# HW#8

Farzan Karimi-Malekabadi

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```
library(ggplot2)  # for plots
library(magrittr)  # for `%>%` operator
library(here)
library(readxl)  # for reading excel files
library(modelsummary)  # for summarizing data
library(rstan)
rstan_options(auto_write = TRUE)  # save compiled STAN object
options(mc.cores = 2)  # use two cores
library(posterior)
library(bayesplot)
theme_set(theme_classic() +
    theme(panel.grid.major.y = element_line(color = "grey92")))
library(psych)
library(tidyverse)
library(readr)
library(lmerTest)
library(brms)
```

# Research Question

> Can endorsement of six moral values predict the collective nostalgia proneness across 19 different cultures?

# Variables

- `profevaluation` : evaluation rating of the instructor: 1 (very unsatisfactory) to 5 (excellent)
- `nonenglish` : 1 = non-native English speakers, 0 = native-English speakers

## Import Data

```
nos_source_d = read_csv("19 cultures.csv")

nos_d = nos_source_d %>% select(
                        CARE_tot,EQUALITY_tot,
                        PROPORTIONALITY_tot,
                        LOYALTY_tot,AUTHORITY_tot,
                        PURITY_tot,Nostalgia,
                        porient_1,age,religiosity_1,
                        starts_with(c("CoNos")),country
                        )%>%
                         mutate(
                        C_Nostalgia = ((CoNos1+CoNos2+CoNos3+CoNos4)/4),
                        moral_Ind = (CARE_tot+EQUALITY_tot+PROPORTIONALITY_tot)/3,
                        moral_Group = (LOYALTY_tot+AUTHORITY_tot+PURITY_tot)/3,
                        mean_Care = mean(CARE_tot),
                        mean_Equality = mean(EQUALITY_tot),
                        mean_Propotionality = mean(PROPORTIONALITY_tot),
                        mean_Loyalty = mean(LOYALTY_tot),
                        mean_Authority = mean(AUTHORITY_tot),
                        mean_Purity = mean(PURITY_tot),
                        mean_Age = mean(age,na.rm=TRUE),
                        mean_P_Nostalgia = mean(Nostalgia,na.rm=TRUE)
                        ) %>%
                        rename(
                        Care = CARE_tot,
                        Equality = EQUALITY_tot,
                        Propotionality = PROPORTIONALITY_tot,
                        Loyalty = LOYALTY_tot,
                        Authority = AUTHORITY_tot,
                        Purity = PURITY_tot,
                        P_Nostalgia = Nostalgia,
                        Religiosity = religiosity_1,
                        Conservatism = porient_1,
                        Age = age
                        )
```

# Variable Summary

