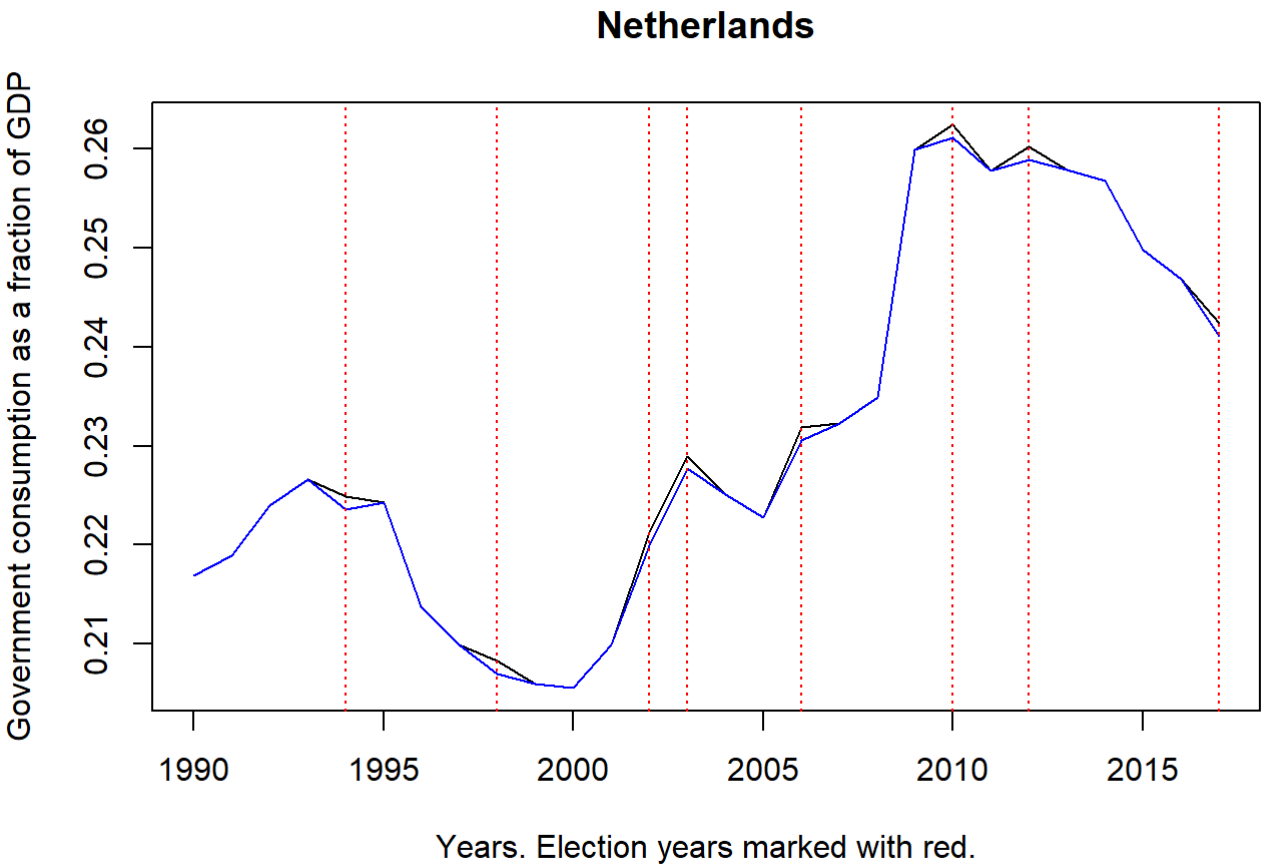

Ireland
Government consumption as a fraction of GDP
0.12
0.14
0.16
0.18
0.20
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

