

Creating Effective Graphs with R

Multi-panel Graphs

17 June 2019

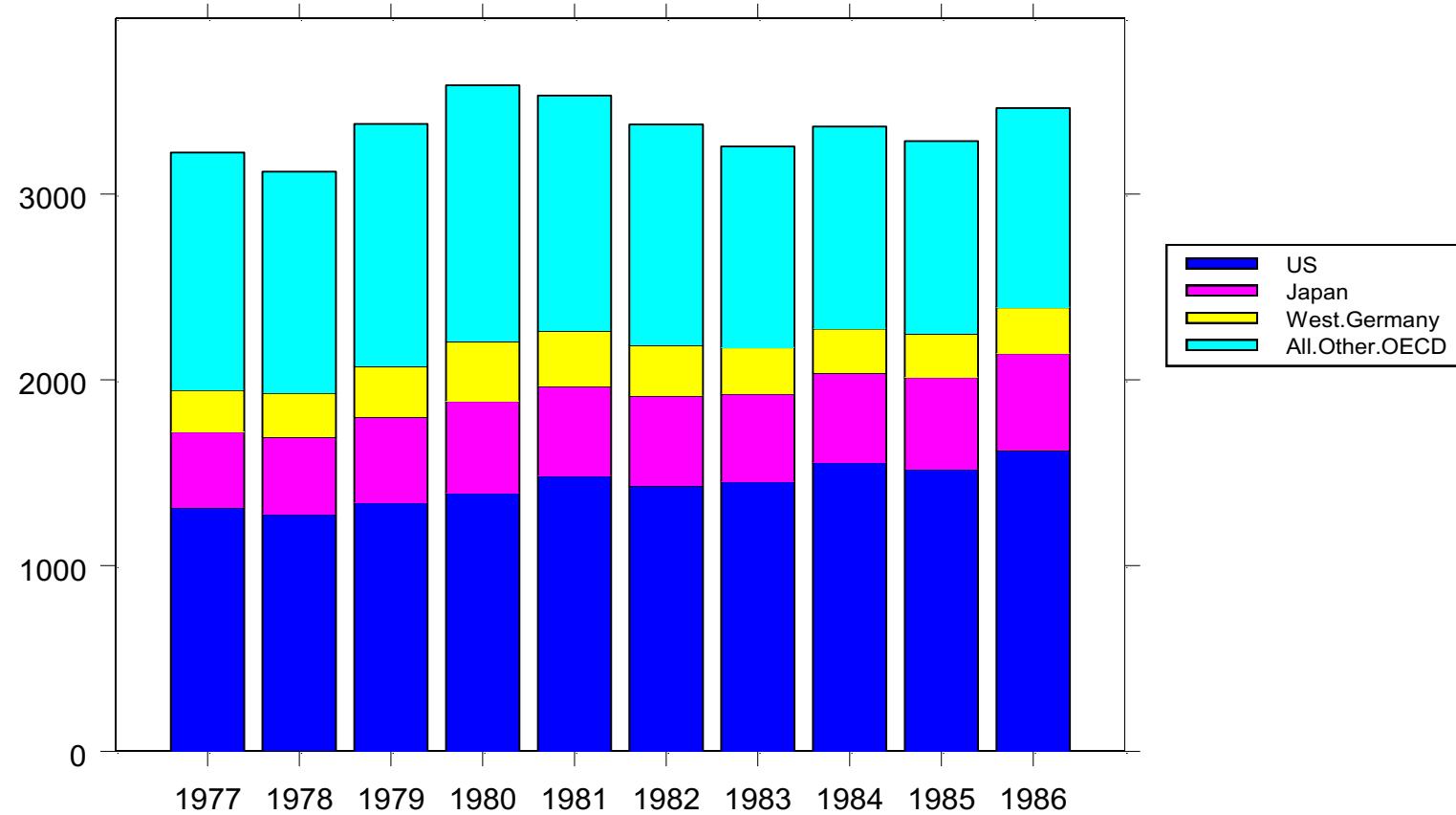
Copyright © 2019 Naomi B. Robbins

Multi-panel graphs