```
#Sample size in each country
 count(nos_d, country)
```

```
## # A tibble: 19 x 2
##    country          n
##    <chr>        <int>
##  1 Argentina      205
##  2 Belgium        205
##  3 Chile          205
##  4 Columbia       205
##  5 Egypt          205
##  6 France         206
##  7 Ireland        205
##  8 Japan          207
##  9 Kenya          205
## 10 Mexico         206
## 11 Morocco        205
## 12 New Zealand    205
## 13 Nigeria        205
## 14 Peru           205
## 15 Russia         206
## 16 Saudi Arabia   207
## 17 South Africa   205
## 18 Switzerland    205
## 19 UAE            205
```

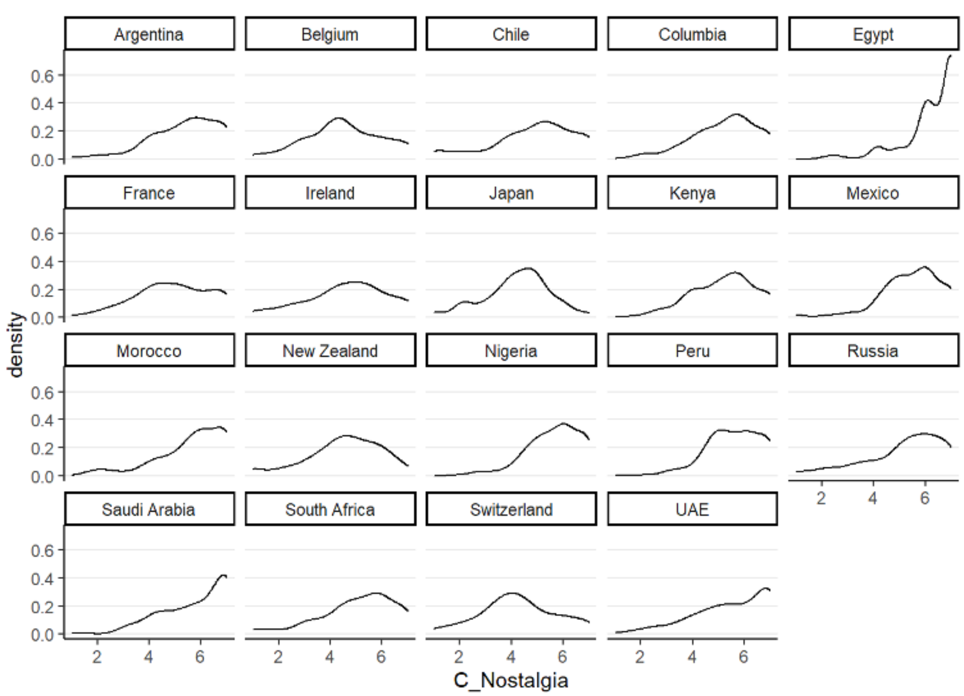
```
#summarizing data in each country

nos_d %>%
  group_by(country) %>%
  summarise(mean = mean(C_Nostalgia, na.rm = T),
            SD = sd(C_Nostalgia, na.rm = T),
            Min = min(C_Nostalgia, na.rm = T),
             Max = max(C_Nostalgia, na.rm = T),
           )%>%
  mutate_if(is.numeric, ~round(., 2)) %>%
  print(n = 50)
```

```
## # A tibble: 19 x 5
##    country       mean    SD   Min   Max
##    <chr>        <dbl> <dbl> <dbl> <dbl>
##  1 Argentina     5.37  1.32  1        7
##  2 Belgium       4.51  1.48  1        7
##  3 Chile         4.85  1.63  1        7
##  4 Columbia      5.24  1.29  1        7
##  5 Egypt         6.19  1.04  2        7
##  6 France        4.89  1.44  1        7
##  7 Ireland       4.61  1.57  1        7
##  8 Japan         4.21  1.29  1        7
##  9 Kenya         5.19  1.24  1.25     7
## 10 Mexico        5.45  1.18  1        7
## 11 Morocco       5.63  1.33  1.5      7
## 12 New Zealand   4.54  1.43  1        7
## 13 Nigeria       5.64  1.04  2        7
## 14 Peru          5.57  1.08  1        7
## 15 Russia        5.2   1.53  1        7
## 16 Saudi Arabia  5.77  1.28  1        7
## 17 South Africa  5.07  1.44  1        7
## 18 Switzerland   4.26  1.47  1        7
## 19 UAE           5.47  1.45  1        7
```

```
# look at distribution by country
nos_d %>%
  ggplot(aes(C_Nostalgia)) +
  geom_density() +
  facet_wrap(~country)
```

