A boring (academic) title or a clever title?
A secondary title

Connor StarrHurst *Washington State University*

In this article we compare the *empirical characteristic function* (Tukey 1977; Becker et al. 1988) to a *moment-generating-functional form* to compute the proportion of hypotheses m that are rejected under the null hypothesis.

Here is a second paragraph of the abstract (if necessary), and with the pipe notation it doesn't break. Notice it still needs to be indented.

Generally, we write this abstract last. Often it is called the executive summary. It should succinctly summarize the entire document. You can include references such as this one to the Appendices section 6 if necessary.

Keywords: multiple comparisons to control; multivariate chi-square distribution; nonlinear growth curves; Richard's curve; simulated critical points

November 09, 2020

1 Introduction

Write something here.
[ONE GRAPHIC]
[TWO GRAPHICS AS ONE]
Write something here.

2 Research Question: What is my primary question

2.1 What is my secondary question

2.2 What is my other secondary question

3 Data Description

Very brief introduction to the data, how it was collected, and so on. Remember that everything is covered (who, what, when, where, why, how, so what, and so on). Reference the section in the Appendix with greater detail about the data provenance. This section should be about two paragraphs, and the Appendix should have more information.

3.1 Summary of Sample

3.2 Summary Statistics of Data

4 Key Findings

5 Conclusion

This was a new page
This is a newline.
Here is some more text.
Below are some example code that may benefit you in preparing your document.

Please state your name: ______________________________
I was born on ____________________ in ____________________

$$Y_{jt} = \alpha + \boldsymbol{\beta} X_{jt} + \upsilon_j + \varepsilon_{jt}, \tag{1}$$

where α is the grand mean, υ_j is the fixed-time country mean, X_{jt} (country j at time t) is the matrix of country-level observations for the vector of aforementioned parameters $\boldsymbol{\beta}$, and ε_{jt} represents the residual idiosyncratic disturbance. Our panel data set consists of repeated observations of countries over time. Therefore, we employ cross-section time-series models. This approach redefines Equation~1 by subtracting time-demeaned values. This *within* transformation subtracts constant country effects for the dependent variable $\bar{Y}_j$, the predictor variables $\bar{X}_j$, and the intercept $\bar{\upsilon}_j$:

$$(Y_{jt} - \theta \bar{Y}_j) = (1-\theta)\alpha + \boldsymbol{\beta}(X_{jt} - \bar{X}_j) + (\upsilon_{jt} - \theta \bar{\upsilon}_j), \tag{2}$$

If $\theta = 0$, the model reduces to a basic pooled ordinary-least-squares (OLS) model; if $\theta = 1$, the model reduces to a fixed-effects model; otherwise the model represents a random-effects model. The pooled OLS estimation is biased if country effects exist (Hsiao 2003). The random-effects model may be susceptible to omitted-variable bias (Wooldridge 2006): bias because a predictor was excluded from the model specification. Conversely, the fixed-effects model is not susceptible to this bias as it captures unobserved intracountry variation around its average country-level “fixed effect." Panel-data analysis commonly has issues with heteroskedasticity, serial autocorrelation, and cross-sectional autocorrelation.