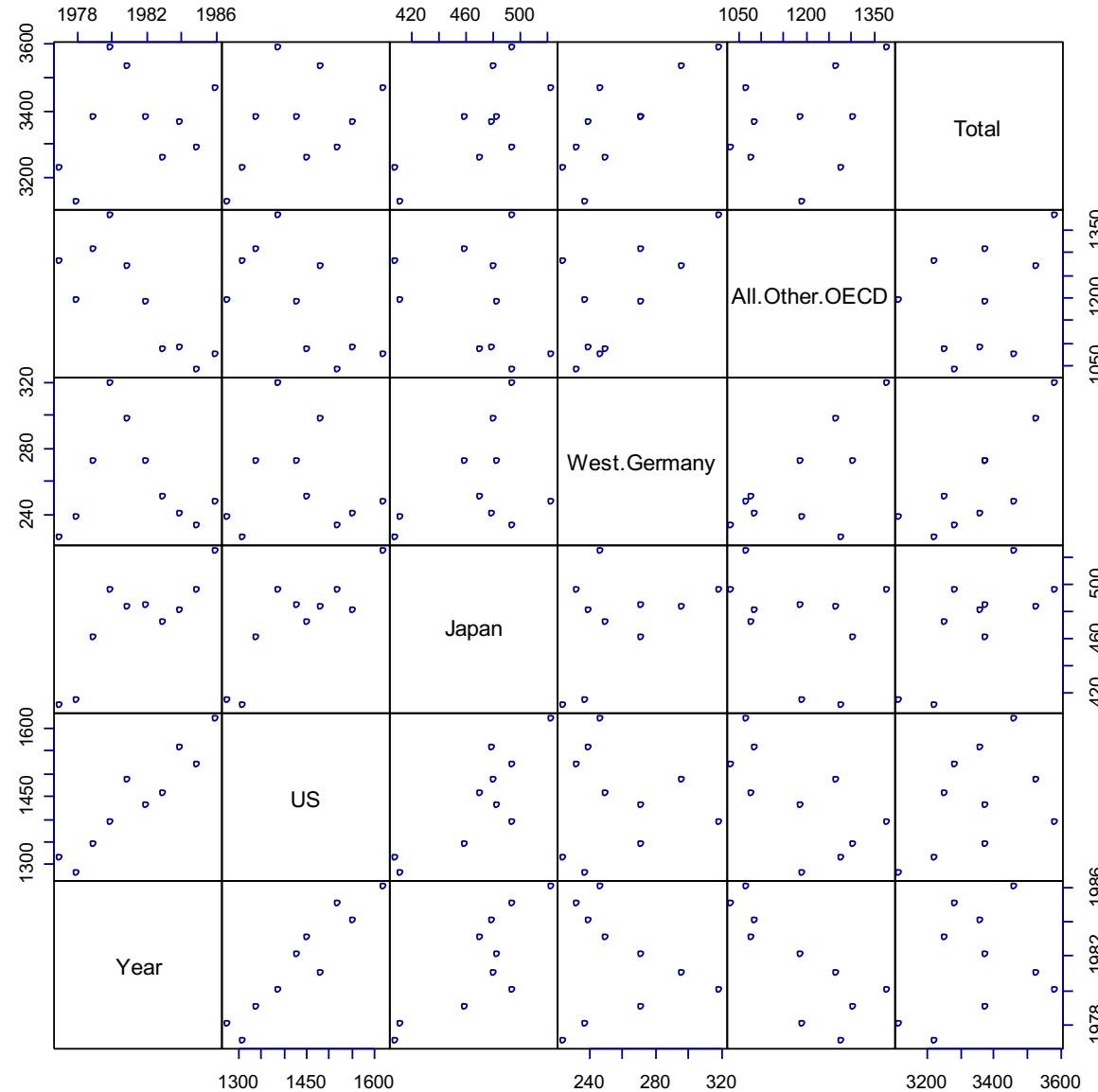
- Scatterplot matrices
- Trellis / faceting / small multiples / lattice /panel graphs
- One common scale
- Linked micromaps

