Association between Attitudes towards Refugees and Attitudes towards the Environment in the European Social Survey

Contents

Preparations

Load packages

```
library(lme4)
library(lmerTest)
library(dplyr)
library(psych)
library(emmeans)
library(ggplot2)
library(metafor)
library(merTools)
```

Session information about the packages

```
sessionInfo()
```

```
## R version 3.6.3 (2020-02-29)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 18362)
##
## Matrix products: default
##
## locale:
## [1] LC_COLLATE=Finnish_Finland.1252  LC_CTYPE=Finnish_Finland.1252    LC_MONETARY=Finnish_F
## [4] LC_NUMERIC=C                     LC_TIME=Finnish_Finland.1252
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] merTools_0.5.0  arm_1.10-1      MASS_7.3-51.5   metafor_2.4-0   ggplot2_3.3.0   emmean
##  [8] dplyr_0.8.5     lmerTest_3.1-2  lme4_1.1-23     Matrix_1.2-18
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_1.0.4.6        mvtnorm_1.1-0       lattice_0.20-38     tidyr_1.0.2         zoo_1.
##  [7] assertthat_0.2.1    digest_0.6.25       mime_0.9            R6_2.4.1            backpo
## [13] coda_0.19-3         pillar_1.4.3        rlang_0.4.5         multcomp_1.4-13     minqa_
## [19] rmarkdown_2.1       splines_3.6.3       statmod_1.4.34      stringr_1.4.0       munsel
## [25] broom_0.5.5         httpuv_1.5.2        compiler_3.6.3      numDeriv_2016.8-1.1 xfun_0
## [31] mnormt_1.5-6        htmltools_0.4.0     tidyselect_1.0.0    tibble_3.0.0        codetc
## [37] later_1.0.0         crayon_1.3.4        withr_2.1.2         grid_3.6.3          nlme_3
## [43] gtable_0.3.0        lifecycle_0.2.0     magrittr_1.5        scales_1.1.0        estima
## [49] stringi_1.4.6       promises_1.1.0      generics_0.0.2      ellipsis_0.3.0      vctrs_
## [55] sandwich_2.5-1      blme_1.0-4          TH.data_1.0-10      iterators_1.0.12    tools_
## [61] purrr_0.3.3         fastmap_1.0.1       abind_1.4-5         parallel_3.6.3      surviv
## [67] colorspace_1.4-1    knitr_1.28
```

Custom functions

```
#to extract fixed effects
getFE<-function(model){
  coefs<-data.frame(summary(model)$coefficients)
  coefs$lower<-coefs[,1]-qt(p=.975,df=coefs[,"df"])*coefs[,2]
  coefs$upper<-coefs[,1]+qt(p=.975,df=coefs[,"df"])*coefs[,2]
  coefs<-cbind.data.frame(round(coefs[,1:4],2),
                          p=round(coefs[,5],3),
                          LL=round(coefs$lower,2),
                          UL=round(coefs$upper,2))
  #row.names(coefs)<-substr(row.names(coefs),1,25)
  return(coefs)
}



#to extract random effects
getVC<-function(model){
  VC<-as.data.frame(VarCorr(model))
  VC<-cbind(VC[,c(1:3)],est_SD=VC[,5],est_SD2=VC[,4])
  return(VC)
}


#to extract model deviance
getDEV<-function(model){
  DEV<-unname(summary(model)$devcomp$cmp["dev"])
  return(DEV)
}


#partial correlation test
pcor.test <- function(x,y,z,use="mat",method="p",na.rm=T){
    # The partial correlation coefficient between x and y given z
    #
    # pcor.test is free and comes with ABSOLUTELY NO WARRANTY.
    #
    # x and y should be vectors
    #
    # z can be either a vector or a matrix
    #
    # use: There are two methods to calculate the partial correlation coefficient.
    #    One is by using variance-covariance matrix ("mat") and the other is by using recurs
    #    Default is "mat".
    #
    # method: There are three ways to calculate the correlation coefficient,
    #       which are Pearson's ("p"), Spearman's ("s"), and Kendall's ("k") methods.
    #       The last two methods which are Spearman's and Kendall's coefficient are based on
```

```
#       Default is "p".
#
# na.rm: If na.rm is T, then all the missing samples are deleted from the whole dataset,
#        If not, the missing samples will be removed just when the correlation coefficie
#      However, the number of samples for the p-value is the number of samples after rem
#      all the missing samples from the whole dataset.
#      Default is "T".

x <- c(x)
y <- c(y)
z <- as.data.frame(z)

if(use == "mat"){
    p.use <- "Var-Cov matrix"
    pcor = pcor.mat(x,y,z,method=method,na.rm=na.rm)
}else if(use == "rec"){
    p.use <- "Recursive formula"
    pcor = pcor.rec(x,y,z,method=method,na.rm=na.rm)
}else{
    stop("\'use\' should be either \"rec\" or \"mat\"!\n")
}

# print the method
if(gregexpr("p",method)[[1]][1] == 1){
    p.method <- "Pearson"
}else if(gregexpr("s",method)[[1]][1] == 1){
    p.method <- "Spearman"
}else if(gregexpr("k",method)[[1]][1] == 1){
    p.method <- "Kendall"
}else{
    stop("\'method\' should be \"pearson\" or \"spearman\" or \"kendall\"!\n")
}

# sample number
n <- dim(na.omit(data.frame(x,y,z)))[1]

# given variables' number
gn <- dim(z)[2]

# p-value
if(p.method == "Kendall"){
    statistic <- pcor/sqrt(2*(2*(n-gn)+5)/(9*(n-gn)*(n-1-gn)))
    p.value <- 2*pnorm(-abs(statistic))

}else{
    statistic <- pcor*sqrt((n-2-gn)/(1-pcor^2))
    p.value <- 2*pnorm(-abs(statistic))
}
```

```
    data.frame(estimate=pcor,p.value=p.value,statistic=statistic,n=n,gn=gn,Method=p.method,Use
}


# By using var-cov matrix
pcor.mat <- function(x,y,z,method="p",na.rm=T){

    x <- c(x)
    y <- c(y)
    z <- as.data.frame(z)

    if(dim(z)[2] == 0){
        stop("There should be given data\n")
    }

    data <- data.frame(x,y,z)

    if(na.rm == T){
        data = na.omit(data)
    }

    xdata <- na.omit(data.frame(data[,c(1,2)]))
    Sxx <- cov(xdata,xdata,m=method)

    xzdata <- na.omit(data)
    xdata <- data.frame(xzdata[,c(1,2)])
    zdata <- data.frame(xzdata[,-c(1,2)])
    Sxz <- cov(xdata,zdata,m=method)

    zdata <- na.omit(data.frame(data[,-c(1,2)]))
    Szz <- cov(zdata,zdata,m=method)

    # is Szz positive definite?
    zz.ev <- eigen(Szz)$values
    if(min(zz.ev)[1]<0){
        stop("\'Szz\' is not positive definite!\n")
    }

    # partial correlation
    Sxx.z <- Sxx - Sxz %*% solve(Szz) %*% t(Sxz)

    rxx.z <- cov2cor(Sxx.z)[1,2]

    rxx.z
}

# By using recursive formula
pcor.rec <- function(x,y,z,method="p",na.rm=T){
    #
```

```
    x <- c(x)
    y <- c(y)
    z <- as.data.frame(z)

    if(dim(z)[2] == 0){
        stop("There should be given data\n")
    }

    data <- data.frame(x,y,z)

    if(na.rm == T){
        data = na.omit(data)
    }

    # recursive formula
    if(dim(z)[2] == 1){
        tdata <- na.omit(data.frame(data[,1],data[,2]))
        rxy <- cor(tdata[,1],tdata[,2],m=method)

        tdata <- na.omit(data.frame(data[,1],data[,-c(1,2)]))
        rxz <- cor(tdata[,1],tdata[,2],m=method)

        tdata <- na.omit(data.frame(data[,2],data[,-c(1,2)]))
        ryz <- cor(tdata[,1],tdata[,2],m=method)

        rxy.z <- (rxy - rxz*ryz)/( sqrt(1-rxz^2)*sqrt(1-ryz^2) )

        return(rxy.z)
    }else{
        x <- c(data[,1])
        y <- c(data[,2])
        z0 <- c(data[,3])
        zc <- as.data.frame(data[,-c(1,2,3)])

        rxy.zc <- pcor.rec(x,y,zc,method=method,na.rm=na.rm)
        rxz0.zc <- pcor.rec(x,z0,zc,method=method,na.rm=na.rm)
        ryz0.zc <- pcor.rec(y,z0,zc,method=method,na.rm=na.rm)

        rxy.z <- (rxy.zc - rxz0.zc*ryz0.zc)/( sqrt(1-rxz0.zc^2)*sqrt(1-ryz0.zc^2) )
        return(rxy.z)
    }
}
```

