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Econometrics

Neuroticism by Gender

Introduction

I have been interested in psychometrics for some time, many people seem to take for granted that there are things about people that are unknowable or unquantifiable, that’s the magic of humanity, they say, some things aren’t measurable by science. I think there is a better way to look at it. I like the idea of measuring the immeasurable, I think personality traits are a part of this. Setting up measures for how people act in specific situations and comparing them to a large group for reference, so that you can understand others, and yourself, much better. Using the information you gather, you can learn how to better interact with others and yourself.

One interesting example of a personality metric is neuroticism, described in (Weisburg, 2011), ”Neuroticism describes the tendency to experience negative emotion and related processes in response to perceived threat and punishment; these include anxiety, depression, anger, self-consciousness, and emotional lability.” In this study we will attempt to reproduce the result from (Lynn, 1997) and (Weisburg, 2011) that women have higher trait neuroticism than men on average.

Literature Review

In both (Lynn, 1997) and (Weisburg, 2011) researchers found that women have higher neuroticism on average than men. When (Weisburg, 2011) tested this they use the Big Five Factor model of personality, which is the same model that our data used to report, they had N = 2643. (Lynn, 1997) used a separate model that measures neuroticism. In their studies they norm the data according to the average in the dataset and use a standard deviation to calculate a z-score. I have done my regression using raw scores due to time constraints.

Data Overview

The data is a data frame with 19,719 observations on 57 variables. It contains the answer results for 50 personality questions as well as demographic information such as gender, handedness, ethnicity, English as native language, and age.

It proved to be quite limiting, having only the raw score results for the Big Five Factor model of personality and demographic information. The ideal dataset would include more continuous variables, perhaps with annual income and family status during childhood to proxy environmental factors during development as possible control variables for personality.

One distinct advantage this data has is a large sample size relative to other studies of this nature, with 19,719 observations, this makes for very powerful analysis.

I recoded the questions I deemed appropriate based on training in statistical and survey methodology, as many questions are asked as reversals of what they’re trying to measure due to a general bias to answer positively. I then summed up the results for each individual, creating a raw score. These raw scores were then used in the models.

Methodology

The difference in calculation compromises the magnitude estimations of our results, but should preserve the relationships between variables, meaning we can accomplish our goal of recreating the difference between men and women, but we won’t be able to accurately attest the magnitude of the difference in terms of the general population.

The method I used is linear regression, with several models used to narrow down a best-fit model for the available data. I’ve included categorical variables for gender and native language (as a proxy for culture). By defining the gender variable the way I have I’ve excluded 124 observations from the data, which is comparatively small relative to the total number of observations. By defining native language the way that I have I’ve excluded 70 observations, again, relatively few.

I’ve also included an interaction variable between both gender and native language because it proved to be statistically significant and slightly improved the adjusted R squared. The model I’ve chosen to use is:

neuroreg3 <- lm(neuro~female+othlang+othlangfem+agree+open+extra)

This uses neuroticism as the dependent variable and takes gender, language, and the other personality traits into account. I hypothesized that the coefficient on female would be positive, representing females being relatively higher than males in neuroticism.

Results

After the modelling was complete my hypothesis was proved to be correct. However, the R squared was surprisingly low until I included the other personality metrics. I did several post estimation tests to confirm the results were accurate, using both car’s linearHypothesis and Stargazer’s comparison functions, reconfirming my results:

=========================================================================

Dependent variable:

-----------------------------------------------------

neuro

(1) (2)

-------------------------------------------------------------------------

female 3.674\*\*\* 3.216\*\*\*

(0.156) (0.158)

othlang 1.294\*\*\* 1.489\*\*\*

(0.188) (0.196)

othlangfem -0.711\*\*\* -0.589\*\*

(0.245) (0.255)

agree -0.077\*\*\*

(0.009)

open -0.037\*\*\*

(0.010)

extra -0.229\*\*\*

(0.007)

Constant 39.691\*\*\* 28.587\*\*\*

(0.475) (0.126)

-------------------------------------------------------------------------

Observations 19,719 19,719

R2 0.108 0.031

Adjusted R2 0.108 0.031

Residual Std. Error 8.141 (df = 19712) 8.484 (df = 19715)

F Statistic 398.591\*\*\* (df = 6; 19712) 212.073\*\*\* (df = 3; 19715)

=========================================================================

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

The difference between men and women is listed as 3.67, meaning that on average, women totaled 3.67 more toward neuroticism. This is rather complicated to interpret because I haven’t normed the test. The questions were written as a Likert scale out of five, with questions for neuroticism such as:

N1 I get stressed out easily.

The participant who is taking the test online would then choose between five choices either agreeing with the statement or disagreeing with it.

1 2 3 4 5

What our interpretation means is that when all 10 questions related to neuroticism are totaled the average woman on the test would have an average score of what she circled 3.67 higher than the average man’s average score. This is a limitation of my research. If I had normed the test I could explain the difference in terms of percentiles relative to the mean or other terms of my choosing.