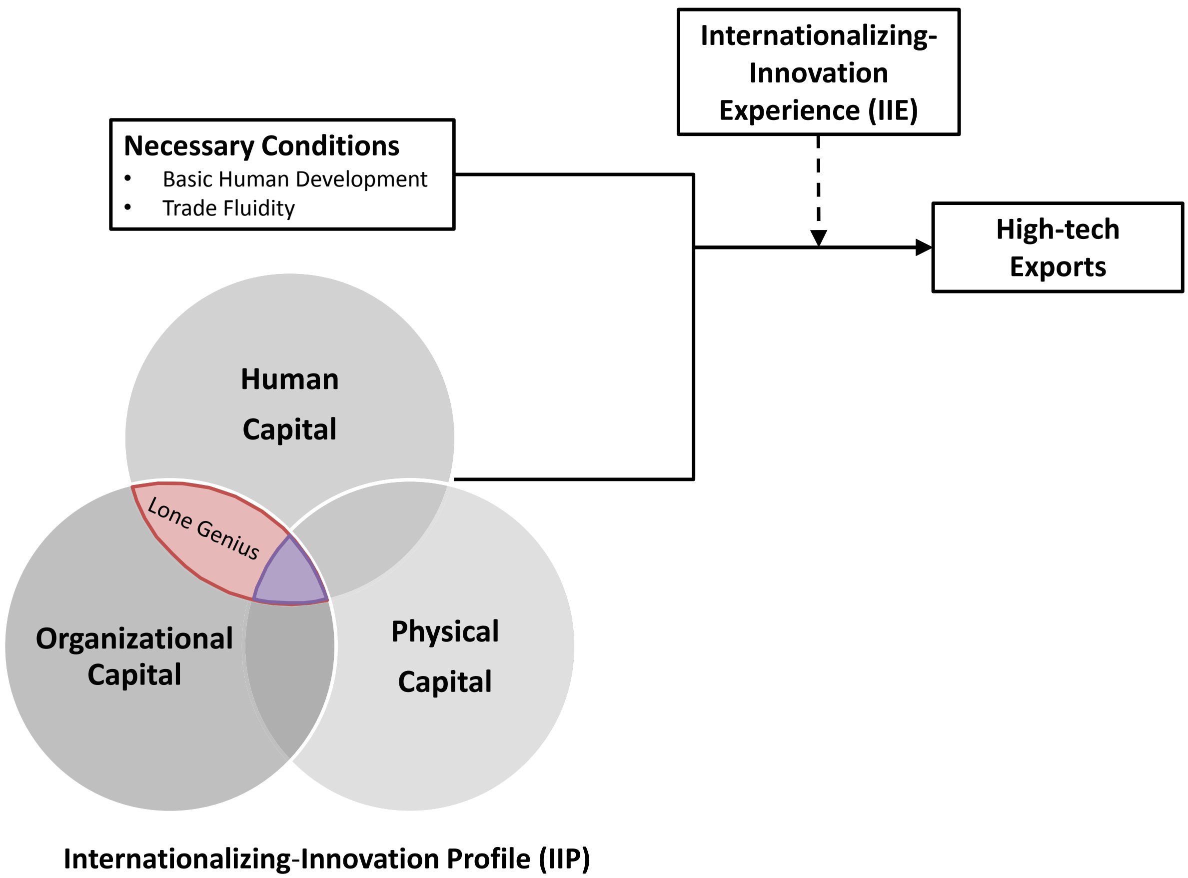
$i = 1$ and

$$i = 1$$

1	2	3	4	5
6	7	8	9	10

See Figure 1.

Figure 1: Conceptual Model



This is a footnote[1] that can be placed within a document.

Refer to the Appendices in section~6 where I am going to cite John (Tukey 1962, pp. 2-3).
Here is a quote by Tukey (1962, pp. 2-3):

> For a long time I have thought I was a statistician, interested in inferences from the particular to the general. But as I have watched mathematical statistics evolve, I have had to cause to wonder and to doubt. [...] All in all, I have come to feel that my central interest is in *data analysis*, which I take to include among other things: procedures for analyzing data, techniques for interpreting the results of such procedures, ways of planning the gathering of data to make its analysis easier, more precise or more accurate, and all the machinery and results of (mathematical) statistics which apply to analyzing the data.

Large parts of data analysis are inferential in the sample-to-population sense, but these are only parts, not the whole. Large parts of data analysis are incisive, laying bare indications which we could not perceive by simple and direct examination of the raw data, but these too are only parts, not the whole. Some parts of data analysis, as the term is her stretch beyond its philology, are allocation, in the sense that they guide us in the distribution of effort and other valuable considerations in observation, experimentation, or analysis. Data analysis is a larger and more varied field than inference, or incisive procedures, or allocation.

Statistics has contributed much to data analysis. In the future it can, and in my view should, contribute more. For such contributions to exist, and be valuable, it is not necessary that they be direct. They need not provide new techniques, or better tables for old techniques, in order to influence the practice of data analysis.