Load data

```
dat<-read.csv2("dat.no.miss.csv",stringsAsFactors = F)
```

Variable transformations

```
table(dat$cntry)
```

Country

```
##
##   AT   BE   CH   CZ   DE   EE   ES   FI   FR   GB   HU   IE   IT   LT   NL   NO   PL   PT
## 1973 1753 1503 2156 2819 1974 1817 1862 2015 1876 1391 2676 2317 1927 1661 1538 1589 1228 1
```

```
#make voting group variable names unique to each country
dat$voting.group<-paste0(dat$cntry,": ",dat$vote.group.combined)
```

Voting group

```
#recode the first variable to represent this attitude
dat$environ<-dat$inctxff.R
describe(dat$environ,fast=T)
```

Centering Attitudes towards the Environment

```
##    vars     n mean   sd min max range   se
## X1    1 36131 2.78 1.24   1   5     4 0.01
```

```
#grand mean center
dat$environ.gmc<-dat$environ-mean(dat$environ,na.rm=T)

#obtain dataframe with country means and add to data

environ.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(environ.cntry=mean(environ.gmc,na.rm=T))

dat<-left_join(x=dat,
               y=environ.cntry,
               by=c("cntry"))

#center individuals around country means

dat$environ.cntrymc<-dat$environ.gmc-dat$environ.cntry

#obtain dataframe with voting group means and add to data

environ.voting.group<-dat %>%
  group_by(voting.group) %>%
```

```
  summarize(environ.voting.group=mean(environ.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=environ.voting.group,
               by=c("voting.group"))

#center individuals around voting group means

dat$environ.vgmc<-dat$environ.cntrymc-dat$environ.voting.group

#describe the variable

describe(dat$environ.vgmc,fast=T)
```

```
##    vars     n mean   sd   min max range   se
## X1    1 36131    0 1.18 -3.29   3  6.29 0.01
```

```
#rename as lvl1, lvl2, and lvl3

dat$environ.lvl1<-dat$environ.vgmc
dat$environ.lvl2<-dat$environ.voting.group
dat$environ.lvl3<-dat$environ.cntry
```

```r
#correlation between the variables

corr.test(dat$nwspol.4,dat$polintr.R,adjust="none")
```

Centering Political Engagement

```
## Call:corr.test(x = dat$nwspol.4, y = dat$polintr.R, adjust = "none")
## Correlation matrix
## [1] 0.32
## Sample Size
## [1] 36545
## [1] 0
##
##  To see confidence intervals of the correlations, print with the short=FALSE option
```

```r
#rename the variable

dat$engagement<-dat$polint.agg

#descriptive statistics
psych::describe(dat$engagement,fast=T)
```

```
##    vars     n mean  sd min max range se
## X1    1 36876 2.49 0.8   1   4     3  0
```

```r
#grand mean center
dat$engagement.gmc<-dat$engagement-mean(dat$engagement,na.rm=T)

#obtain dataframe with country means and add to data

engagement.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(engagement.cntry=mean(engagement.gmc,na.rm=T))

dat<-left_join(x=dat,
               y=engagement.cntry,
               by=c("cntry"))

#center individuals around country means

dat$engagement.cntrymc<-dat$engagement.gmc-dat$engagement.cntry

#obtain dataframe with voting group means and add to data

engagement.voting.group<-dat %>%
  group_by(voting.group) %>%
  summarize(engagement.voting.group=mean(engagement.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=engagement.voting.group,
```

```
                by=c("voting.group"))

#center individuals around voting group means

dat$engagement.vgmc<-dat$engagement.cntrymc-dat$engagement.voting.group

#describe the centered variable

describe(dat$engagement.vgmc,fast=T)
```

```
##    vars     n mean   sd   min  max range se
## X1    1 36876    0 0.74 -2.06 2.63  4.69  0
```

```
#rename as lvl1, lvl2, and lvl3

dat$engagement.lvl1<-dat$engagement.vgmc
dat$engagement.lvl2<-dat$engagement.voting.group
dat$engagement.lvl3<-dat$engagement.cntry
```

```
#grand mean center
dat$refugees<-dat$gvrfgap.R-mean(dat$gvrfgap.R,na.rm=T)
describe(dat$refugees,fast=T)
```

Rename and grand mean center the Attitudes towards refugees (pro-refugee attitudes indicate high scores)

```
##    vars     n mean   sd   min  max range   se
## X1    1 36425    0 1.19 -1.93 2.07     4 0.01
```

```
#rename
dat$refugees.gmc<-dat$refugees

#obtain dataframe with country means and add to data

refugees.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(refugees.cntry=mean(refugees.gmc,na.rm=T))

dat<-left_join(x=dat,
               y=refugees.cntry,
               by=c("cntry"))

#center individuals around country means

dat$refugees.cntrymc<-dat$refugees.gmc-dat$refugees.cntry

#obtain dataframe with voting group means and add to data

refugees.voting.group<-dat %>%
  group_by(voting.group) %>%
  summarize(refugees.voting.group=mean(refugees.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=refugees.voting.group,
               by=c("voting.group"))

#center individuals around voting group means

dat$refugees.vgmc<-dat$refugees.cntrymc-dat$refugees.voting.group

#describe the variable

describe(dat$refugees.vgmc,fast=T)
```

```
##    vars     n mean   sd   min  max range   se
## X1    1 36425    0 1.04 -3.27 3.26  6.53 0.01
```

```
#rename as lvl1, lvl2, and lvl3
```

```
dat$refugees.lvl1<-dat$refugees.vgmc
dat$refugees.lvl2<-dat$refugees.voting.group
dat$refugees.lvl3<-dat$refugees.cntry
```

```r
#grand-mean center age
dat$age<-dat$agea-mean(dat$agea,na.rm=T)
#sex around zero
dat$gender<-dat$gndr-1.5 #-0.5 males, 0.5 females
#rename occupation variable
dat$occup<-dat$isco.13
#grand-mean center education years
dat$educ<-dat$eduyrs-mean(dat$eduyrs,na.rm=T)
#residence around zero
dat$resid<-dat$rural-0.5 #-0.5 urban, 0.5 rural
```

