Data Visualization With Stata

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Introduction

- Stata is a powerful and intuitive data analysis program.
- Learning how to graph in Stata is an important part of learning how to use Stata. Yet, the default graphs in Stata can sometimes be less than optimal.
- This document is an introduction to (a) basic graphing ideas in Stata; and (b) a quick note on the use of schemes to make your Stata graphs look more professional.

What are Variables?

- By variables, I simply mean the columns of data that you have.
- For our purposes, you may think of variables as synonymous with questionnaire items, or columns of data.

Variable Types

- *Categorical variables* represent unordered categories like *race*, *ethnicity*, *neighborhood*, *religious affiliation*, or *place of residence*.
- *Continuous variables* represent a continuous scale like *income*, a *mental health scale*, or a *measure of life expectancy*.

A Data Visualization Strategy

Once we have discerned the type of variable that have, there are two followup questions we may ask before deciding upon a graphing strategy:

- Is our graph about **one thing at a time**?
  - How much of x is there?
  - What is the distribution of x?
- Is our graph about **two things at a time**?
  - What is the relationship of x and y?
  - How are x and y associated?

Figure 1: Norway Spruce and Larch Forest in Austrian Alps

Data Source

Image Source: https://ec.europa.eu/jrc/en/research-topic/forestry/qr-tree-project/norway-spruce

The data used in this example are derived from the R package *Functions and Datasets for "Forest Analytics with R"*.

According to the documentation, the source of these data are: "von Guttenberg's Norway spruce (Picea abies [L.] Karst) tree measurement data."

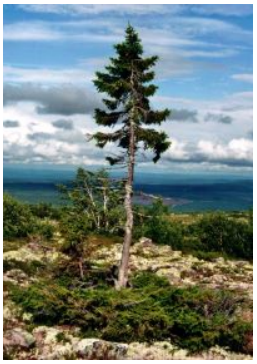

Figure 2: Old Tjikko, a 9,550 Year Old Norway Spruce in Sweden

The documentation goes on to further note that:

> "The data are measures from 107 trees. The trees were selected as being of average size from healthy and well stocked stands in the Alps."

```
. use "https://github.com/agrogan1/newstuff/raw/master/data-visualization-with
> -Stata/gutten.dta", clear
```

Variables

`site` Growth *quality* class of the tree's habitat. 5 levels.

`location` Distinguishes tree *location*. 7 levels.

`tree` An identifier for the tree within location.

`age_base` The tree age taken at ground level.

> For some purposes, it might be best to use a centered age variable, centered at the grand mean of tree age:

```
. egen ageMEAN = mean(age_base)

. generate ageCENTERED = age_base - ageMEAN
```

`height` Tree height, m.

`dbh_cm` Tree diameter, cm.

`volume` Tree volume.

`age_bh` Tree age taken at 1.3 m.

`tree.ID` A factor uniquely identifying the tree.

Graphs

One Continuous Thing At A Time

```
. histogram height, title("Tree Height")
(bin=30, start=1.5, width=1.4)

. graph export myhistogram.png, width(500) replace
(file myhistogram.png written in PNG format)
```