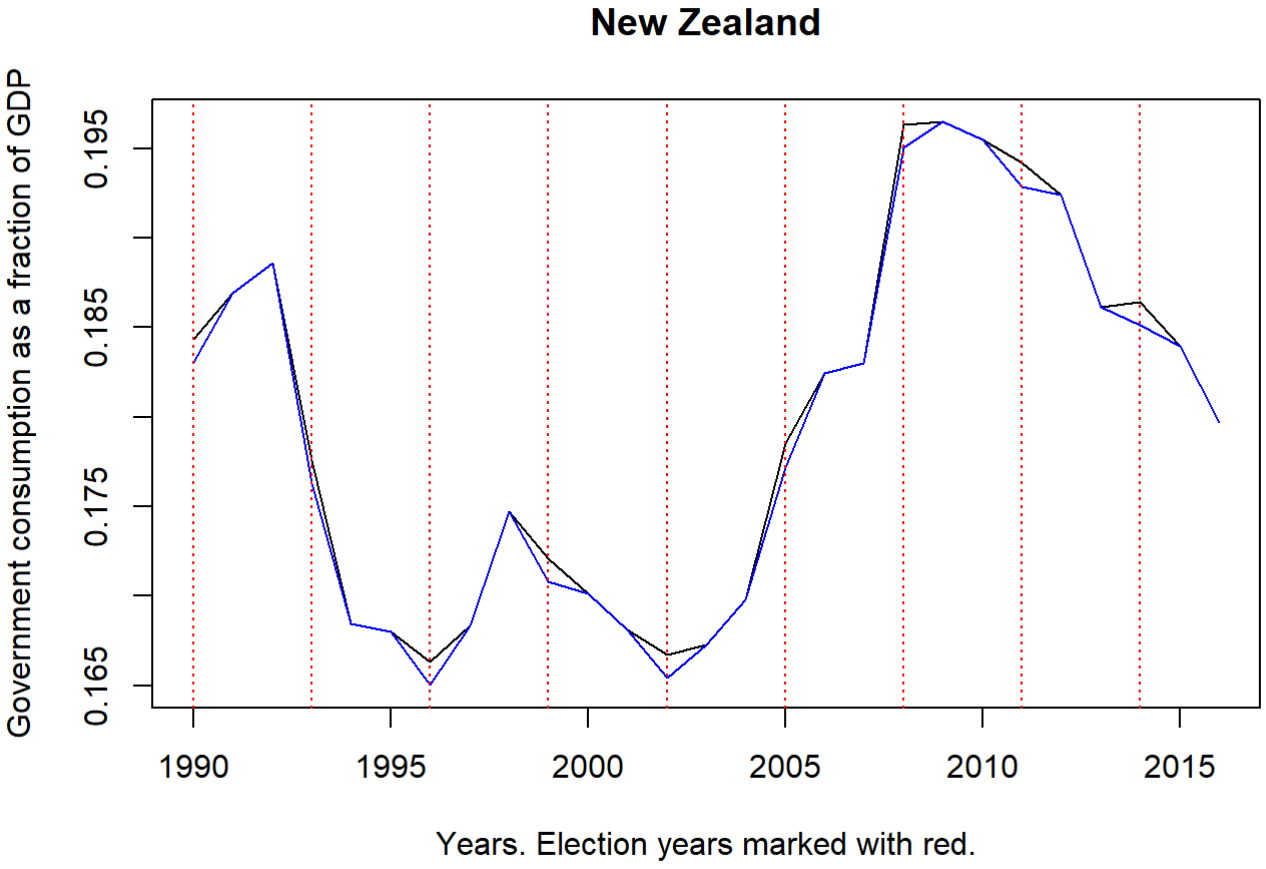

Israel
Government consumption as a fraction of GDP
0.23
0.24
0.25
0.26
0.27
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

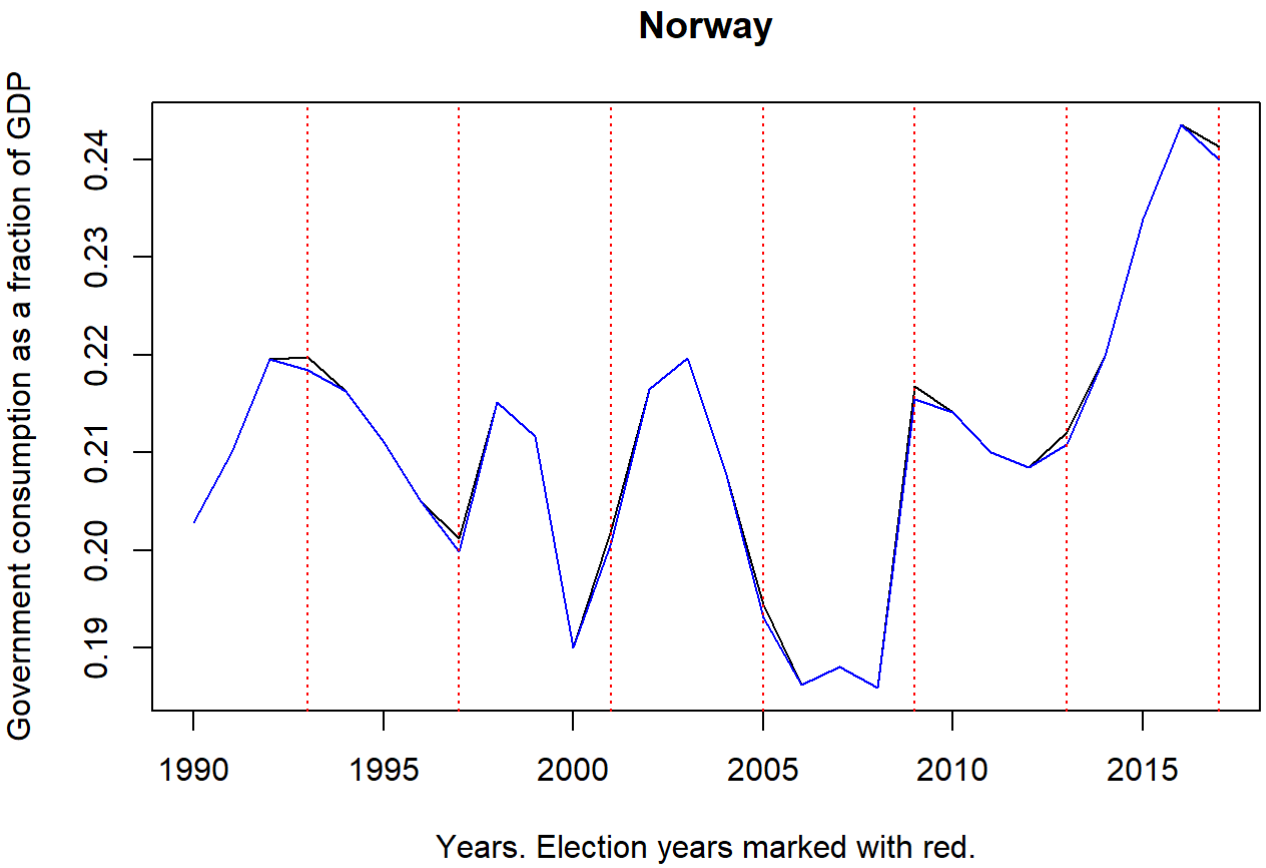

Italy
Government consumption as a fraction of GDP
0.175
0.185
0.195
0.205
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