Rename and Center the covariates aroung grand mean or logical middle points if applicable

```
#recode if the party voted is =1, or not =0 anti-immigration
dat$anti.imm.party.dummy<-ifelse(is.na(dat$anti.imm.party.rule2),0,1)
#recode if the party voted is =1, or not =0 pro-environment
dat$pro.env.party.dummy<-ifelse(is.na(dat$pro.env.party.manual),0,1)

#dat$other.party.dummy<-ifelse(grepl("Other",dat$vote.group.combined),1,0)

#dummy-code not voting
dat$did.not.vote.dummy<-ifelse(grepl("did not vote",dat$vote.group.combined),1,0)
table(dat$did.not.vote.dummy)
```

Voting group dummy-coded variables

```
##
##     0     1
## 29063  7813
```

```
#dummy-code "don't know"
dat$dont.know.dummy<-ifelse(grepl("Don't know",dat$vote.group.combined),1,0)
table(dat$dont.know.dummy)
```

```
##
##     0     1
## 35670  1206
```

```
#dummy-code invalid vote
dat$invalid.vote.dummy<-ifelse(grepl("Invalid vote",dat$vote.group.combined),1,0)
table(dat$invalid.vote.dummy)
```

```
##
##     0     1
## 36861    15
```

```
#dummy-code "no answer"
dat$no.answer.dummy<-ifelse(grepl("No answer",dat$vote.group.combined),1,0)
table(dat$no.answer.dummy)
```

```
##
##     0     1
## 36864    12
```

```
#dummy-code not-eligible: age
dat$not.eligible.age.dummy<-ifelse(grepl("not eligible: age",dat$vote.group.combined),1,0)
table(dat$not.eligible.age.dummy)
```

```
##
##     0     1
## 35063  1813
```

```
#dummy code not-eligible: citizenship
dat$not.eligible.citizenship.dummy<-ifelse(grepl("not eligible: citizenship",dat$vote.group.co
table(dat$not.eligible.citizenship.dummy)
```

```
##
##     0     1
## 35663  1213
```

```
#dummy-code not-eligible: other reasons
dat$not.eligible.other.dummy<-ifelse(grepl("not eligible: other",dat$vote.group.combined),1,0)
table(dat$not.eligible.other.dummy)
```

```
##
##     0     1
## 36611   265
```

```
#add dummy-variable for other_party voting

dat<- dat %>%
  mutate(other.party.dummy:=case_when(
    anti.imm.party.dummy==1 |
      pro.env.party.dummy==1 |
      did.not.vote.dummy==1 |
      dont.know.dummy==1 |
      invalid.vote.dummy==1 |
      no.answer.dummy==1 |
      not.eligible.age.dummy==1 |
      not.eligible.citizenship.dummy==1 |
      not.eligible.other.dummy==1 ~0,
    TRUE~1
  ))

table(dat$other.party.dummy)
```

```
##
##     0     1
## 18517 18359
```

```
#recode the names for a new multi-category variable: all.parties.lvl2

dat<-dat %>%
  mutate(all.parties.lvl2:=case_when(
    did.not.vote.dummy==1~"Did not vote",
    dont.know.dummy==1~"Don't know",
    no.answer.dummy==1~"No answer",
    invalid.vote.dummy==1~"Invalid vote",
    not.eligible.age.dummy==1~"NE age",
    not.eligible.citizenship.dummy==1~"NE citizen",
    not.eligible.other.dummy==1~"NE other",
    other.party.dummy==1~"Other party",
    anti.imm.party.dummy==1~"Anti-immigration party",
    pro.env.party.dummy==1~"Pro-environment party",
  ),
  party:=case_when(
    other.party.dummy==1~"Other party",
    anti.imm.party.dummy==1~"Anti-immigration party",
```

```
    pro.env.party.dummy==1~"Pro-environment party",
    TRUE~NA_character_
  ))
```

```
#missing values per each row
dat$analysis.miss<-
  is.na(dat$cntry)+
  is.na(dat$voting.group)+
  is.na(dat$refugees)+
  is.na(dat$environ)+
  is.na(dat$vote.group.combined)+
  is.na(dat$age)+
  is.na(dat$gender)+
  is.na(dat$occup)+
  is.na(dat$educ)+
  is.na(dat$resid)+
  is.na(dat$engagement)
table(dat$analysis.miss)
```

Omit missing variables

```
##
##     0     1     2
## 35740  1076    60
```

```
#include only those without any missing values
dat<-dat %>%
  filter(analysis.miss ==0)
```

Exploratory analyses for moderators

Does the association vary by age?

Center the age variable

```
describe(dat$age)
```

```
##    vars     n  mean   sd median trimmed   mad    min   max range skew kurtosis  se
## X1    1 35740 -0.09 18.4   0.64   -0.17 22.24 -34.36 50.64    85 0.02    -0.91 0.1
```

```
#already grand-mean centered

#obtain dataframe with country means and add to data

age.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(age.cntry=mean(age,na.rm=T))

dat<-left_join(x=dat,
               y=age.cntry,
               by=c("cntry"))

#center individuals around country means

dat$age.cntrymc<-dat$age-dat$age.cntry

#obtain dataframe with voting group means and add to data

age.voting.group<-dat %>%
  group_by(voting.group) %>%
  summarize(age.voting.group=mean(age.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=age.voting.group,
               by=c("voting.group"))

#center individuals around voting group means

dat$age.vgmc<-dat$age.cntrymc-dat$age.voting.group

#describe the variable

describe(dat$age.vgmc)
```

```
##    vars     n mean    sd median trimmed   mad    min   max range skew kurtosis   se
## X1    1 35740    0 16.12  -0.02   -0.18 17.63 -41.78 55.52  97.3 0.09    -0.56 0.09
```

```
#rename as lvl1, lvl2, and lvl3

dat$age.lvl1<-dat$age.vgmc
```

```
dat$age.lvl2<-dat$age.voting.group
dat$age.lvl3<-dat$age.cntry
```

Model 1 (Same as H1 selected model but with centered age)