Table 1: Descriptive Statistics and Correlation Analysis

		M	SD	1	2	3	4	5	6	7	8	9
1.	ln(High-technology Exports)	22.03	2.22	1								
2.	Human Development (HDI)	.78	.10	.36***	1							
3.	Trade Openness (OPEN)	81.25	60.73	.22***	.21***	1						
4.	WTO	.82	.39	.11**	.18***	.14***	1					
5.	Team: Sole Inventor	.37	.16	-.05	.04	-.22***	-.30***	1				
6.	Team: Multiregional	.38	.19	-.31***	-.32***	.11***	.25***	-.72***	1			
7.	Firm = 0	.17	.14	-.46***	-.33***	-.23***	-.20***	.35***	-.04	1		
8.	Firm = 2+	.04	.05	-.03	-.10**	-.02	.09**	-.19***	.20***	-.03	1	
9.	Independent Claims (DEPTH)	2.43	.54	.00	.04	.06†	.32***	-.38***	.35***	-.14***	.03	1
10.	Unique Technologies (BREADTH)	1.64	.19	.00	-.03	-.05†	-.20***	-.20***	.10**	-.05	.00	.14***

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

Notes: Pearson pairwise correlations are reported. Correlations and Summary Statistics fail to account for country-level and time-varying effects. We caution the reader to make inferences from these basic associations. They do not capture joint associations inherent to a regression model.

6 APPENDICES

6.1 Data Provenance

6.1.1 Data Collection Handout

Figure 2: Handout Page 1

CHAPTER 1

EXPLORATORY DATA ANALYSIS

> We were together learning how to use the analysis of variance, and perhaps it is worth while stating an impression that I have formed-that the analysis of variance, which may perhaps be called a statistical method, because that term is a very ambiguous one — is not a mathematical theorem, but rather a convenient method of arranging the arithmetic. Just as in arithmetical textbooks — if we can recall their contents — we were given rules for arranging how to find the greatest common measure, and how to work out a sum in practice, and were drilled in the arrangement and order in which we were to put the figures down, so with the analysis of variance; its one claim to attention lies in its convenience.
>
> *The Future of Data Analysis*
> J. W. TUKEY

IN 1986, the Vietnamese government began a policy of textitdoi moi (renovation), and decided to move from a centrally planned command economy to a "market economy with socialist direction". As a result, Vietnam was able to evolve from near famine conditions in 1986 to a position as the world's third larger exporter of rice in the mid nineties. Between 1992 and 1997 Vietnam's GDP rose by 8.9% annually (World Bank, 1999).

The first Vietnam Living Standards Survey (VLSS) was conducted in 1992-93 by the State Planning Committee (SPC) (now Ministry of Planning and Investment) along with the General Statistical Office (GSO). The second VLSS was