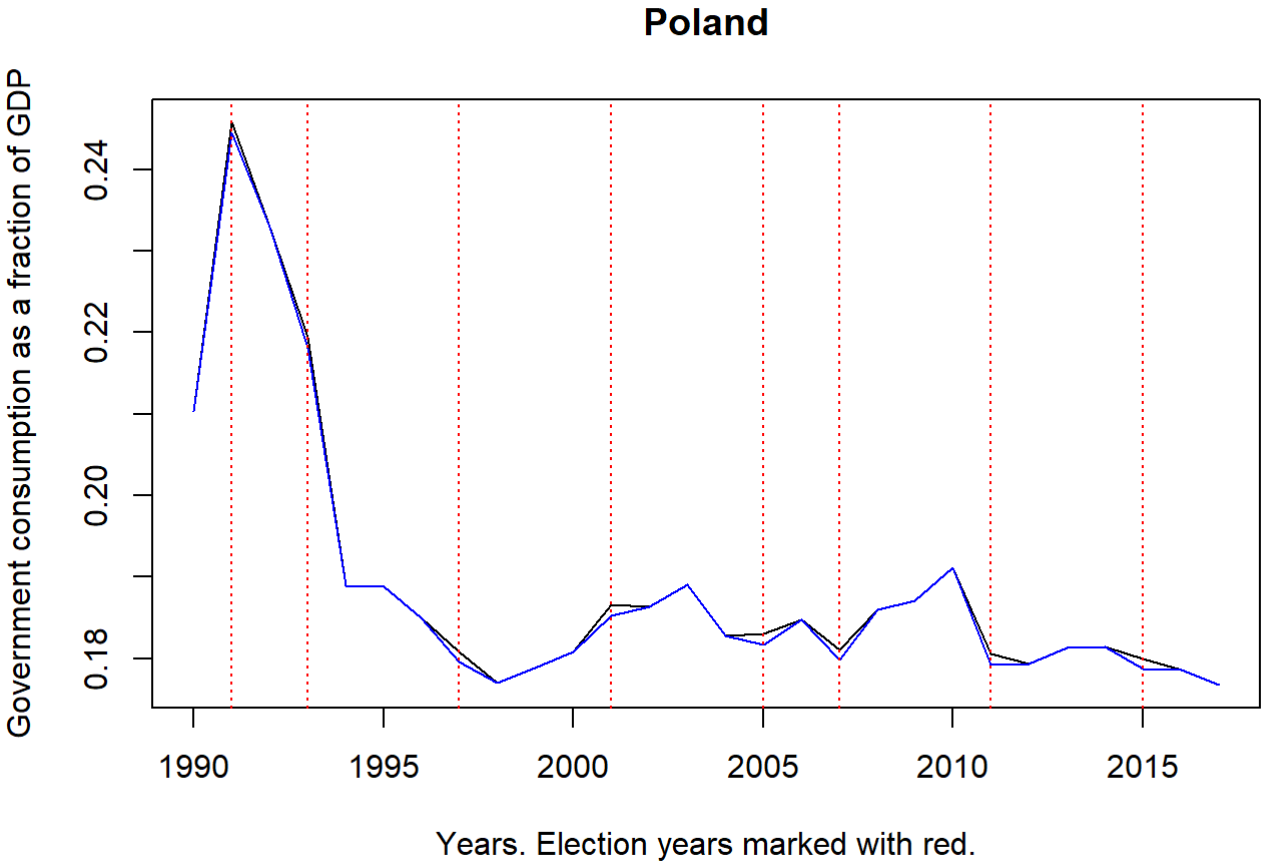

Japan
Government consumption as a fraction of GDP
0.14
0.16
0.18
0.20
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