Stacked Bar Chart: Petroleum Stocks

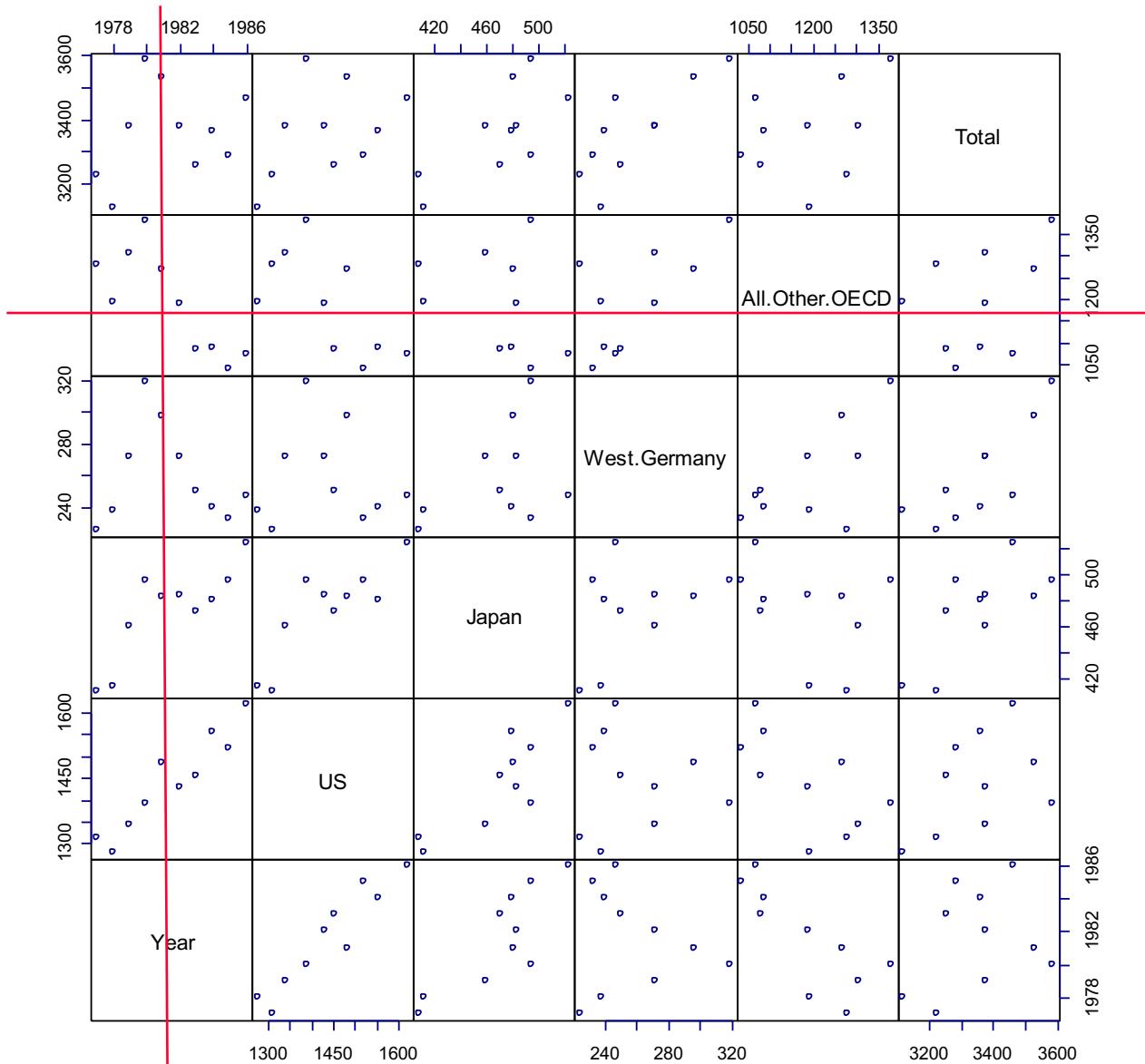
Millions of gallons



Scatterplot Matrix of Energy Data



Reading Scatterplot Matrix



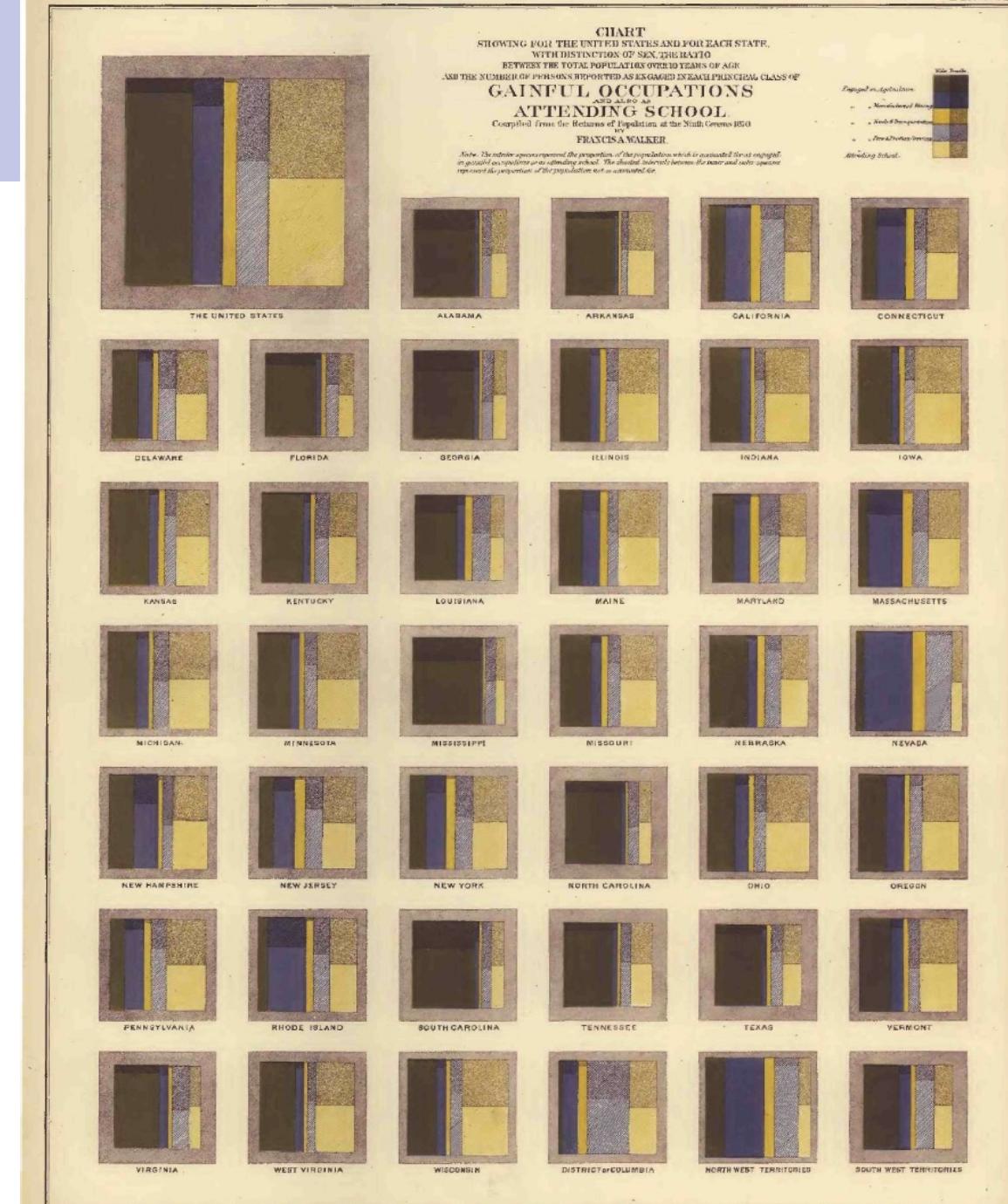
Multi-panel graphs

- Scatterplot matrices
- Trellis / faceting / small multiples / lattice /panel graphs
- One common scale
- Linked micromaps

1870 Census Data

Statistical Atlas of the United States