```
## Warning: Removed 5 rows containing non-finite values (stat_density).
```



# Model

Let $Y$ = profevaluation, $G$ = nonenglish

Model: $$

$$\begin{aligned}
\text{Individual level:}& \\
\texttt{C_Nostalgia}_{ij} &\sim \mathcal{N}(\mu_{ij}, \sigma) \\
\mu_{ij} &= \\
\beta_{0j}+& \\
\beta_{1j}\texttt{Care}_{ij}+& \\
\beta_{2j}\texttt{Equality}_{ij}+& \\
\beta_{3j}\texttt{Propotionality}_{ij}+& \\
\beta_{4j}\texttt{Loyalty}_{ij}+& \\
\beta_{5j}\texttt{Authority}_{ij}+& \\
\beta_{6j}\texttt{Purity}_{ij}+& \\
\beta_{7j}\texttt{P_Nostalgia}_{ij}+& \\
\beta_{8j}\texttt{Religiosity}_{ij}+& \\
\beta_{9j}\texttt{Conservatism}_{ij}+& \\
\beta_{10j}\texttt{Age}_{ij}& \\
\text{County level:}& \\
\beta_{0j} &\sim \mathcal{N}(\mu^{[\beta_0]}, \tau^{[\beta_0]})
\end{aligned}$$

$$

Prior:

# Running brms

We used 4 chains, each with 4,000 iterations (first 2,000 as warm-ups).

```
m1_fit=readRDS(file = "my_data.rds")
summary(m1_fit)
```

```
##  Family: gaussian
##   Links: mu = identity; sigma = identity
## Formula: C_Nostalgia ~ 1 + Care + Equality + Propotionality + Loyalty + Authority + Purity + +Conservatism + P_Nostalgia
+ Age + mean_Care + mean_Equality + mean_Propotionality + mean_Loyalty + mean_Authority + mean_Purity + mean_P_Nostalgia + m
ean_Age + (1 | country)
##    Data: nos_d (Number of observations: 3680)
##   Draws: 4 chains, each with iter = 4000; warmup = 2000; thin = 1;
##          total post-warmup draws = 8000
##
## Group-Level Effects:
## ~country (Number of levels: 19)
##               Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sd(Intercept)     0.31      0.06     0.22     0.45 1.00     1409     2633
##
## Population-Level Effects:
##                                Estimate            Est.Error
## Intercept           -6135891535363441.00 19943302765414832.00
## Care                               -0.04                 0.03
## Equality                            0.04                 0.02
## Propotionality                     -0.03                 0.03
## Loyalty                             0.29                 0.03
## Authority                           0.40                 0.04
## Purity                              0.12                 0.03
## Conservatism                        0.03                 0.01
## P_Nostalgia                         0.38                 0.01
## Age                                -0.00                 0.00
## mean_Care             141822435261972.25   672806573107786.25
## mean_Equality         -23213199303772.18   972574992923735.12
## mean_Propotionality  -474237305644288.75  1162882006414636.50
## mean_Loyalty         1339716146715075.00  1613066160319512.50
## mean_Authority         -7371477570737.66  2615706639725024.50
## mean_Purity          -418348078510432.81  1201839504116819.50
## mean_P_Nostalgia      500576617974214.69   489885350392581.56
## mean_Age               43267138560574.63   197410202130227.88
##                                 l-95% CI             u-95% CI Rhat Bulk_ESS
## Intercept           -45020159827702688.00 25198860588418864.00 2.43        5
## Care                               -0.10                 0.02 1.00     8433
## Equality                           -0.00                 0.08 1.00     7846
## Propotionality                     -0.09                 0.04 1.00     7602
## Loyalty                             0.23                 0.35 1.00     6422
## Authority                           0.33                 0.48 1.00     5769
## Purity                              0.06                 0.17 1.00     7019
## Conservatism                        0.01                 0.04 1.00     9738
## P_Nostalgia                         0.35                 0.40 1.00     9863
## Age                                -0.00                 0.00 1.00    10968
## mean_Care            -1579511599534515.75  1565009840274948.00 1.56        8
## mean_Equality        -2741802691552028.00  1304605151111614.50 1.91        6
## mean_Propotionality  -3093728000404815.00  1448132170164927.00 1.88        6
## mean_Loyalty         -1400963482761625.75  4363812405006119.00 2.13        5
## mean_Authority       -4924696244579012.00  5546592480217804.00 2.82        5
## mean_Purity          -3411620160541986.50  1938019405620595.25 2.03        5
## mean_P_Nostalgia      -149269959690262.94  1733315154036284.75 1.61        7
## mean_Age              -331527548173030.25   383844463386461.25 2.35        5
##                     Tail_ESS
## Intercept                 NA
## Care                    6142
## Equality                6177
## Propotionality          6092
## Loyalty                 6134
## Authority               6262
## Purity                  6157
## Conservatism            5953
## P_Nostalgia             5346
## Age                     5839
## mean_Care                 NA
## mean_Equality             NA
## mean_Propotionality       NA
## mean_Loyalty              NA
## mean_Authority            NA
## mean_Purity               NA
## mean_P_Nostalgia          NA
## mean_Age                  NA
```