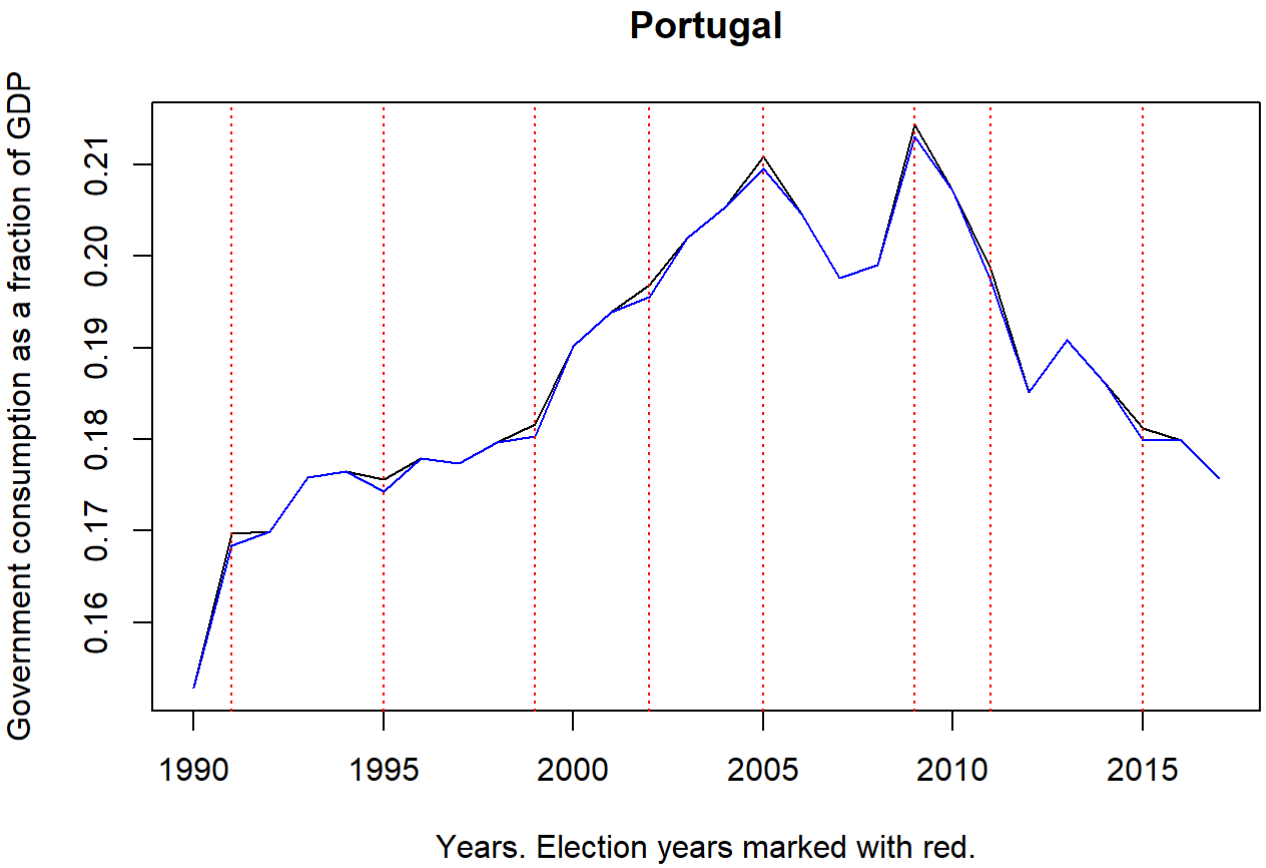

Luxembourg
Government consumption as a fraction of GDP
0.150
0.160
0.170
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