Figure 3: Handout Page 2

314 J.W. Horn et al. / Molecular Phylogenetics and Evolution 63 (2012) 305–326

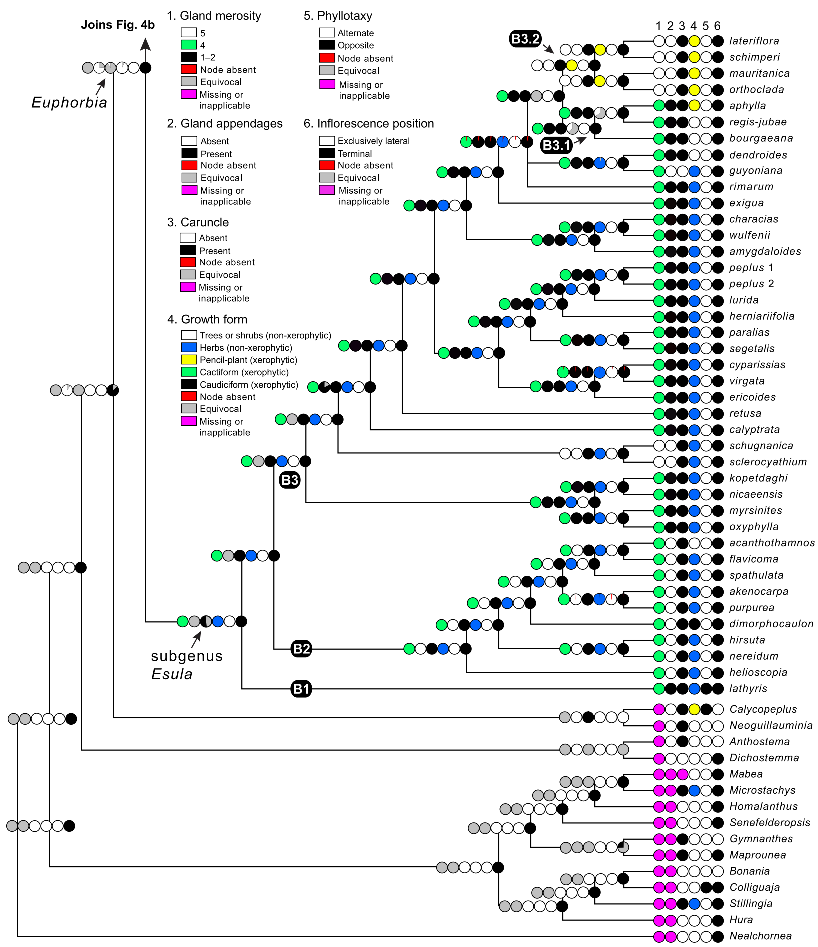
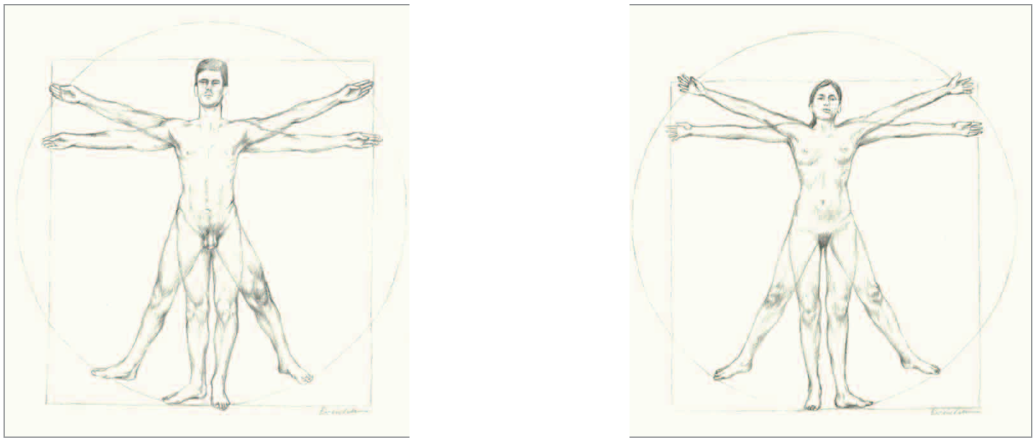


Fig. 4a. Ancestral state reconstructions for (1) cyathial gland merosity, (2) gland appendages, (3) caruncle, (4) growth form, (5) phyllotaxy, and (6) inflorescence position in *Euphorbia* and Euphorbioideae outgroups. Ancestral states for each character were estimated using likelihood optimizations across a randomly selected subset of 1000 post burn-in trees from the Bayesian inference analysis of the combined data set and plotted onto the 95% majority rule tree of the complete set of post burn-in trees. Pie charts at each node represent the proportion of trees in which the optimizations indicated were present, given a likelihood decision threshold of 2.0 (>2 log units better than the raw likelihood value(s) of the other states). Shown here are optimizations for Euphorbioideae outgroups and *Euphorbia* subgenus *Esula*; continued in Figs. 4b and 4c.

the root, the root of Clade C + D, and at the root nodes of Clades A, C, and D. The asymmetrical model of character evolution we used to optimize this trait favors a scenario of multiple, independent gains of caruncles within both Clades C and D; caruncles are absent from Clade A (Figs. 4b and 4c). In contrast, caruncles are present in all but one species we scored from Clade B, but they are reconstructed as unequivocally present at the root node of this clade in just over half of trees that we examined (Fig. 4a; present: 521, equivocal: 479).