```
##
## Family Specific Parameters:
##       Estimate Est.Error l-95% CI u-95% CI Rhat Bulk_ESS Tail_ESS
## sigma     1.05      0.01     1.03     1.07 1.00     9768     6247
##
## Draws were sampled using sampling(NUTS). For each parameter, Bulk_ESS
## and Tail_ESS are effective sample size measures, and Rhat is the potential
## scale reduction factor on split chains (at convergence, Rhat = 1).
```

Get priors:

```
get_prior(C_Nostalgia ~ 1 + Care+ Equality+ Propotionality
                              + Loyalty+ Authority+ Purity+
                              + Conservatism + P_Nostalgia + Age
                              + mean_Care + mean_Equality
                              + mean_Propotionality + mean_Loyalty
                              + mean_Authority + mean_Purity
                              + mean_P_Nostalgia + mean_Age
                              + (1|country)
                              ,

    family = gaussian(link = "identity"),
    data = nos_d)
```

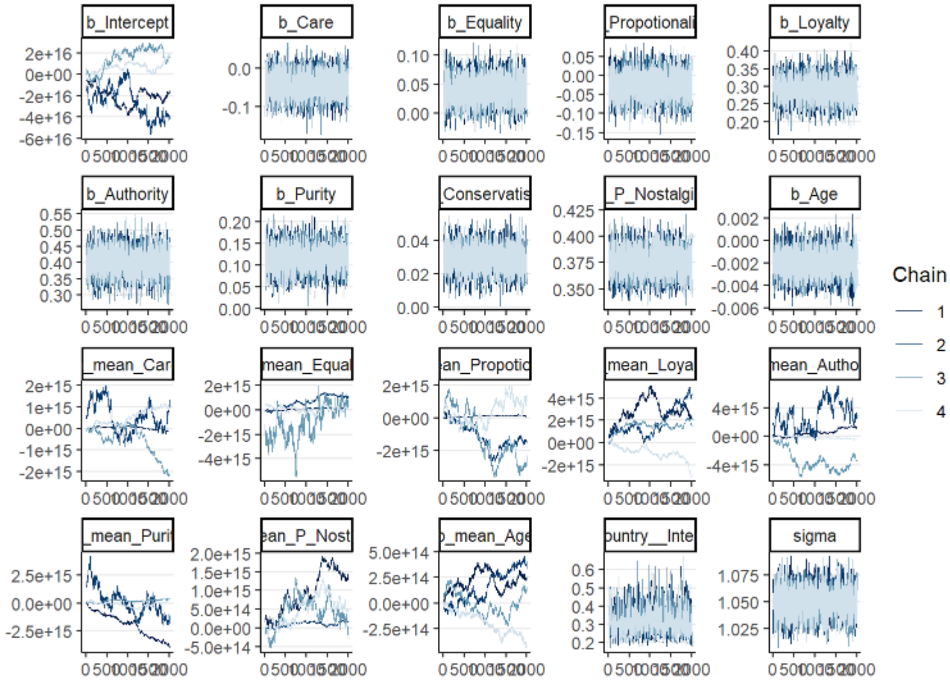
```
## Warning: Rows containing NAs were excluded from the model.
```