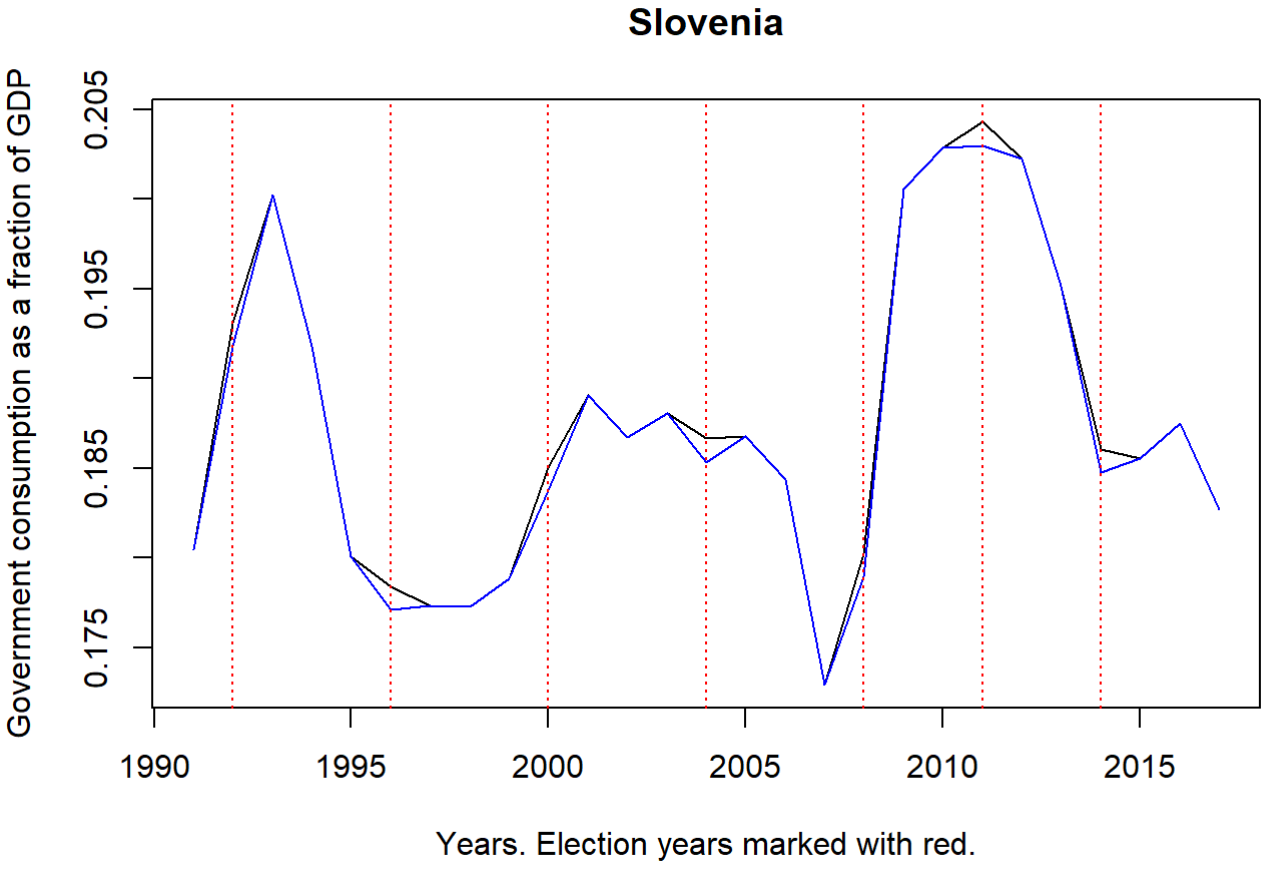

Netherlands
Government consumption as a fraction of GDP
0.21
0.22
0.23
0.24
0.25
0.26
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

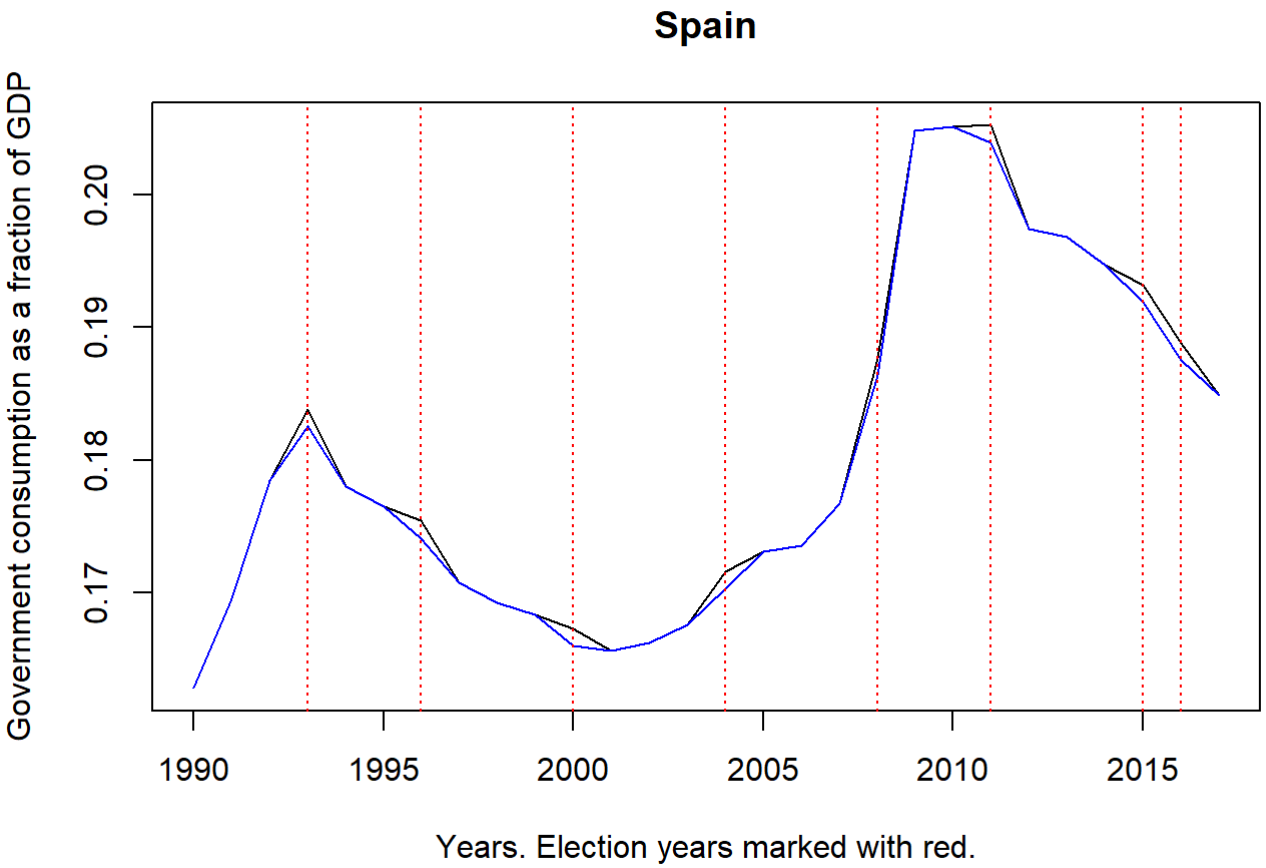

New Zealand
Government consumption as a fraction of GDP
0.165
0.175
0.185
0.195
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