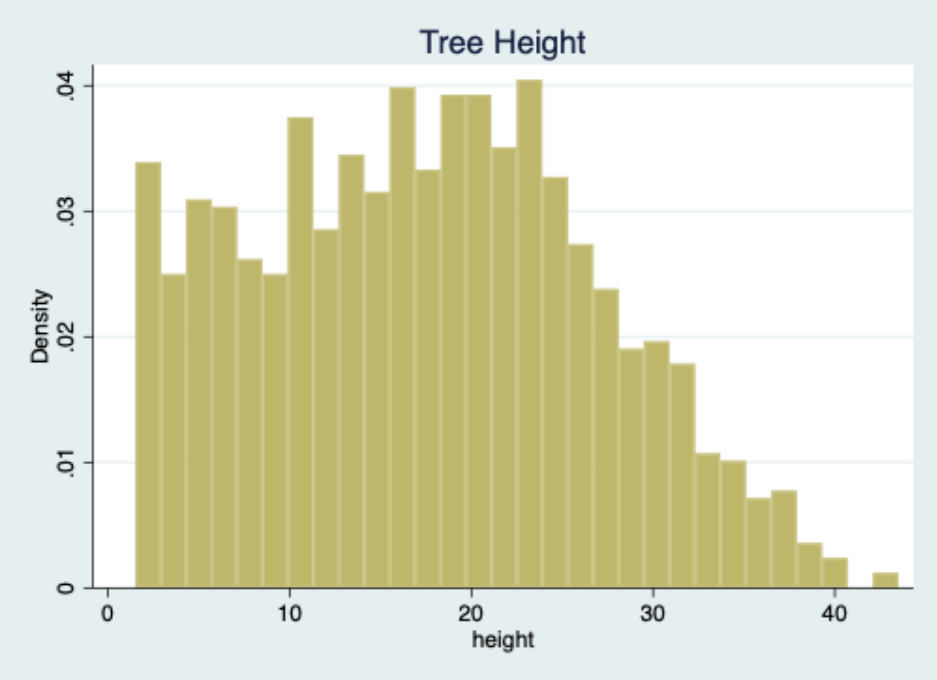

Figure 3: Histogram Of Tree Height

One Categorical Thing At A Time

```
. graph bar, over(location) title("Tree Location")

. graph export mybargraph.png, width(500) replace
(file mybargraph.png written in PNG format)
```

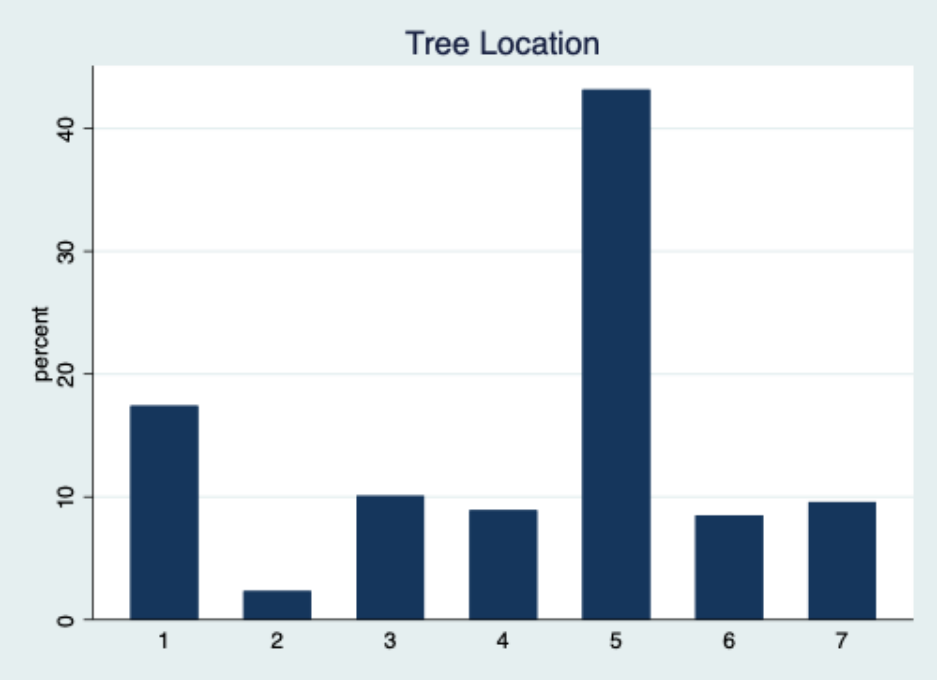

Figure 4: Bar Graph Of Tree Location

Continuous by Continuous

```
. twoway scatter height age_base, title("Tree Height by Age")

. graph export myscatter.png, width(500) replace
(file myscatter.png written in PNG format)
```

Categorical by Categorical

```
. graph bar, over(site) over(location) title("Tree Site Growth Quality by Loca
> tion")

. graph export mybargraph2.png, width(500) replace
(file mybargraph2.png written in PNG format)
```

Continuous by Categorical

```
. graph bar height, over(location) title("Tree Height by Location")

. graph export mybargraph3.png, width(500) replace
(file mybargraph3.png written in PNG format)
```

Schemes

Stata *graph schemes* can substantially improve the look of a graph. Built in graph schemes include `sj` and `economist` and `s1rcolor`.