```
##                 prior     class                coef   group resp dpar nlpar
##                (flat)         b                                           
##                (flat)         b                 Age                       
##                (flat)         b           Authority                       
##                (flat)         b                Care                       
##                (flat)         b        Conservatism                       
##                (flat)         b            Equality                       
##                (flat)         b             Loyalty                       
##                (flat)         b            mean_Age                       
##                (flat)         b      mean_Authority                       
##                (flat)         b           mean_Care                       
##                (flat)         b       mean_Equality                       
##                (flat)         b        mean_Loyalty                       
##                (flat)         b    mean_P_Nostalgia                       
##                (flat)         b mean_Propotionality                       
##                (flat)         b         mean_Purity                       
##                (flat)         b         P_Nostalgia                       
##                (flat)         b      Propotionality                       
##                (flat)         b              Purity                       
##  student_t(3, 5.2, 2.5) Intercept                                         
##    student_t(3, 0, 2.5)        sd                                         
##    student_t(3, 0, 2.5)        sd                     country              
##    student_t(3, 0, 2.5)        sd           Intercept country              
##    student_t(3, 0, 2.5)     sigma                                         
##  bound       source
##             default
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##        (vectorized)
##             default
##             default
##        (vectorized)
##        (vectorized)
##             default
```

Convergence check of MCMC