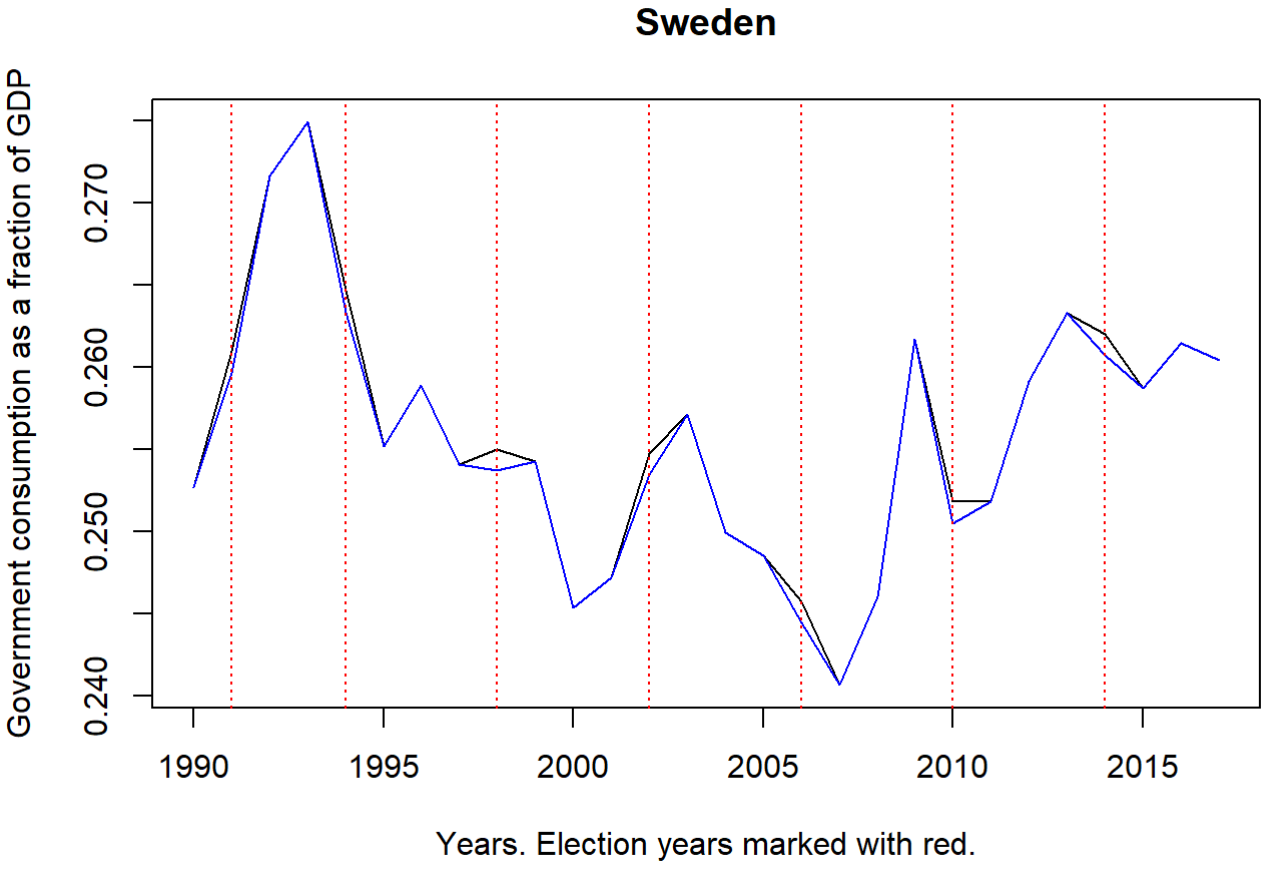

Norway
Government consumption as a fraction of GDP
0.19
0.20
0.21
0.22
0.23
0.24
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