- Divide age variable by 10 to give interpretation by a decade

```
dat$age.lvl1.10<-dat$age.lvl1/10

EX3.mod1<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                gender+occup+educ+resid+
                 age.lvl1.10+
                environ.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))



isSingular(EX3.mod1)
```

```
## [1] FALSE
```

```
(VC.EX3.mod1<-getVC(EX3.mod1))
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.30440667  0.0926634196
## 2 voting.group environ.lvl1         <NA>  0.04306793  0.0018548466
## 3 voting.group  (Intercept) environ.lvl1  0.11749126  0.0015403298
## 4        cntry  (Intercept)         <NA>  0.49917568  0.2491763637
## 5        cntry environ.lvl1         <NA>  0.04008438  0.0016067573
## 6        cntry  (Intercept) environ.lvl1 -0.04834386 -0.0009673194
## 7     Residual         <NA>         <NA>  1.02911869  1.0590852861
```

```
getFE(EX3.mod1)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.07       0.14    49.52    0.5
## gender                                                 0.06       0.01 35582.65    4.6
## occupClerical support workers                         -0.04       0.09 35512.24   -0.4
## occupCraft and related trades workers                 -0.07       0.09 35522.70   -0.7
## occupElementary occupations                            0.01       0.09 35527.09    0.1
## occupManagers                                         -0.02       0.09 35509.88   -0.2
## occupOther: Not in paid work                           0.14       0.09 35700.60    1.5
## occupPlant and machine operators, and assemblers      -0.06       0.09 35519.71   -0.7
## occupProfessionals                                     0.07       0.09 35514.53    0.7
## occupRetired                                          -0.04       0.10 35505.90   -0.4
## occupService and sales workers                        -0.04       0.09 35521.63   -0.4
## occupSkilled agricultural, forestry and fishery workers -0.06     0.09 35525.96   -0.6
## occupTechnicians and associate professionals          -0.03       0.09 35511.65   -0.3
## occupUnemployed                                       -0.02       0.11 35547.75   -0.2
## educ                                                   0.01       0.00 35715.13    7.7
## resid                                                 -0.06       0.01 35639.20   -5.2
## age.lvl1.10                                            0.02       0.00 35528.89    5.2
## environ.lvl1                                           0.12       0.01    19.40   11.5
```

Model 2 (interaction between age and environmental attitudes)

```
EX3.mod2<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                gender+occup+educ+resid+
                 age.lvl1.10+
                environ.lvl1+
                 age.lvl1.10:environ.lvl1,
                 data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))


anova(EX3.mod1,EX3.mod2)
```

```
## Data: dat
## Models:
## EX3.mod1: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX3.mod1:     gender + occup + educ + resid + age.lvl1.10 + environ.lvl1
## EX3.mod2: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX3.mod2:     gender + occup + educ + resid + age.lvl1.10 + environ.lvl1 +
## EX3.mod2:     age.lvl1.10:environ.lvl1
##          npar    AIC    BIC logLik deviance  Chisq Df Pr(>Chisq)
## EX3.mod1   25 104282 104494 -52116   104232
## EX3.mod2   26 104275 104495 -52111   104223 9.3761  1   0.002198 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
isSingular(EX3.mod2)
```

```
## [1] FALSE
```

```
(VC.EX3.mod2<-getVC(EX3.mod2))
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.30426074  0.0925745987
## 2 voting.group environ.lvl1         <NA>  0.04295373  0.0018450227
## 3 voting.group  (Intercept) environ.lvl1  0.12759011  0.0016674922
## 4        cntry  (Intercept)         <NA>  0.49911415  0.2491149305
## 5        cntry environ.lvl1         <NA>  0.04005143  0.0016041172
## 6        cntry  (Intercept) environ.lvl1 -0.04815853 -0.0009627004
## 7     Residual         <NA>         <NA>  1.02899151  1.0588235363
```

```
getFE(EX3.mod2)
```

```
##                                                 Estimate Std..Error       df t.valu
## (Intercept)                                         0.07       0.14    49.52    0.5
## gender                                              0.05       0.01 35582.46    4.6
## occupClerical support workers                      -0.04       0.09 35512.30   -0.4
## occupCraft and related trades workers              -0.07       0.09 35522.74   -0.7
## occupElementary occupations                         0.01       0.09 35527.15    0.1
## occupManagers                                      -0.02       0.09 35509.94   -0.2
```

```
## occupOther: Not in paid work                                  0.14       0.09 35700.95    1.5
## occupPlant and machine operators, and assemblers              -0.07       0.09 35519.77   -0.7
## occupProfessionals                                             0.07       0.09 35514.57    0.7
## occupRetired                                                  -0.04       0.10 35505.92   -0.4
## occupService and sales workers                                -0.04       0.09 35521.68   -0.4
## occupSkilled agricultural, forestry and fishery workers       -0.06       0.09 35526.03   -0.6
## occupTechnicians and associate professionals                  -0.03       0.09 35511.69   -0.3
## occupUnemployed                                               -0.02       0.11 35547.78   -0.2
## educ                                                           0.01       0.00 35716.30    7.8
## resid                                                         -0.06       0.01 35639.39   -5.2
## age.lvl1.10                                                    0.02       0.00 35528.59    5.3
## environ.lvl1                                                   0.12       0.01    19.40   11.5
## age.lvl1.10:environ.lvl1                                      -0.01       0.00 35544.83   -3.0
```

```
EX3.mod2.trends<-
  emtrends(EX3.mod2,specs = c("age.lvl1.10"),var=c("environ.lvl1"),
           at=list(age.lvl1.10=c(

             mean(dat$age.lvl1.10)-sd(dat$age.lvl1.10),
             mean(dat$age.lvl1.10),
             mean(dat$age.lvl1.10)+sd(dat$age.lvl1.10)
             )))

(EX3.mod2.trends.tab<-data.frame(EX3.mod2.trends))
```

Marginal effects for ages at -1SD and +1SD

```
##     age.lvl1.10 environ.lvl1.trend         SE  df  asymp.LCL asymp.UCL
## 1 -1.611745e+00          0.1381195 0.01171672 Inf 0.11515520 0.1610839
## 2  1.780079e-18          0.1237155 0.01072314 Inf 0.10269849 0.1447324
## 3  1.611745e+00          0.1093114 0.01170135 Inf 0.08637713 0.1322456
```

```
EX3.mod2.trends.tab$p<-
  2*(1-pnorm(abs(EX3.mod2.trends.tab$environ.lvl1.trend/
                   EX3.mod2.trends.tab$SE)))
EX3.mod2.trends.tab$adj.p<-
  p.adjust(EX3.mod2.trends.tab$p,method="holm")

EX3.mod2.trends.tab<-
  cbind(group=round(EX3.mod2.trends.tab[,1],2),
      round(EX3.mod2.trends.tab[,c(2,3)],2),
      round(EX3.mod2.trends.tab[,c(7,8)],4),
      round(EX3.mod2.trends.tab[,c(5,6)],2))
EX3.mod2.trends.tab
```

```
##   group environ.lvl1.trend   SE p adj.p asymp.LCL asymp.UCL
## 1 -1.61               0.14 0.01 0     0      0.12      0.16
## 2  0.00               0.12 0.01 0     0      0.10      0.14
## 3  1.61               0.11 0.01 0     0      0.09      0.13
```

```
pairs(EX3.mod2.trends,adjust="none")
```

```
##  contrast                                  estimate      SE  df z.ratio p.value
##  -1.61174532093322 - 1.78007855902334e-18   0.0144 0.00470 Inf 3.063   0.0022
##  -1.61174532093322 - 1.61174532093322       0.0288 0.00941 Inf 3.063   0.0022
##  1.78007855902334e-18 - 1.61174532093322    0.0144 0.00470 Inf 3.063   0.0022
##
## Results are averaged over the levels of: gender, occup, resid
## Degrees-of-freedom method: asymptotic
```

Does the association vary by sex?