Figure 5: Scatterplot Of Tree Height By Age

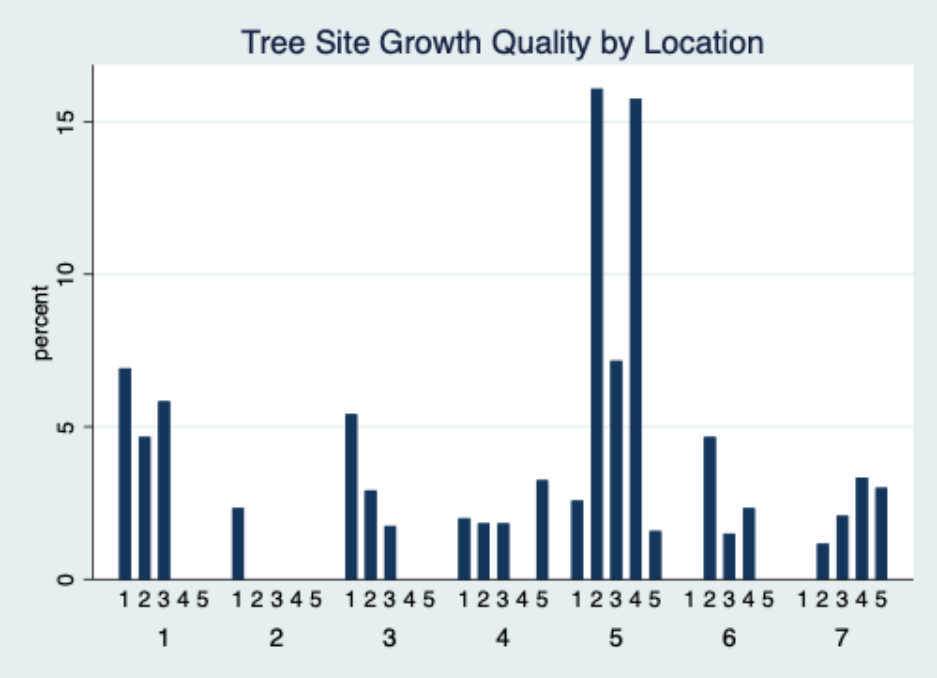

Figure 6: Bar Graph Of Tree Site By Location

Figure 7: Bar Graph Of Mean Tree Height By Location

`lean2` (type `findit lean2` in the Stata Command Window) is a user written scheme that is very helpful when preparing graphics for publication. I have written a Stata Michigan graph scheme that can be installed. `burd` is another user written graph scheme that *somewhat* replicates the look of `ggplot`.

Continuous by Continuous

```
. twoway scatter height age_base, title("Tree Height by Age") scheme(michigan)

. graph export myscatterM.png, width(500) replace
(file myscatterM.png written in PNG format)

. twoway scatter height age_base, title("Tree Height by Age") scheme(lean2) ms
> ymbol(o)

. graph export myscatterL.png, width(500) replace
(file myscatterL.png written in PNG format)

. twoway scatter height age_base, title("Tree Height by Age") scheme(s1rcolor)

. graph export myscatterS.png, width(500) replace
(file myscatterS.png written in PNG format)

. twoway scatter height age_base, title("Tree Height by Age") scheme(burd) msy
> mbol(o)

. graph export myscatterB.png, width(500) replace
(file myscatterB.png written in PNG format)
```

Continuous by Categorical

Note that in the graph below, I have used the `asyvars` option to give different colors to the different bars.