```
mcmc_plot(m1_fit, type = "trace")
```

```
## No divergences to plot.
```




# Results

Table of coefficients

```
m1_fit %>%
    # Convert to `draws` object to work with the `posterior` package
    as_draws() %>%
    # Get summary
    summarize_draws() %>%
    # Use `knitr::kable()` for tabulation
    knitr::kable(digits = 2)
```

| variable | mean | median | sd | mad | q5 | q95 | rhat | ess_bulk | es |
|---|---|---|---|---|---|---|---|---|---|
| b_Intercept | -6.135892e+15 | -4.268493e+15 | 1.994330e+16 | 2.246563e+16 | -3.969580e+16 | 2.372787e+16 | 2.43 | 4.89 | |
| b_Care | -4.000000e-02 | -4.000000e-02 | 3.000000e-02 | 3.000000e-02 | -9.000000e-02 | 1.000000e-02 | 1.00 | 8432.99 | 61 |
| b_Equality | 4.000000e-02 | 4.000000e-02 | 2.000000e-02 | 2.000000e-02 | 0.000000e+00 | 8.000000e-02 | 1.00 | 7845.73 | 61 |
| b_Propotionality | -3.000000e-02 | -3.000000e-02 | 3.000000e-02 | 3.000000e-02 | -8.000000e-02 | 3.000000e-02 | 1.00 | 7602.43 | 60 |
| b_Loyalty | 2.900000e-01 | 2.900000e-01 | 3.000000e-02 | 3.000000e-02 | 2.400000e-01 | 3.400000e-01 | 1.00 | 6422.16 | 61 |
| b_Authority | 4.000000e-01 | 4.000000e-01 | 4.000000e-02 | 4.000000e-02 | 3.400000e-01 | 4.600000e-01 | 1.00 | 5768.92 | 62 |
| b_Purity | 1.200000e-01 | 1.200000e-01 | 3.000000e-02 | 3.000000e-02 | 7.000000e-02 | 1.600000e-01 | 1.00 | 7018.63 | 61 |
| b_Conservatism | 3.000000e-02 | 3.000000e-02 | 1.000000e-02 | 1.000000e-02 | 2.000000e-02 | 4.000000e-02 | 1.00 | 9737.63 | 59 |
| b_P_Nostalgia | 3.800000e-01 | 3.800000e-01 | 1.000000e-02 | 1.000000e-02 | 3.600000e-01 | 4.000000e-01 | 1.00 | 9863.26 | 53 |
| b_Age | 0.000000e+00 | 0.000000e+00 | 0.000000e+00 | 0.000000e+00 | 0.000000e+00 | 0.000000e+00 | 1.00 | 10967.52 | 58 |
| b_mean_Care | 1.418224e+14 | 8.884616e+13 | 6.728066e+14 | 3.130974e+14 | -1.119253e+15 | 1.286299e+15 | 1.56 | 7.82 | |
| b_mean_Equality | -2.321320e+13 | 1.388712e+14 | 9.725750e+14 | 3.505750e+14 | -2.236765e+15 | 1.238962e+15 | 1.91 | 6.27 | |
| b_mean_Propotionality | -4.742373e+14 | -4.825037e+13 | 1.162882e+15 | 8.735318e+14 | -2.818101e+15 | 1.157375e+15 | 1.88 | 5.67 | |
| b_mean_Loyalty | 1.339716e+15 | 1.499474e+15 | 1.613066e+15 | 1.594513e+15 | -1.226625e+15 | 4.113604e+15 | 2.13 | 5.18 | |
| b_mean_Authority | -7.371478e+12 | 3.168752e+13 | 2.615707e+15 | 1.296361e+15 | -4.665176e+15 | 4.773206e+15 | 2.82 | 4.66 | |
| b_mean_Purity | -4.183481e+14 | -4.582312e+13 | 1.201840e+15 | 4.989748e+14 | -3.110012e+15 | 9.108577e+14 | 2.03 | 5.36 | |
| b_mean_P_Nostalgia | 5.005766e+14 | 3.987817e+14 | 4.898854e+14 | 4.557662e+14 | -2.905459e+13 | 1.575792e+15 | 1.61 | 6.74 | |
| b_mean_Age | 4.326714e+13 | 3.627833e+13 | 1.974102e+14 | 2.140246e+14 | -2.938724e+14 | 3.614772e+14 | 2.35 | 4.93 | |
| sd_country__Intercept | 3.100000e-01 | 3.100000e-01 | 6.000000e-02 | 6.000000e-02 | 2.300000e-01 | 4.300000e-01 | 1.00 | 1409.05 | 26 |