Center the sex variable

```
describe(dat$gender)
```

```
##    vars     n mean  sd median trimmed mad  min max range  skew kurtosis se
## X1    1 35740 0.02 0.5    0.5    0.02   0 -0.5 0.5     1 -0.07       -2  0
```

```
#grand mean center
dat$gender.gmc<-dat$gender-mean(dat$gender,na.rm=T)

#obtain dataframe with country means and add to data

gender.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(gender.cntry=mean(gender.gmc,na.rm=T))

dat<-left_join(x=dat,
               y=gender.cntry,
               by=c("cntry"))

#center individuals around country means

dat$gender.cntrymc<-dat$gender.gmc-dat$gender.cntry

#obtain dataframe with voting group means and add to data

gender.voting.group<-dat %>%
  group_by(voting.group) %>%
  summarize(gender.voting.group=mean(gender.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=gender.voting.group,
               by=c("voting.group"))

#center individuals around voting group means

dat$gender.vgmc<-dat$gender.cntrymc-dat$gender.voting.group

#describe the variable

describe(dat$gender.vgmc)
```

```
##    vars     n mean   sd median trimmed mad  min  max range  skew kurtosis se
## X1    1 35740    0 0.49   0.34       0 0.4 -0.8 0.86  1.66 -0.07    -1.91  0
```

```
#rename as lvl1, lvl2, and lvl3

dat$gender.lvl1<-dat$gender.vgmc
dat$gender.lvl2<-dat$gender.voting.group
dat$gender.lvl3<-dat$gender.cntry
```

Model 1 (Same as H1 selected model but with centered sex)

```
EX1.mod1<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                age+occup+educ+resid+
                 gender.lvl1+
                environ.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))



isSingular(EX1.mod1)
```

```
## [1] FALSE
```

```
getVC(EX1.mod1)
```

```
##            grp         var1         var2      est_SD      est_SD2
## 1 voting.group  (Intercept)         <NA>  0.31081495  0.096605935
## 2 voting.group environ.lvl1         <NA>  0.04319467  0.001865779
## 3 voting.group  (Intercept) environ.lvl1  0.13043033  0.001751099
## 4        cntry  (Intercept)         <NA>  0.49963845  0.249638579
## 5        cntry environ.lvl1         <NA>  0.03998946  0.001599157
## 6        cntry  (Intercept) environ.lvl1 -0.05059339 -0.001010870
## 7     Residual         <NA>         <NA>  1.02912353  1.059095237
```

```
getFE(EX1.mod1)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.08       0.14    49.42    0.5
## age                                                    0.00       0.00 34236.53    4.5
## occupClerical support workers                         -0.04       0.09 35508.20   -0.4
## occupCraft and related trades workers                 -0.07       0.09 35517.67   -0.7
## occupElementary occupations                            0.01       0.09 35520.15    0.1
## occupManagers                                         -0.02       0.09 35506.79   -0.2
## occupOther: Not in paid work                           0.14       0.09 35673.27    1.5
## occupPlant and machine operators, and assemblers      -0.07       0.09 35515.40   -0.7
## occupProfessionals                                     0.07       0.09 35512.10    0.8
## occupRetired                                          -0.03       0.10 35508.45   -0.3
## occupService and sales workers                        -0.04       0.09 35513.98   -0.4
## occupSkilled agricultural, forestry and fishery workers -0.06     0.09 35522.40   -0.6
## occupTechnicians and associate professionals          -0.03       0.09 35507.83   -0.3
## occupUnemployed                                       -0.02       0.11 35524.96   -0.2
## educ                                                   0.01       0.00 35701.13    7.4
## resid                                                 -0.06       0.01 35633.28   -5.2
## gender.lvl1                                            0.05       0.01 35448.50    4.4
## environ.lvl1                                           0.12       0.01    19.40   11.5
```

Model 2 (interaction between sex and environmental attitudes)

```
EX1.mod2<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                age+occup+educ+resid+
                 gender.lvl1+
                environ.lvl1+
                 gender.lvl1:environ.lvl1,
                 data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))


anova(EX1.mod1,EX1.mod2)
```

```
## Data: dat
## Models:
## EX1.mod1: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX1.mod1:     age + occup + educ + resid + gender.lvl1 + environ.lvl1
## EX1.mod2: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX1.mod2:     age + occup + educ + resid + gender.lvl1 + environ.lvl1 +
## EX1.mod2:     gender.lvl1:environ.lvl1
##          npar    AIC    BIC logLik deviance Chisq Df Pr(>Chisq)
## EX1.mod1   25 104292 104504 -52121   104242
## EX1.mod2   26 104294 104514 -52121   104242 0.012  1     0.9128
```

```
isSingular(EX1.mod2)
```

```
## [1] FALSE
```

```
getVC(EX1.mod2)
```

```
##            grp         var1         var2      est_SD      est_SD2
## 1 voting.group  (Intercept)         <NA>  0.31082638  0.096613040
## 2 voting.group environ.lvl1         <NA>  0.04319942  0.001866190
## 3 voting.group  (Intercept) environ.lvl1  0.13037807  0.001750654
## 4        cntry  (Intercept)         <NA>  0.49964041  0.249640543
## 5        cntry environ.lvl1         <NA>  0.03999356  0.001599484
## 6        cntry  (Intercept) environ.lvl1 -0.05050727 -0.001009256
## 7     Residual         <NA>         <NA>  1.02912290  1.059093940
```

```
getFE(EX1.mod2)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.08       0.14    49.42    0.5
## age                                                    0.00       0.00 34235.66    4.5
## occupClerical support workers                         -0.04       0.09 35508.12   -0.4
## occupCraft and related trades workers                 -0.07       0.09 35517.72   -0.7
## occupElementary occupations                            0.01       0.09 35520.04    0.1
## occupManagers                                         -0.02       0.09 35506.74   -0.2
## occupOther: Not in paid work                           0.14       0.09 35673.24    1.5
## occupPlant and machine operators, and assemblers      -0.07       0.09 35515.40   -0.7
```

```
## occupProfessionals                                          0.07       0.09 35512.07    0.8
## occupRetired                                               -0.03       0.10 35508.36   -0.3
## occupService and sales workers                             -0.04       0.09 35513.90   -0.4
## occupSkilled agricultural, forestry and fishery workers    -0.06       0.09 35522.38   -0.6
## occupTechnicians and associate professionals               -0.03       0.09 35507.78   -0.3
## occupUnemployed                                            -0.02       0.11 35524.83   -0.2
## educ                                                        0.01       0.00 35700.98    7.4
## resid                                                      -0.06       0.01 35633.12   -5.2
## gender.lvl1                                                 0.05       0.01 35448.16    4.4
## environ.lvl1                                                0.12       0.01    19.42   11.5
## gender.lvl1:environ.lvl1                                    0.00       0.01 35516.35    0.1
```

Does the association vary by education (years)?