Conclusion

In conclusion it seems as though women are higher than men in neuroticism. This means I uphold the results of the other researchers, and if I could do something different in the project I would norm the results to make the interpretation more intuitive, and compare the magnitude using my dataset with a much higher N.

Citations

Lynn, Richard, and Terence Martin. “Gender Differences in Extraversion, Neuroticism, and Psychoticism in 37 Nations.” *The Journal of Social Psychology*, vol. 137, no. 3, 1997, pp. 369–373., doi:10.1080/00224549709595447.

Weisberg, Yanna J., et al. “Gender Differences in Personality across the Ten Aspects of the Big Five.” *Frontiers in Psychology*, vol. 2, 31 May 2011, doi:10.3389/fpsyg.2011.00178.

Appendix 1

library(car)

library(stargazer)

attach(Big5)

#some of the variables need to be reversed:

# E2;E4;E6;E8;E10;N2;N4;A1;A3;A5;A7;C2;C4;C6;C8;O2;O4;O6

#If you accidentally run one of the recode lines more than once

# reimport the dataset and re-recode them.

E2 = recode(E2, '1=5; 2=4; 4=2; 5=1' )

E4 = recode(E4, '1=5; 2=4; 4=2; 5=1' )

E6 = recode(E6, '1=5; 2=4; 4=2; 5=1' )

E8 = recode(E8, '1=5; 2=4; 4=2; 5=1' )

E10 = recode(E10, '1=5; 2=4; 4=2; 5=1' )

N2 = recode(N2, '1=5; 2=4; 4=2; 5=1' )

N4 = recode(N4, '1=5; 2=4; 4=2; 5=1' )

A1 = recode(A1, '1=5; 2=4; 4=2; 5=1' )

A3 = recode(A3, '1=5; 2=4; 4=2; 5=1' )

A5 = recode(A5, '1=5; 2=4; 4=2; 5=1' )

A7 = recode(A7, '1=5; 2=4; 4=2; 5=1' )

C2 = recode(C2, '1=5; 2=4; 4=2; 5=1' )

C4 = recode(C4, '1=5; 2=4; 4=2; 5=1' )

C6 = recode(C6, '1=5; 2=4; 4=2; 5=1' )

C8 = recode(C8, '1=5; 2=4; 4=2; 5=1' )

O2 = recode(O2, '1=5; 2=4; 4=2; 5=1' )

O4 = recode(O4, '1=5; 2=4; 4=2; 5=1' )

O6 = recode(O6, '1=5; 2=4; 4=2; 5=1' )

# We are primarily concerned with Neuroticism as that pertains to

# our research question

extra <- (E1+E2+E3+E4+E5+E6+E7+E8+E9+E10)

neuro <- (N1+N2+N3+N4+N5+N6+N7+N8+N9+N10)

agree <- (A1+A2+A3+A4+A5+A6+A7+A8+A9+A10)

open <- (O1+O2+O3+O4+O5+O6+O7+O8+O9+O10)

# recoding the categorical variables to something we can use as a two state

# variable

female <- ifelse(gender==2,1,0)

othlang <- ifelse(engnat==2,1,0)

# calculating the number of observations we are excluding by doing it this

# way

sum(gender>2) #102

sum(gender==0) #24

sum(engnat==0) #70

# Test regression

extrareg <- lm(extra~ female + age + othlang)

summary(extrareg)

plot(extrareg)

# First regression run to test previous literature that women have higher

# neuroticism on average

neuroreg <- lm(neuro~ female + age + othlang)

summary(neuroreg)

linearHypothesis(neuroreg, c("age"))

# age is not statistically significant and so will be excluded from future

# regressions

# Third regression, wondered if the other personality metrics affect one

# another

neuroreg2 <- lm(neuro~female+othlang+agree+open+extra)

summary(neuroreg2)

# They do correlate with a small effect, they should not however.

othlangfem <- othlang\*female

neuroreg3 <- lm(neuro~female+othlang+othlangfem+agree+open+extra)

summary(neuroreg3)

linearHypothesis(neuroreg3, c("agree+open+extra"))

linearHypothesis(neuroreg3, c("female","othlangfem"))

linearHypothesis(neuroreg3, c("female + othlangfem"))

linearHypothesis(neuroreg3, c("othlang"))

neuroreg4 <- lm(neuro~female+othlang+othlangfem)

summary(neuroreg4)

stargazer::stargazer(list(neuroreg3,neuroreg4), type="text")

# Another regression just to test curiosity.

openreg <- lm(Open~ female + othlang +Neuro)

summary(openreg)

plot(openreg)

# Possible restriction on the data, my attempt to standardize the scores

# I worry the analysis needs to be done on the transformed Z scores of

# the results to be valid. I believe the results are still valid, but

# it changes the interpretation of the results.

nhat <- sum(neuro)/19719

nstandev <- sqrt(((sum(neuro)^2 - ((sum(neuro)^2)/;19719))/19719))