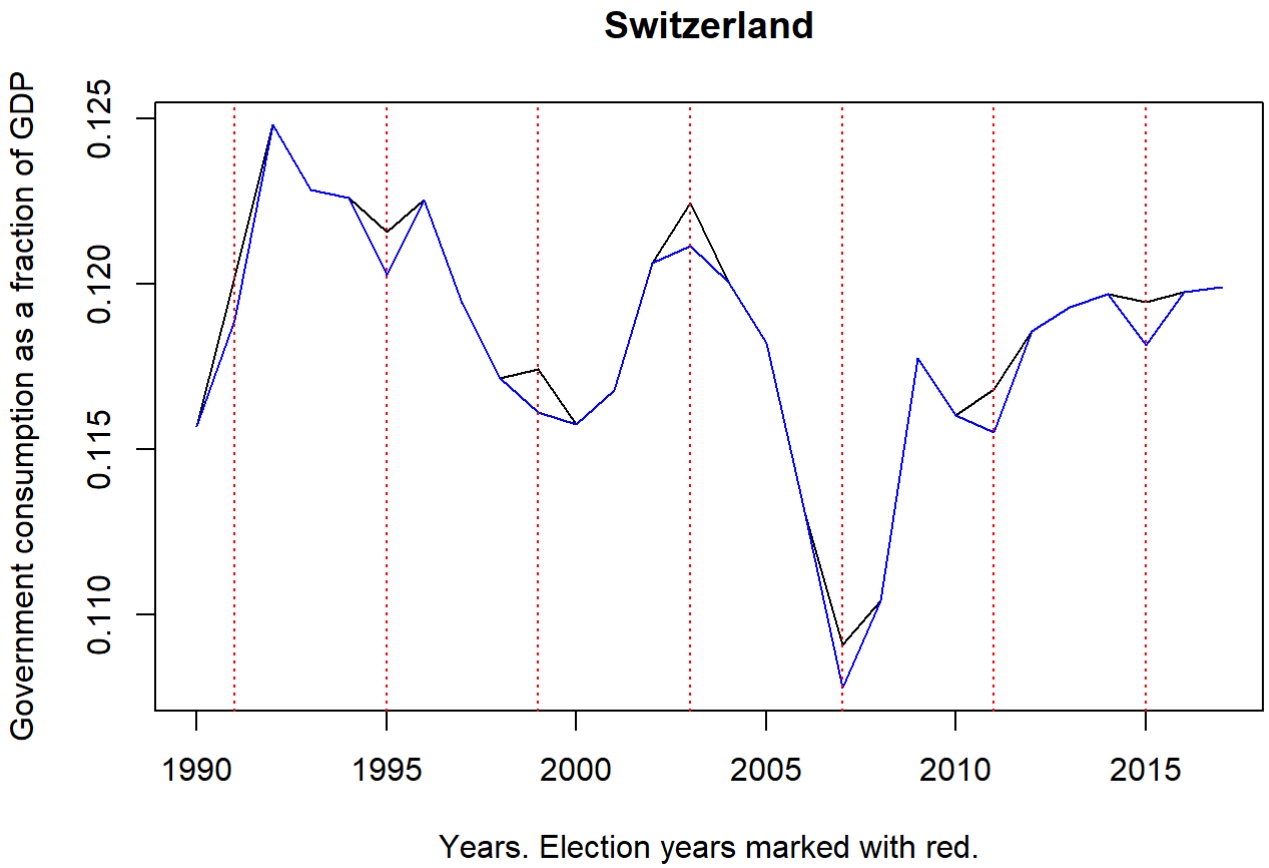

Poland
Government consumption as a fraction of GDP
0.18
0.20
0.22
0.24
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

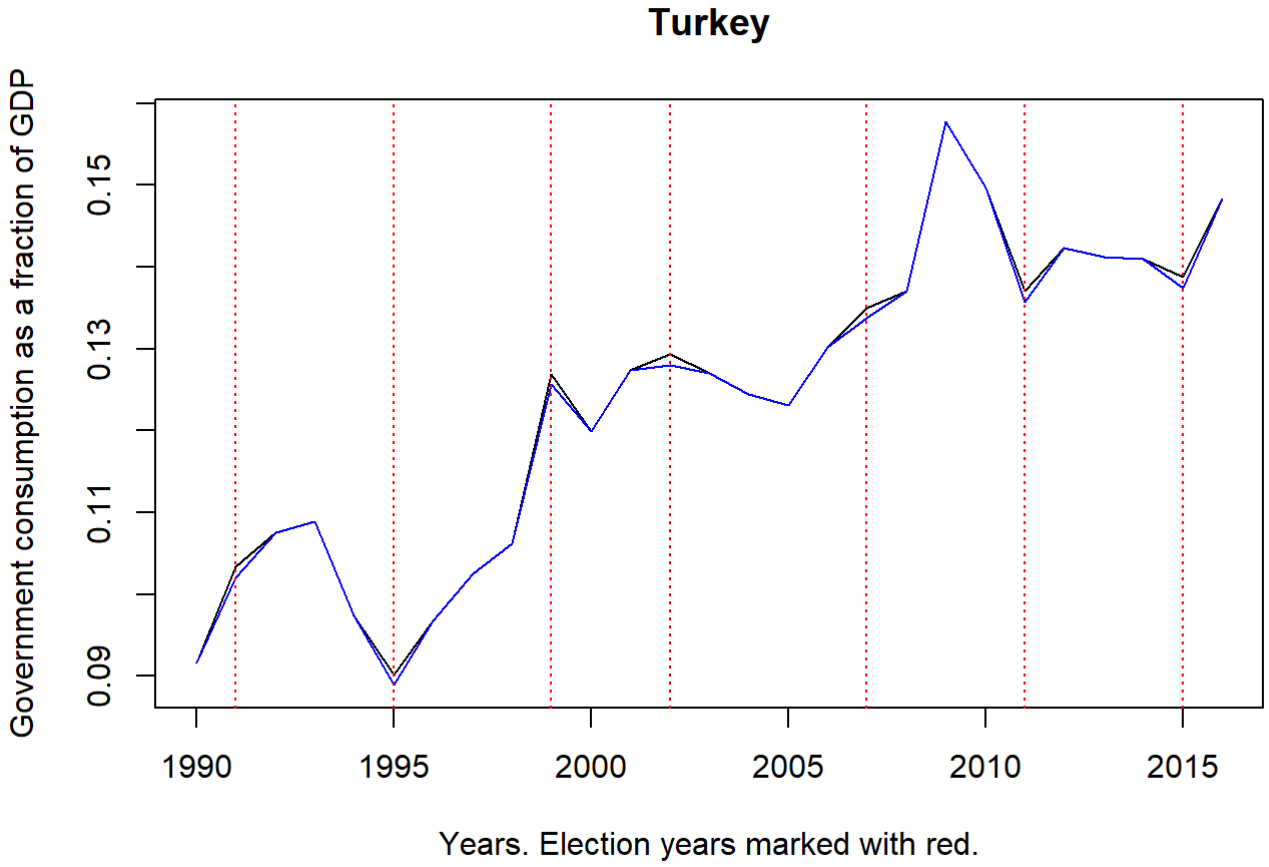

Portugal
Government consumption as a fraction of GDP
0.16
0.17
0.18
0.19
0.20
0.21
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.