Center the education variable

```
describe(dat$educ)
```

```
##    vars     n mean   sd median trimmed  mad    min   max range skew kurtosis   se
## X1    1 35740 0.04 3.86  -0.02   -0.01 2.97 -13.02 40.98    54 0.33     1.88 0.02
```

```
#already grand-mean centered

#obtain dataframe with country means and add to data

educ.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(educ.cntry=mean(educ,na.rm=T))

dat<-left_join(x=dat,
               y=educ.cntry,
               by=c("cntry"))

#center individuals around country means

dat$educ.cntrymc<-dat$educ-dat$educ.cntry

#obtain dataframe with voting group means and add to data

educ.voting.group<-dat %>%
  group_by(voting.group) %>%
  summarize(educ.voting.group=mean(educ.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=educ.voting.group,
               by=c("voting.group"))

#center individuals around voting group means

dat$educ.vgmc<-dat$educ.cntrymc-dat$educ.voting.group

#describe the variable

describe(dat$educ.vgmc)
```

```
##    vars     n mean   sd median trimmed  mad    min   max range skew kurtosis   se
## X1    1 35740    0 3.56  -0.16   -0.08 3.23 -15.82 39.72 55.54 0.42     2.49 0.02
```

```
#rename as lvl1, lvl2, and lvl3

dat$educ.lvl1<-dat$educ.vgmc
dat$educ.lvl2<-dat$educ.voting.group
dat$educ.lvl3<-dat$educ.cntry
```

Model 1 (Same as H1 selected model but with centered education)

```
EX4.mod1<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                gender+occup+age+resid+
                 educ.lvl1+
                environ.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))



isSingular(EX4.mod1)
```

```
## [1] FALSE
```

```
(VC.EX4.mod1<-getVC(EX4.mod1))
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.31538141  0.0994654350
## 2 voting.group environ.lvl1         <NA>  0.04319669  0.0018659537
## 3 voting.group  (Intercept) environ.lvl1  0.13786860  0.0018782434
## 4        cntry  (Intercept)         <NA>  0.49968068  0.2496807852
## 5        cntry environ.lvl1         <NA>  0.03998612  0.0015988901
## 6        cntry  (Intercept) environ.lvl1 -0.03730454 -0.0007453556
## 7     Residual         <NA>         <NA>  1.02911789  1.0590836279
```

```
getFE(EX4.mod1)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.08       0.14    49.37    0.5
## gender                                                 0.06       0.01 35565.32    4.6
## occupClerical support workers                         -0.04       0.09 35505.86   -0.4
## occupCraft and related trades workers                 -0.07       0.09 35518.14   -0.8
## occupElementary occupations                            0.01       0.09 35523.49    0.0
## occupManagers                                         -0.02       0.09 35505.18   -0.2
## occupOther: Not in paid work                           0.13       0.09 35680.92    1.4
## occupPlant and machine operators, and assemblers      -0.07       0.09 35516.64   -0.7
## occupProfessionals                                     0.07       0.09 35512.25    0.8
## occupRetired                                          -0.04       0.10 35508.76   -0.3
## occupService and sales workers                        -0.04       0.09 35513.41   -0.4
## occupSkilled agricultural, forestry and fishery workers -0.06     0.09 35523.19   -0.6
## occupTechnicians and associate professionals          -0.03       0.09 35505.55   -0.3
## occupUnemployed                                       -0.03       0.11 35526.98   -0.2
## age                                                    0.00       0.00 34776.42    4.3
## resid                                                 -0.06       0.01 35638.63   -5.2
## educ.lvl1                                              0.01       0.00 35615.19    6.9
## environ.lvl1                                           0.12       0.01    19.39   11.5
```

Model 2 (interaction between education and environment attitudes)

```
EX4.mod2<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                gender+occup+age+resid+
                 educ.lvl1+
                environ.lvl1+
                 environ.lvl1:educ.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))

anova(EX4.mod1,EX4.mod2)
```

```
## Data: dat
## Models:
## EX4.mod1: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX4.mod1:     gender + occup + age + resid + educ.lvl1 + environ.lvl1
## EX4.mod2: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX4.mod2:     gender + occup + age + resid + educ.lvl1 + environ.lvl1 +
## EX4.mod2:     environ.lvl1:educ.lvl1
##          npar    AIC    BIC logLik deviance  Chisq Df Pr(>Chisq)
## EX4.mod1   25 104298 104510 -52124   104248
## EX4.mod2   26 104280 104501 -52114   104228 19.406  1  1.057e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
isSingular(EX4.mod2)
```

```
## [1] FALSE
```

```
(VC.EX4.mod2<-getVC(EX4.mod2))
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.31474748  0.0990659785
## 2 voting.group environ.lvl1         <NA>  0.04281063  0.0018327499
## 3 voting.group  (Intercept) environ.lvl1  0.14510199  0.0019551822
## 4        cntry  (Intercept)         <NA>  0.49874182  0.2487434013
## 5        cntry environ.lvl1         <NA>  0.04021941  0.0016176010
## 6        cntry  (Intercept) environ.lvl1 -0.03869034 -0.0007760934
## 7     Residual         <NA>         <NA>  1.02886241  1.0585578524
```

```
getFE(EX4.mod2)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.08       0.14    49.48    0.5
## gender                                                 0.05       0.01 35565.51    4.6
## occupClerical support workers                         -0.05       0.09 35506.10   -0.5
## occupCraft and related trades workers                 -0.07       0.09 35518.38   -0.8
## occupElementary occupations                            0.00       0.09 35523.75    0.0
## occupManagers                                         -0.02       0.09 35505.43   -0.2
## occupOther: Not in paid work                           0.13       0.09 35681.55    1.4
## occupPlant and machine operators, and assemblers      -0.07       0.09 35516.92   -0.8
```

```
## occupProfessionals                                        0.07       0.09 35512.31    0.7
## occupRetired                                             -0.04       0.10 35509.14   -0.4
## occupService and sales workers                           -0.04       0.09 35513.61   -0.5
## occupSkilled agricultural, forestry and fishery workers  -0.07       0.09 35523.45   -0.7
## occupTechnicians and associate professionals             -0.04       0.09 35505.75   -0.4
## occupUnemployed                                          -0.03       0.11 35527.26   -0.3
## age                                                       0.00       0.00 34768.80    4.2
## resid                                                    -0.06       0.01 35639.30   -5.2
## educ.lvl1                                                 0.01       0.00 35614.80    6.7
## environ.lvl1                                              0.12       0.01    19.40   11.4
## educ.lvl1:environ.lvl1                                    0.01       0.00 35550.14    4.4
```

```
EX4.mod2.trends<-
  emtrends(EX4.mod2,specs = c("educ.lvl1"),var=c("environ.lvl1"),
           at=
             list(educ.lvl1=
                    c(mean(dat$educ.lvl1)-sd(dat$educ.lvl1),
                      mean(dat$educ.lvl1),                                    mean(dat$educ.lvl1)+sd
(EX4.mod2.trends.tab<-data.frame(EX4.mod2.trends))
```

Marginal effects for different levels of education

```
##       educ.lvl1 environ.lvl1.trend         SE  df  asymp.LCL asymp.UCL
## 1 -3.561414e+00          0.1033404 0.01171741 Inf 0.08037474 0.1263061
## 2  9.056577e-19          0.1234926 0.01075061 Inf 0.10242182 0.1445634
## 3  3.561414e+00          0.1436448 0.01164837 Inf 0.12081444 0.1664752
```

```
EX4.mod2.trends.tab$p<-
  2*(1-pnorm(abs(EX4.mod2.trends.tab$environ.lvl1.trend/
                   EX4.mod2.trends.tab$SE)))
EX4.mod2.trends.tab$adj.p<-
  p.adjust(EX4.mod2.trends.tab$p,method="holm")

EX4.mod2.trends.tab<-
  cbind(group=round(EX4.mod2.trends.tab[,1],2),
        round(EX4.mod2.trends.tab[,c(2,3)],2),
        round(EX4.mod2.trends.tab[,c(7,8)],4),
        round(EX4.mod2.trends.tab[,c(5,6)],2))
EX4.mod2.trends.tab
```

```
##   group environ.lvl1.trend   SE p adj.p asymp.LCL asymp.UCL
## 1 -3.56               0.10 0.01 0     0      0.08      0.13
## 2  0.00               0.12 0.01 0     0      0.10      0.14
## 3  3.56               0.14 0.01 0     0      0.12      0.17
```

Does the association vary by place of residence (urban/rural)?