| sigma | 1.050000e+00 | 1.050000e+00 | 1.000000e-02 | 1.000000e-02 | 1.030000e+00 | 1.070000e+00 | 1.00 | 9767.84 | 62 |

| variable | mean | median | sd | mad | q5 | q95 | rhat | ess_bulk | es |
|---|---|---|---|---|---|---|---|---|---|
| Intercept | 5.680000e+00 | 5.230000e+00 | 5.920000e+00 | 2.870000e+00 | -5.800000e-01 | 1.147000e+01 | 1.01 | 576.00 | 2 |
| r_country[Argentina,Intercept] | 4.600000e-01 | 4.600000e-01 | 1.000000e-01 | 1.000000e-01 | 2.900000e-01 | 6.400000e-01 | 1.00 | 1858.71 | 36 |
| r_country[Belgium,Intercept] | -4.900000e-01 | -4.900000e-01 | 1.000000e-01 | 1.000000e-01 | -6.600000e-01 | -3.200000e-01 | 1.00 | 1756.90 | 36 |
| r_country[Chile,Intercept] | 1.000000e-02 | 1.000000e-02 | 1.000000e-01 | 1.000000e-01 | -1.600000e-01 | 1.800000e-01 | 1.00 | 1735.48 | 32 |
| r_country[Columbia,Intercept] | 2.700000e-01 | 2.700000e-01 | 1.100000e-01 | 1.000000e-01 | 1.000000e-01 | 4.400000e-01 | 1.00 | 1855.90 | 33 |
| r_country[Egypt,Intercept] | 0.000000e+00 | 0.000000e+00 | 1.000000e-01 | 1.000000e-01 | -1.700000e-01 | 1.700000e-01 | 1.00 | 1827.85 | 38 |
| r_country[France,Intercept] | -2.200000e-01 | -2.200000e-01 | 1.000000e-01 | 1.000000e-01 | -3.900000e-01 | -6.000000e-02 | 1.00 | 1717.24 | 34 |
| r_country[Ireland,Intercept] | -1.500000e-01 | -1.500000e-01 | 1.000000e-01 | 1.000000e-01 | -3.200000e-01 | 2.000000e-02 | 1.00 | 1742.52 | 37 |
| r_country[Japan,Intercept] | 1.600000e-01 | 1.600000e-01 | 1.100000e-01 | 1.100000e-01 | -1.000000e-02 | 3.400000e-01 | 1.00 | 1936.30 | 33 |
| r_country[Kenya,Intercept] | -1.400000e-01 | -1.400000e-01 | 1.100000e-01 | 1.100000e-01 | -3.200000e-01 | 4.000000e-02 | 1.00 | 1909.86 | 35 |
| r_country[Mexico,Intercept] | 4.000000e-01 | 4.000000e-01 | 1.000000e-01 | 1.000000e-01 | 2.300000e-01 | 5.700000e-01 | 1.00 | 1746.13 | 38 |
| r_country[Morocco,Intercept] | -8.000000e-02 | -8.000000e-02 | 1.000000e-01 | 1.000000e-01 | -2.600000e-01 | 9.000000e-02 | 1.00 | 1890.27 | 37 |
| r_country[New.Zealand,Intercept] | -1.500000e-01 | -1.500000e-01 | 1.000000e-01 | 1.000000e-01 | -3.200000e-01 | 2.000000e-02 | 1.00 | 1671.05 | 36 |
| r_country[Nigeria,Intercept] | 1.800000e-01 | 1.800000e-01 | 1.000000e-01 | 1.000000e-01 | 1.000000e-02 | 3.600000e-01 | 1.00 | 1906.10 | 38 |
| r_country[Peru,Intercept] | 4.600000e-01 | 4.600000e-01 | 1.000000e-01 | 1.000000e-01 | 2.900000e-01 | 6.300000e-01 | 1.00 | 1836.32 | 36 |
| r_country[Russia,Intercept] | 1.500000e-01 | 1.500000e-01 | 1.000000e-01 | 1.000000e-01 | -2.000000e-02 | 3.200000e-01 | 1.00 | 1702.09 | 36 |
| r_country[Saudi.Arabia,Intercept] | -6.000000e-02 | -6.000000e-02 | 1.000000e-01 | 1.000000e-01 | -2.300000e-01 | 1.100000e-01 | 1.00 | 1869.00 | 34 |
| r_country[South.Africa,Intercept] | -8.000000e-02 | -8.000000e-02 | 1.000000e-01 | 1.000000e-01 | -2.500000e-01 | 9.000000e-02 | 1.00 | 1844.80 | 35 |
| r_country[Switzerland,Intercept] | -5.300000e-01 | -5.300000e-01 | 1.000000e-01 | 1.000000e-01 | -7.000000e-01 | -3.600000e-01 | 1.00 | 1806.46 | 34 |