Trees and shrubs are reconstructed as the ancestral growth form (Character 4) at all deep nodes within the phylogeny, including all backbone nodes of *Euphorbia* (root node of *Euphorbia*, woody: 937, equivocal: 63). Among the subgeneric clades, a transition to the herbaceous habit is likely to be a synapomorphy for Clade B (Fig. 4a). A non-succulent, woody growth form is the ancestral state at the root nodes of Clades A and C (Figs. 4b and 4c). The root node of Clade D is woody in just over half of the reconstructions, but equivocal in the rest (Fig. 4c; woody: 529, equivocal: 471).



(a) Thomas et al. (2020) discuss this. **(b)** Schnitt realer Sensor (Thomas et al. 2020)

Figure 4: Der Sensor in Theorie und Verwirklichung... caption at bottom instead? I can write a really long caption if I want.
This is using "crop" to include one image and trim it to appear as two. Likely you will have two separate images if you use this option, so you would set the trim parameters all equal to 0.
This figure has subfigures which each also have a possible caption.

6.2 Preparing the Report Workspace as a subsection

6.2.1 Preparing the Report Workspace as a subsubsection

Preparing the Report Workspace as a paragraph

Preparing the Report Workspace as a subparagrah Below is the necessary functions and libraries required to run the code referenced in this document.

```
library(devtools); # required for source_url

path.humanVerseWSU = "https://raw.githubusercontent.com/MonteShaffer/humanVerseWSU/"
source_url( paste0(path.humanVerseWSU,"master/misc/functions-project-measure.R") );
```