Center the residence variable

```
describe(dat$resid)
```

```
##    vars     n  mean   sd median trimmed mad  min max range skew kurtosis se
## X1    1 35740 -0.11 0.49   -0.5   -0.14   0 -0.5 0.5     1 0.45    -1.79  0
```

```
dat$resid.gmc<-dat$resid-mean(dat$resid,na.rm=T)


#obtain dataframe with country means and add to data

resid.cntry<-dat %>%
  group_by(cntry) %>%
  summarize(resid.cntry=mean(resid.gmc,na.rm=T))

dat<-left_join(x=dat,
               y=resid.cntry,
               by=c("cntry"))

#center individuals around country means

dat$resid.cntrymc<-dat$resid.gmc-dat$resid.cntry

#obtain dataframe with voting group means and add to data

resid.voting.group<-dat %>%
  group_by(voting.group) %>%
  summarize(resid.voting.group=mean(resid.cntrymc,na.rm=T))

dat<-left_join(x=dat,
               y=resid.voting.group,
               by=c("voting.group"))

#center individuals around voting group means

dat$resid.vgmc<-dat$resid.cntrymc-dat$resid.voting.group

#describe the variable

describe(dat$resid.vgmc)
```

```
##    vars     n mean   sd median trimmed  mad   min  max range skew kurtosis se
## X1    1 35740    0 0.47  -0.25   -0.02 0.34 -0.86 0.97  1.83 0.41    -1.53  0
```

```
#rename as lvl1, lvl2, and lvl3

dat$resid.lvl1<-dat$resid.vgmc
dat$resid.lvl2<-dat$resid.voting.group
dat$resid.lvl3<-dat$resid.cntry
```

Model 1 (Same as H1 selected model but with centered residence)

```
EX5.mod1<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                gender+occup+age+educ+
                 resid.lvl1+
                environ.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))



isSingular(EX5.mod1)
```

```
## [1] FALSE
```

```
(VC.EX5.mod1<-getVC(EX5.mod1))
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.31213323  0.0974271515
## 2 voting.group environ.lvl1         <NA>  0.04314186  0.0018612198
## 3 voting.group  (Intercept) environ.lvl1  0.12768151  0.0017193602
## 4        cntry  (Intercept)         <NA>  0.49932897  0.2493294180
## 5        cntry environ.lvl1         <NA>  0.04001042  0.0016008337
## 6        cntry  (Intercept) environ.lvl1 -0.04882110 -0.0009753655
## 7     Residual         <NA>         <NA>  1.02912226  1.0590926168
```

```
getFE(EX5.mod1)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.08       0.14    49.44    0.5
## gender                                                 0.06       0.01 35568.31    4.6
## occupClerical support workers                         -0.04       0.09 35507.14   -0.4
## occupCraft and related trades workers                 -0.07       0.09 35517.33   -0.7
## occupElementary occupations                            0.01       0.09 35519.18    0.1
## occupManagers                                         -0.02       0.09 35506.37   -0.2
## occupOther: Not in paid work                           0.14       0.09 35672.96    1.5
## occupPlant and machine operators, and assemblers      -0.07       0.09 35515.02   -0.7
## occupProfessionals                                     0.07       0.09 35510.98    0.7
## occupRetired                                          -0.04       0.10 35507.41   -0.3
## occupService and sales workers                        -0.04       0.09 35512.89   -0.4
## occupSkilled agricultural, forestry and fishery workers -0.06     0.09 35524.34   -0.6
## occupTechnicians and associate professionals          -0.03       0.09 35507.07   -0.3
## occupUnemployed                                       -0.03       0.11 35524.45   -0.2
## age                                                    0.00       0.00 34269.44    4.4
## educ                                                   0.01       0.00 35698.20    7.5
## resid.lvl1                                            -0.06       0.01 35436.62   -4.8
## environ.lvl1                                           0.12       0.01    19.40   11.5
```

Model 2 (interaction between residence and environment attitudes)

```
EX5.mod2<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                gender+occup+age+educ+
                 resid.lvl1+
                environ.lvl1+
                 environ.lvl1:resid.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))

anova(EX5.mod1,EX5.mod2)
```

```
## Data: dat
## Models:
## EX5.mod1: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX5.mod1:     gender + occup + age + educ + resid.lvl1 + environ.lvl1
## EX5.mod2: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX5.mod2:     gender + occup + age + educ + resid.lvl1 + environ.lvl1 +
## EX5.mod2:     environ.lvl1:resid.lvl1
##           npar    AIC    BIC logLik deviance  Chisq Df Pr(>Chisq)
## EX5.mod1   25 104293 104506 -52122   104243
## EX5.mod2   26 104295 104516 -52122   104243 0.1275  1      0.721
```

```
isSingular(EX5.mod2)
```

```
## [1] FALSE
```

```
(VC.EX5.mod2<-getVC(EX5.mod2))
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.31212906  0.0974245472
## 2 voting.group environ.lvl1         <NA>  0.04311736  0.0018591063
## 3 voting.group  (Intercept) environ.lvl1  0.12866809  0.0017316382
## 4        cntry  (Intercept)         <NA>  0.49932953  0.2493299812
## 5        cntry environ.lvl1         <NA>  0.04002016  0.0016016135
## 6        cntry  (Intercept) environ.lvl1 -0.04828142 -0.0009648196
## 7     Residual         <NA>         <NA>  1.02912138  1.0590908084
```

```
getFE(EX5.mod2)
```

```
##                                                    Estimate Std..Error       df t.valu
## (Intercept)                                            0.08       0.14    49.44    0.5
## gender                                                 0.06       0.01 35568.19    4.7
## occupClerical support workers                         -0.04       0.09 35507.17   -0.4
## occupCraft and related trades workers                 -0.07       0.09 35517.36   -0.7
## occupElementary occupations                            0.01       0.09 35519.21    0.1
## occupManagers                                         -0.02       0.09 35506.44   -0.2
## occupOther: Not in paid work                           0.14       0.09 35673.02    1.5
## occupPlant and machine operators, and assemblers      -0.07       0.09 35515.08   -0.7
## occupProfessionals                                     0.07       0.09 35511.04    0.7
## occupRetired                                          -0.04       0.10 35507.69   -0.3
```

```
## occupService and sales workers                              -0.04       0.09 35512.89   -0.4
## occupSkilled agricultural, forestry and fishery workers      -0.06       0.09 35524.50   -0.6
## occupTechnicians and associate professionals                 -0.03       0.09 35507.07   -0.3
## occupUnemployed                                              -0.03       0.11 35524.48   -0.2
## age                                                           0.00       0.00 34269.03    4.4
## educ                                                          0.01       0.00 35698.28    7.5
## resid.lvl1                                                   -0.06       0.01 35436.44   -4.8
## environ.lvl1                                                  0.12       0.01    19.40   11.5
## resid.lvl1:environ.lvl1                                       0.00       0.01 35520.29   -0.3
```