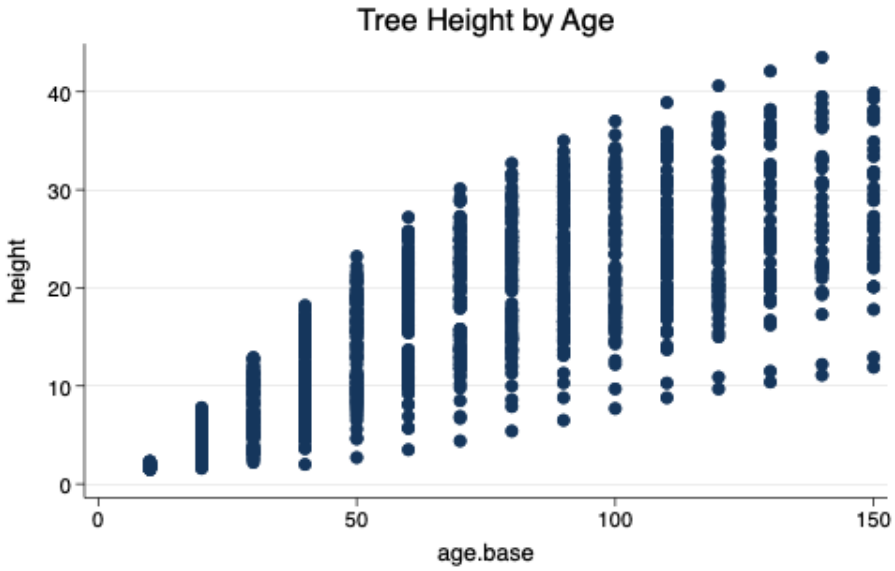

Figure 8: Scatterplot Of Tree Height By Age With Michigan Graph Scheme

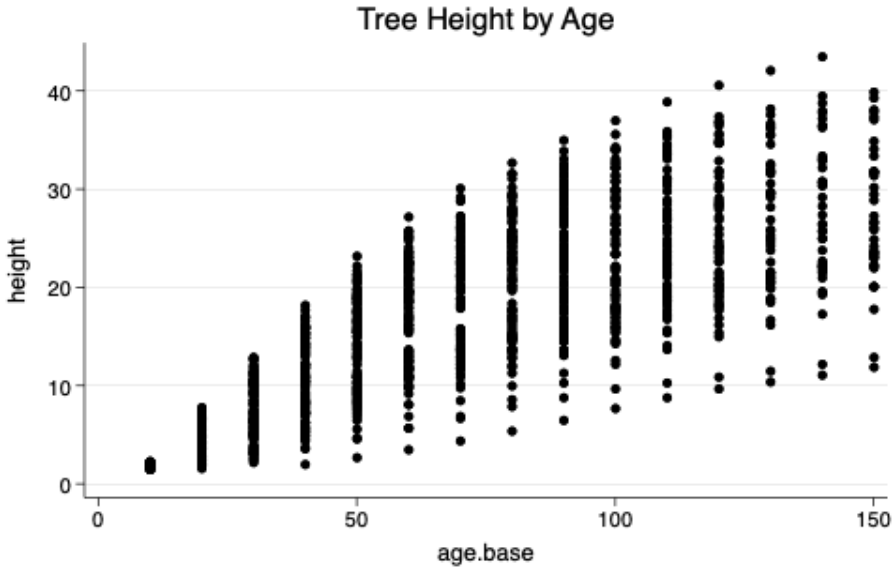

Figure 9: Scatterplot Of Tree Height By Age With lean2 Graph Scheme

Figure 10: Scatterplot Of Tree Height By Age With s1rcolor Graph Scheme

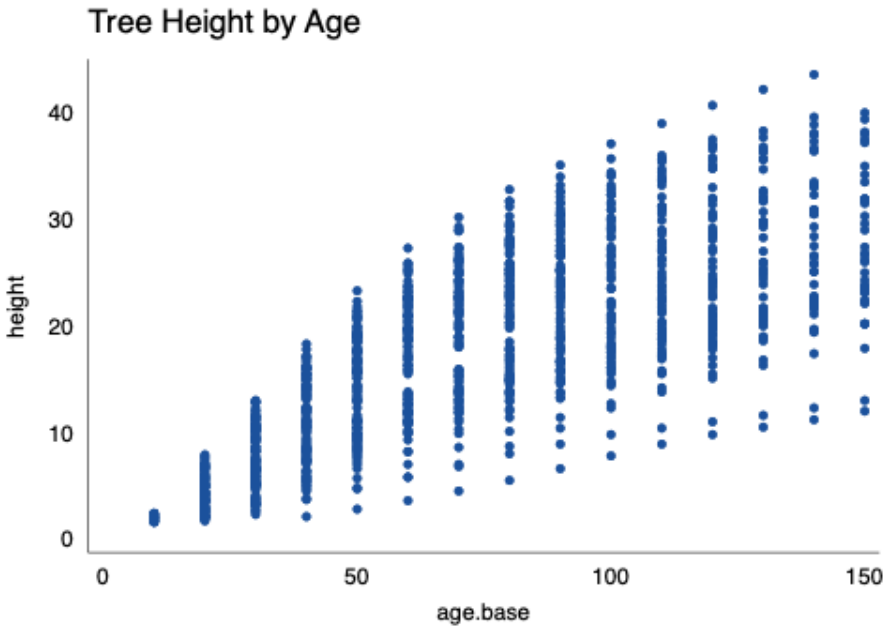

Figure 11: Scatterplot Of Tree Height By Age With burd Graph Scheme

```
. graph bar height, over(location) asyvars title("Tree Height by Location") sc
> heme(michigan)

. graph export mybarM.png, width(500) replace
(file mybarM.png written in PNG format)
```

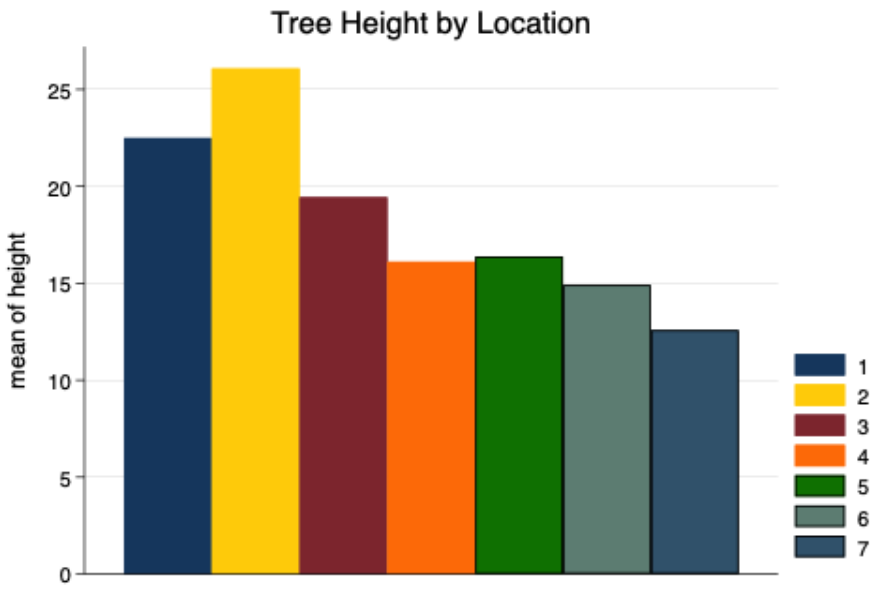

Figure 12: Bar Graph Of Mean Tree Height By Location With Michigan Graph Scheme

```
. graph bar height, over(location) asyvars title("Tree Height by Location") sc
> heme(lean2)

. graph export mybarL.png, width(500) replace
(file mybarL.png written in PNG format)

. graph bar height, over(location) asyvars title("Tree Height by Location") sc
> heme(s1rcolor)

. graph export mybarS.png, width(500) replace
(file mybarS.png written in PNG format)

. graph bar height, over(location) asyvars title("Tree Height by Location") sc
> heme(burd)

. graph export mybarB.png, width(500) replace
(file mybarB.png written in PNG format)
```