Below is the code to load the data and prepare it for analysis.

```
path.to.project = "C:/Users/Connor/.ssh/stats419/project-measure/";

path.to.secret = "C:/Users/Connor/Documents/1) WSU 2018-/Fall 2020/Stat 419/Project 1 Measure/";

measure = utils::read.csv( paste0(path.to.secret, "final.measure.txt"), header=TRUE, quote="", sep="|")

#path.github = "https://raw.githubusercontent.com/this-IS-YOUR-PATH-TO-GITHUB/";
#source_url( paste0(path.github,"master/functions/functions-project-measure.R") );

# this is your function
# put in the same "units"
# merge left/right
# build proportion data
# and so on ...
# measure.df = prepareMeasureData(measure);

set.seed(10199816)

measureExample = measure[ sample(1:nrow(measure), 22), ]; #grab 22 samples from measure

measureExample$data_collector = factor(measureExample$data_collector);
measureExample$person_id = factor(measureExample$person_id);
measureExample$writing = factor(tolower(measureExample$writing));
measureExample$eye = factor(tolower(measureExample$eye));
measureExample$eye.color = factor(tolower(measureExample$eye.color));
measureExample$ethnicity = factor(tolower(measureExample$ethnicity));
measureExample$gender = factor(tolower(measureExample$gender));
measureExample$gender[measureExample$gender=="f"] = "female";
measureExample$gender[measureExample$gender=="m"] = "male";

measureExample$swinging = factor(tolower(measureExample$swinging));
#measureExample$side = factor(tolower(measureExample$side));

measureExample$units = factor(tolower(measureExample$units));
measureExample$units[measureExample$units=="inches"] = "in";
```

```
## Warning in `[<-.factor`(`*tmp*`, measureExample$units == "inches", value =
## structure(c(1L, : invalid factor level, NA generated
```

```r
# remember conv_units ...

summary(measureExample);
```

```
##                           data_collector                              person_id
##  feaa341d33cedb0f4f7ec731c84e5ba9: 3     0ab2282a9d538094dbe633278574cec9: 1
##  0185c7c2eed9d48197953305a817c8b1: 2     0f91a4e5bcb75e278d54f8cca555cc4b: 1
##  253a0d24ddff7cbe1b9f621870d9d198: 2     2264bdbc3a7aae3cb9b76b698f187fcf: 1
##  5a96f81207a7a619ea2574c7e86cda93: 2     2bb88f446d3a78151df3ae67ad006e10: 1
##  ed892caec7a86a00ec5fbefdf5f44faf: 2     48cebdedc0acd343de4853d8e649058d: 1
##  00b0bc50a5d4c23ebdac6e69cebf284d: 1     628888963c3e9ac15557b4f124de3a6b: 1
##  (Other)                         :10     (Other)                         :16
##      height       head.height    head.circumference    arm.span
##  Min.   :33.50   Min.   :6.890   Min.   : 8.465     Min.   :31.50
##  1st Qu.:66.79   1st Qu.:8.563   1st Qu.:22.047     1st Qu.:67.62
##  Median :68.31   Median :8.804   Median :22.441     Median :70.86
##  Mean   :66.00   Mean   :8.720   Mean   :21.814     Mean   :67.30
##  3rd Qu.:70.46   3rd Qu.:9.250   3rd Qu.:23.000     3rd Qu.:72.62
##  Max.   :74.02   Max.   :9.843   Max.   :24.606     Max.   :87.80
##  NA's   :2       NA's   :2       NA's   :1          NA's   :2
##   floor.navel       units      writing      eye          eye.color   swinging
##  Min.   :37.01   cm    :18   both : 1   left : 7   blue      : 7   both : 1
##  1st Qu.:40.08   inches: 0   left : 2   right:13   blue-green: 1   left : 4
##  Median :41.25   NA's  : 4   right:19   NA's : 2   blue/green: 1   right:17
##  Mean   :41.26                                     brown     :10
##  3rd Qu.:43.21                                     green     : 1
##  Max.   :45.47                                     hazel     : 2
##  NA's   :7
##       age            gender      quality          minutes
##  Min.   : 1.00   f     : 0   Min.   : 6.000   Min.   : 3.00
##  1st Qu.:21.00   female:10   1st Qu.: 9.000   1st Qu.:10.00
##  Median :27.00   m     : 0   Median : 9.000   Median :12.00
##  Mean   :29.32   male  :12   Mean   : 8.795   Mean   :14.67
##  3rd Qu.:38.00               3rd Qu.: 9.875   3rd Qu.:18.00
##  Max.   :58.00               Max.   :10.000   Max.   :45.00
##                                               NA's   :1
##              ethnicity     notes            hand.length      hand.width
##  caucasian         : 3   Length:22          Min.   :3.750   Min.   :4.331
##  indian            : 1   Class :character   1st Qu.:6.693   1st Qu.:7.490
##  latino            : 1   Mode  :character   Median :7.382   Median :7.957
##  white             :15                      Mean   :7.046   Mean   :7.582
##  white non-hispanic: 2                      3rd Qu.:7.695   3rd Qu.:8.387
##                                             Max.   :8.268   Max.   :9.449
##                                             NA's   :2       NA's   :2
##    hand.elbow     elbow.armpit      arm.reach      foot.length
##  Min.   :15.16   Min.   : 7.874   Min.   :14.96   Min.   : 8.504
##  1st Qu.:16.93   1st Qu.: 9.081   1st Qu.:78.36   1st Qu.: 9.646
##  Median :17.35   Median :10.207   Median :85.62   Median :10.236
##  Mean   :17.42   Mean   :11.171   Mean   :75.94   Mean   :10.166
##  3rd Qu.:18.23   3rd Qu.:11.811   3rd Qu.:90.38   3rd Qu.:10.384
##  Max.   :19.29   Max.   :26.500   Max.   :94.49   Max.   :12.205
##  NA's   :4       NA's   :4        NA's   :4       NA's   :4
##  floor.kneepit    floor.hip      floor.armpit     my.units
##  Min.   :15.47   Min.   :32.28   Min.   :40.94   Length:22
```

```
##  1st Qu.:17.72   1st Qu.:38.15   1st Qu.:51.62   Class :character
##  Median :18.25   Median :39.76   Median :52.82   Mode  :character
##  Mean   :18.39   Mean   :39.52   Mean   :53.20
##  3rd Qu.:19.24   3rd Qu.:41.03   3rd Qu.:56.69
##  Max.   :20.87   Max.   :44.49   Max.   :59.06
##  NA's   :4       NA's   :4       NA's   :4
##  my.ethnicity        my.gender          new.units            my.eye
##  Length:22          Length:22          Length:22          Length:22
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##   my.writing         my.swinging        my.eye.color
##  Length:22          Length:22          Length:22
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
##
##
##
##
```