Does the association vary by occupational groups

Model 1 (Same as H1 selected model)

```
EX2.mod1<-lmer(refugees~(environ.lvl1|voting.group)+
                 (environ.lvl1|cntry)+
                 age+gender+educ+resid+occup+
                 environ.lvl1,data=dat,REML=F,
                  control=lmerControl(optimizer="bobyqa",
                                      optCtrl=list(maxfun=2e8)))



isSingular(EX2.mod1)
```

```
## [1] FALSE
```

```
getVC(EX2.mod1)
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.30918363  0.0955945141
## 2 voting.group environ.lvl1         <NA>  0.04317550  0.0018641240
## 3 voting.group  (Intercept) environ.lvl1  0.12926379  0.0017255628
## 4        cntry  (Intercept)         <NA>  0.49932256  0.2493230223
## 5        cntry environ.lvl1         <NA>  0.04000565  0.0016004517
## 6        cntry  (Intercept) environ.lvl1 -0.04865068 -0.0009718325
## 7     Residual         <NA>         <NA>  1.02912455  1.0590973317
```

Model 2 (Interaction between environment and occupational groups)

```
EX2.mod2<-lmer(refugees~(environ.lvl1|voting.group)+
                (environ.lvl1|cntry)+
                age+gender+educ+resid+occup+
                environ.lvl1+
                 occup:environ.lvl1,data=dat,REML=F,
                 control=lmerControl(optimizer="bobyqa",
                                     optCtrl=list(maxfun=2e8)))


anova(EX2.mod1,EX2.mod2)
```

```
## Data: dat
## Models:
## EX2.mod1: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX2.mod1:     age + gender + educ + resid + occup + environ.lvl1
## EX2.mod2: refugees ~ (environ.lvl1 | voting.group) + (environ.lvl1 | cntry) +
## EX2.mod2:     age + gender + educ + resid + occup + environ.lvl1 + occup:environ.lvl1
##          npar    AIC    BIC logLik deviance  Chisq Df Pr(>Chisq)
## EX2.mod1   25 104289 104502 -52120   104239
## EX2.mod2   37 104281 104594 -52103   104207 32.836 12   0.001027 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
isSingular(EX2.mod2)
```

```
## [1] FALSE
```

```
getVC(EX2.mod2)
```

```
##            grp         var1         var2      est_SD       est_SD2
## 1 voting.group  (Intercept)         <NA>  0.30949953  0.0957899604
## 2 voting.group environ.lvl1         <NA>  0.04210546  0.0017728693
## 3 voting.group  (Intercept) environ.lvl1  0.09193784  0.0011980989
## 4        cntry  (Intercept)         <NA>  0.49892466  0.2489258209
## 5        cntry environ.lvl1         <NA>  0.03929672  0.0015442324
## 6        cntry  (Intercept) environ.lvl1 -0.03786228 -0.0007423317
## 7     Residual         <NA>         <NA>  1.02867966  1.0581818352
```

```
EX2.mod2.trends<-emtrends(EX2.mod2,specs = c("occup"),var=c("environ.lvl1"))
(EX2.mod2.trends.tab<-data.frame(EX2.mod2.trends))
```

Marginal effects for each occupation group

```
##                                                occup environ.lvl1.trend         SE  df    a
## 1                                        Armed forces        0.002458622 0.07237495 Inf -0.
## 2                           Clerical support workers        0.171992561 0.01883320 Inf  0.
## 3                     Craft and related trades workers        0.119880759 0.01694750 Inf  0.
## 4                               Elementary occupations        0.101679221 0.01877408 Inf  0.
## 5                                           Managers        0.081133954 0.01964255 Inf  0.
## 6                             Other: Not in paid work        0.159899211 0.02207025 Inf  0.
## 7         Plant and machine operators, and assemblers        0.102839704 0.01985327 Inf  0.
## 8                                       Professionals        0.140211289 0.01480285 Inf  0.
## 9                                             Retired        0.131422064 0.03913153 Inf  0.
## 10                          Service and sales workers        0.110732091 0.01505900 Inf  0.
## 11 Skilled agricultural, forestry and fishery workers        0.121043544 0.03187536 Inf  0.
## 12            Technicians and associate professionals        0.130837107 0.01590712 Inf  0.
## 13                                        Unemployed        0.007406265 0.05474532 Inf -0.
```

```
EX2.mod2.trends.tab$p<-
  2*(1-pnorm(abs(EX2.mod2.trends.tab$environ.lvl1.trend/
                   EX2.mod2.trends.tab$SE)))
EX2.mod2.trends.tab$adj.p<-
  p.adjust(EX2.mod2.trends.tab$p,method="holm")

EX2.mod2.trends.tab<-
  cbind(group=EX2.mod2.trends.tab[,1],
        round(EX2.mod2.trends.tab[,c(2,3)],2),
        round(EX2.mod2.trends.tab[,c(7,8)],4),
        round(EX2.mod2.trends.tab[,c(5,6)],2))
EX2.mod2.trends.tab
```

```
##                                                group environ.lvl1.trend   SE      p  adj.p
## 1                                        Armed forces                0.00 0.07 0.9729 1.0000
## 2                           Clerical support workers                0.17 0.02 0.0000 0.0000
## 3                     Craft and related trades workers                0.12 0.02 0.0000 0.0000
## 4                               Elementary occupations                0.10 0.02 0.0000 0.0000
## 5                                           Managers                0.08 0.02 0.0000 0.0002
## 6                             Other: Not in paid work                0.16 0.02 0.0000 0.0000
## 7         Plant and machine operators, and assemblers                0.10 0.02 0.0000 0.0000
## 8                                       Professionals                0.14 0.01 0.0000 0.0000
## 9                                             Retired                0.13 0.04 0.0008 0.0024
## 10                          Service and sales workers                0.11 0.02 0.0000 0.0000
## 11 Skilled agricultural, forestry and fishery workers                0.12 0.03 0.0001 0.0006
## 12            Technicians and associate professionals                0.13 0.02 0.0000 0.0000
## 13                                        Unemployed                0.01 0.05 0.8924 1.0000
```

```
#contrast for all groups against mean of other groups
contrast(EX2.mod2.trends, "del.eff", by = NULL,adjust=c("holm"))
```

```
##  contrast                                                estimate     SE  df z.ratio p.va
##  Armed forces effect                                     -0.11246 0.0721 Inf -1.559  0.95
##  Clerical support workers effect                          0.07120 0.0187 Inf  3.806  0.00
##  Craft and related trades workers effect                  0.01474 0.0168 Inf  0.876  1.00
##  Elementary occupations effect                           -0.00498 0.0186 Inf -0.267  1.00
##  Managers effect                                         -0.02723 0.0196 Inf -1.392  1.00
##  Other: Not in paid work effect                           0.05810 0.0220 Inf  2.639  0.09
##  Plant and machine operators, and assemblers effect      -0.00372 0.0197 Inf -0.188  1.00
##  Professionals effect                                     0.03677 0.0148 Inf  2.491  0.14
##  Retired effect                                           0.02725 0.0389 Inf  0.700  1.00
##  Service and sales workers effect                         0.00483 0.0149 Inf  0.324  1.00
##  Skilled agricultural, forestry and fishery workers effect  0.01600 0.0318 Inf  0.504  1.00
##  Technicians and associate professionals effect           0.02661 0.0158 Inf  1.683  0.83
##  Unemployed effect                                       -0.10710 0.0545 Inf -1.965  0.49
##
## Results are averaged over the levels of: gender, resid
## Degrees-of-freedom method: asymptotic
## P value adjustment: holm method for 13 tests
```