| r_country[UAE,Intercept] | -2.100000e-01 | -2.100000e-01 | 1.000000e-01 | 1.000000e-01 | -3.700000e-01 | -4.000000e-02 | 1.00 | 1684.04 | 33 |
| lp__ | -5.433760e+03 | -5.433470e+03 | 5.090000e+00 | 5.070000e+00 | -5.442600e+03 | -5.425980e+03 | 1.01 | 1393.27 | 24 |
| z_1[1,1] | 1.510000e+00 | 1.500000e+00 | 4.100000e-01 | 4.000000e-01 | 8.600000e-01 | 2.200000e+00 | 1.00 | 1746.08 | 31 |
| z_1[1,2] | -1.620000e+00 | -1.610000e+00 | 4.300000e-01 | 4.200000e-01 | -2.350000e+00 | -9.500000e-01 | 1.00 | 1480.56 | 32 |
| z_1[1,3] | 3.000000e-02 | 3.000000e-02 | 3.300000e-01 | 3.300000e-01 | -5.100000e-01 | 5.700000e-01 | 1.00 | 1790.90 | 34 |
| z_1[1,4] | 8.800000e-01 | 8.700000e-01 | 3.600000e-01 | 3.600000e-01 | 3.000000e-01 | 1.490000e+00 | 1.00 | 1890.04 | 35 |
| z_1[1,5] | 0.000000e+00 | 0.000000e+00 | 3.400000e-01 | 3.400000e-01 | -5.500000e-01 | 5.700000e-01 | 1.00 | 1865.46 | 38 |
| z_1[1,6] | -7.400000e-01 | -7.200000e-01 | 3.500000e-01 | 3.500000e-01 | -1.340000e+00 | -1.800000e-01 | 1.00 | 1619.89 | 33 |
| z_1[1,7] | -5.000000e-01 | -5.000000e-01 | 3.400000e-01 | 3.400000e-01 | -1.090000e+00 | 5.000000e-02 | 1.00 | 1705.57 | 33 |
| z_1[1,8] | 5.400000e-01 | 5.300000e-01 | 3.600000e-01 | 3.500000e-01 | -4.000000e-02 | 1.140000e+00 | 1.00 | 2047.75 | 35 |
| z_1[1,9] | -4.500000e-01 | -4.400000e-01 | 3.600000e-01 | 3.500000e-01 | -1.040000e+00 | 1.200000e-01 | 1.00 | 1926.19 | 35 |
| z_1[1,10] | 1.300000e+00 | 1.290000e+00 | 3.900000e-01 | 3.800000e-01 | 6.800000e-01 | 1.960000e+00 | 1.00 | 1687.24 | 38 |
| z_1[1,11] | -2.800000e-01 | -2.700000e-01 | 3.400000e-01 | 3.400000e-01 | -8.600000e-01 | 2.800000e-01 | 1.00 | 1929.11 | 36 |
| z_1[1,12] | -4.900000e-01 | -4.900000e-01 | 3.500000e-01 | 3.500000e-01 | -1.080000e+00 | 6.000000e-02 | 1.00 | 1651.40 | 35 |
| z_1[1,13] | 6.000000e-01 | 5.900000e-01 | 3.500000e-01 | 3.400000e-01 | 4.000000e-02 | 1.190000e+00 | 1.00 | 1897.73 | 37 |
| z_1[1,14] | 1.500000e+00 | 1.490000e+00 | 4.100000e-01 | 4.000000e-01 | 8.600000e-01 | 2.190000e+00 | 1.00 | 1686.83 | 33 |
| z_1[1,15] | 5.000000e-01 | 4.900000e-01 | 3.400000e-01 | 3.400000e-01 | -5.000000e-02 | 1.070000e+00 | 1.00 | 1727.87 | 36 |
| z_1[1,16] | -1.800000e-01 | -1.800000e-01 | 3.400000e-01 | 3.300000e-01 | -7.500000e-01 | 3.700000e-01 | 1.00 | 1913.16 | 37 |
| z_1[1,17] | -2.500000e-01 | -2.500000e-01 | 3.400000e-01 | 3.400000e-01 | -8.200000e-01 | 3.000000e-01 | 1.00 | 1807.51 | 36 |
| z_1[1,18] | -1.740000e+00 | -1.730000e+00 | 4.300000e-01 | 4.300000e-01 | -2.490000e+00 | -1.050000e+00 | 1.00 | 1439.09 | 29 |
| z_1[1,19] | -6.800000e-01 | -6.700000e-01 | 3.500000e-01 | 3.600000e-01 | -1.270000e+00 | -1.200000e-01 | 1.00 | 1602.49 | 31 |

# Interpretations

We found evidence that loyalty, authority and purity can significantly predict collective nostalgia across 19 countries after controlling for age, personal nostalgia and age.