Below is the code to generate the summary statistics and save them as a table that you see in Section ??.

```
# measureExample2 = measureExample[, (4:8)];
#
# colnames(measureExample2) = c("height", "headH", "headC", "handL.l", "handL.r");
#
# my.M = colMeans(measureExample2); #mean
# # my.SD =  ??? how are you going to get this data?
#
# my.SD = abs( rnorm(ncol(measureExample2), mean=13, sd = 1) );  # this is intentionally not correct ..
#
#
# library(Hmisc);
#
# my.corr = rcorr( as.matrix(measureExample2), type="pearson"); #r correlations, the count for each, & p
#
# str(my.corr);
#
# my.corr.r = my.corr$r;
# my.corr.pval = my.corr$P;
#
# # we have long variable names, we may want to create a dictionary that shortens them, and build an ap
#
# # the appendix should have the handout, the data collection process outlined, the data provenance pro
#
# my.corr.r.2 = round(my.corr.r,2);
# my.corr.p.3 = as.numeric( round(my.corr.pval,3) ); # flatten
#
# cuts = c(0.10, 0.05, 0.01, 0.001);
# symb = c("+", "*", "**", "***");
```

```
#
# my.corr.p.3.symb = "";
# my.corr.p.3.symb[is.na(my.corr.p.3)] = "";
# my.corr.p.3.symb[my.corr.p.3 <= 0.10] = "+";
# my.corr.p.3.symb[my.corr.p.3 <= 0.05] = "*";
# my.corr.p.3.symb[my.corr.p.3 <= 0.01] = "**";
# my.corr.p.3.symb[my.corr.p.3 <= 0.001] = "***";
#
# my.corr.p.3.symb;
#
# include.diag = FALSE;  # the 1's on the diagonal are not included
# # this is a lower triangular form ...
#
# char.matrix = as.character(my.corr.r.2);
#
#
# my.matrix = matrix(
#                 paste0(char.matrix, my.corr.p.3.symb),
#                 nrow=ncol(measureExample2));
# my.matrix;
```

ENDNOTES

[1] This is a footnote that can be really long.
You can have multiple paragraphs in the footnote. You can have <u>underline</u> or **bold** or *italics*. You can even have a math equation inline.
In this section, we review the regression results to summarize our findings. First, we examine each model for significance, and conclude the hypothesized models fit well with the data. Second, we conclude that the fixed country effects represent consistent and unbiased parameter estimates. Third, with the use of the Driscoll and Kraay (1998) robust standard errors, we adjust any variance bias to ascertain the significance of these consistent estimates. Therefore, we are able to make inferences about the hypotheses using our model estimates. For ease of interpretation across these 12 models, we introduce ${}^{\text{M1}}_{\text{Total}}\hat{\beta}_1$ as notation to refer to parameter estimate $\hat{\beta}_1$ (HDI) for the Total Sample and (M1) Model 1: Main Effects. We proceed by reporting findings for the total sample.
The footnotes are automatically converted to "endnotes" and will be included at the end of the document. It will finish when you have that outer brace like this.

REFERENCES

Becker, Richard A, John M Chambers, Allan R Wilks. 1988. *The New S Language*. Wadsworth & Brooks.

Driscoll, John C., Aart C. Kraay. 1998. Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics* **80**(4), 549–560.

Hsiao, Cheng. 2003. *Analysis of Panel Data*. 2nd ed. Cambridge, United Kingdom: Cambridge University Press.

Thomas, Diana M, David Galbreath, Maura Boucher, Krista Watts. 2020. Revisiting Leonardo da Vinci's Vitruvian Man Using Contemporary Measurements. *JAMA* **323**(22), 2342–2343.

Tukey, John W. 1962. The Future of Data Analysis. *The Annals of Mathematical Statistics* **33**(1), 1–67.

Tukey, John W. 1977. *Exploratory Data Analysis*. 1st ed. Reading, MA.

Wooldridge, Jeffrey. 2006. *Introductory Econometrics: A Modern Approach*. Boston, MA: Cengage Learning.

TABLE OF CONTENTS