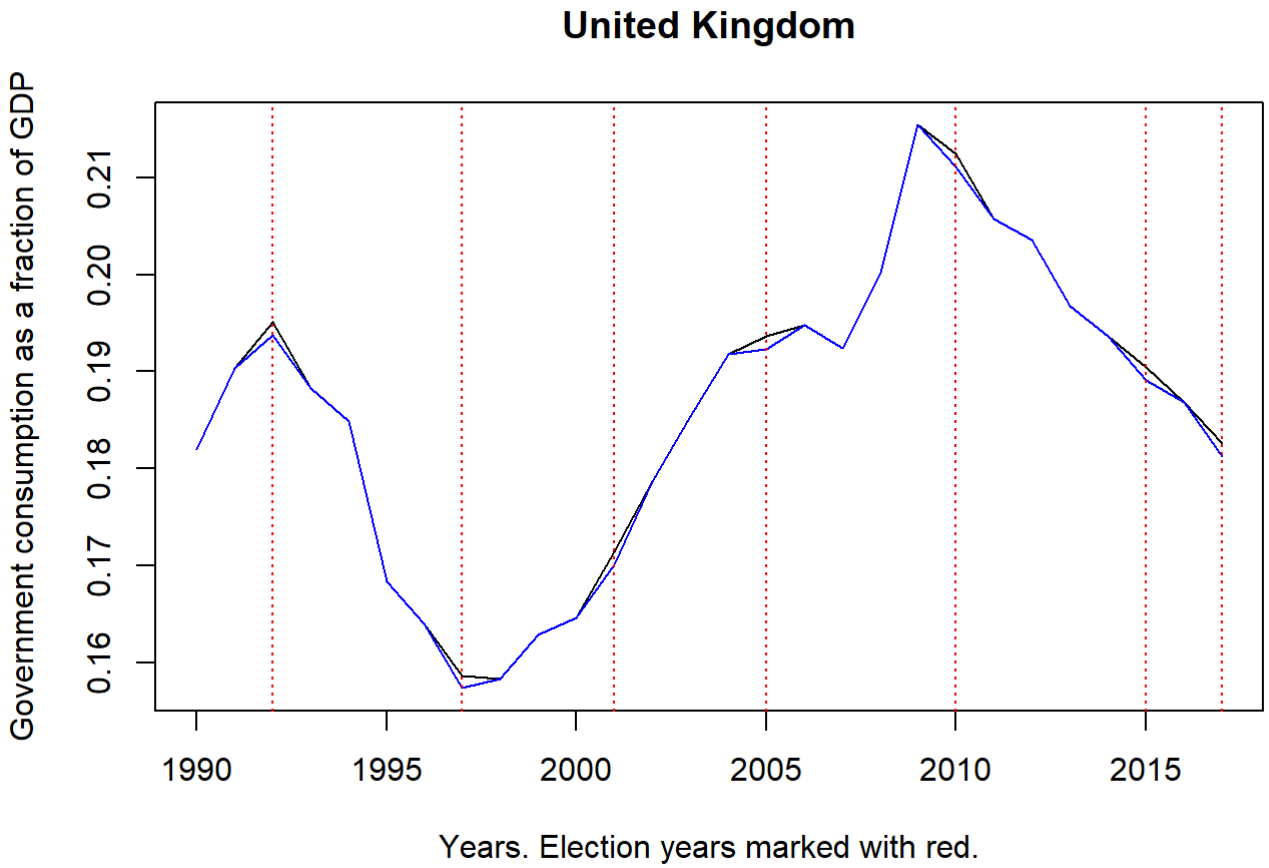

Slovenia
Government consumption as a fraction of GDP
0.175
0.185
0.195
0.205
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.


Spain
Government consumption as a fraction of GDP
0.17
0.18
0.19
0.20
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.


Sweden
Government consumption as a fraction of GDP
0.240
0.250
0.260
0.270
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.


Switzerland
Government consumption as a fraction of GDP
0.110
0.115
0.120
0.125
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.


Turkey
Government consumption as a fraction of GDP
0.09
0.11
0.13
0.15
1990
1995
2000
2005
2010
2015
Years. Election years marked with red.



Appendix A: R-hints

A few hints for panel data calculations in R. Assuming you have a dataset `dataframe` in memory, with variable `I` denoting *units* and `T` denoting *time*, you can create panel dataframe called `p_df` using:

```
library(plm)

p_df <- pdata.frame(dataframe, index = c("I","T"))
```

In addition to `I` and `T`, there is a variable `y` in the dataset

```
colnames(p_df)
```

```
## [1] "I" "T" "y"
```

If we want to create a new variable, which is the *difference* between $\texttt{y}_{i,t}$ and $\texttt{y}_{i,t-1}$, we can create this using the $lag()$-function in the plm-package:

```
p_df$x = p_df$y-lag(p_df$y)
```

References

Efthyvoulou, Georgios. “Political Budget Cycles in the European Union and the Impact of Political Pressures: A dynamic panel regression analysis.” (2010).

Efthyvoulou, Georgios. “Political budget cycles in the European Union and the impact of political pressures.” Public Choice 153.3-4 (2012): 295-327.