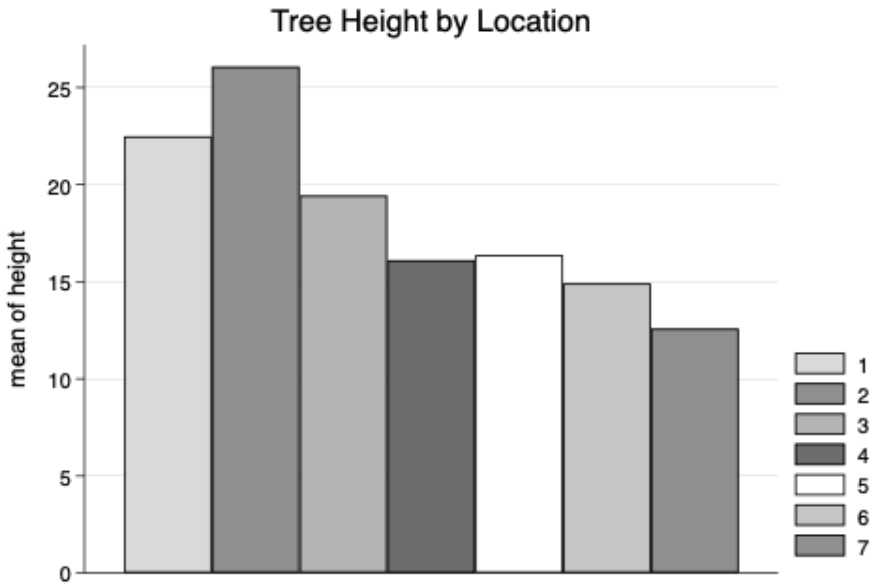

Figure 13: Bar Graph Of Mean Tree Height By Location With lean2 Graph Scheme

Figure 14: Bar Graph Of Mean Tree Height By Location With s1rcolor Graph Scheme

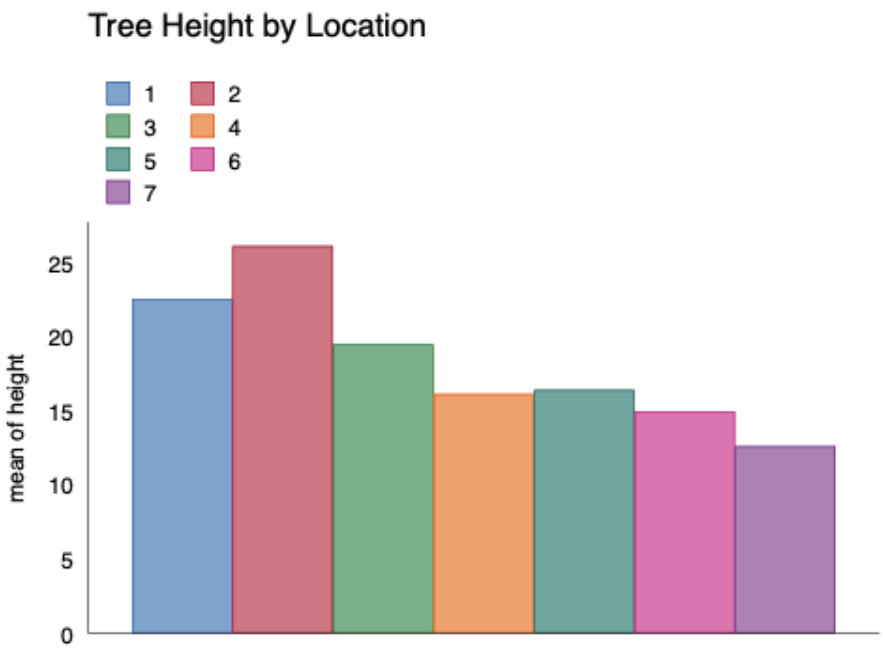

Figure 15: Bar Graph Of Mean Tree Height By Location With burd Graph Scheme