Persons with gainful occupations and attending school,
Walker (1874)

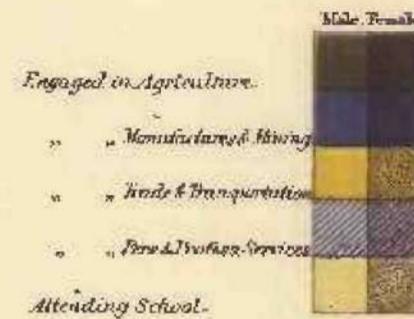


Top Enlarged

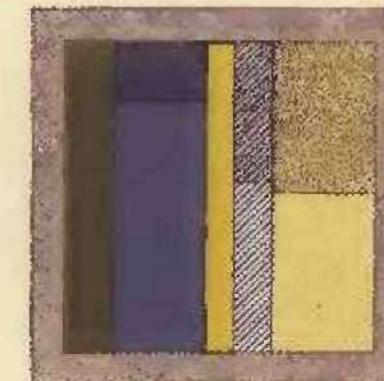
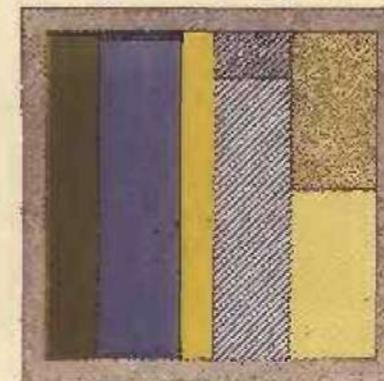
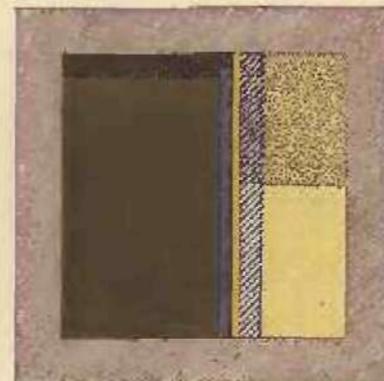
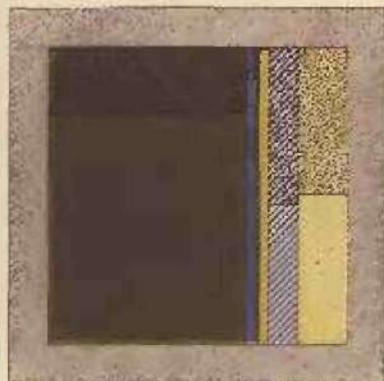
Pl. XXXII

CHART
SHOWING FOR THE UNITED STATES AND FOR EACH STATE,
WITH DISTINCTION OF SEX, THE RATIO
BETWEEN THE TOTAL POPULATION OVER 10 YEARS OF AGE
AND THE NUMBER OF PERSONS REPORTED AS ENGAGED IN EACH PRINCIPAL CLASS OF
GAINFUL OCCUPATIONS
AND ALSO AS
ATTENDING SCHOOL.
Compiled from the Returns of Population at the Ninth Census 1870
by
FRANCIS A. WALKER.

Note. The interior squares represent the proportion of the population which is accounted for as engaged in gainful occupations or as attending school. The shaded intervals between the inner and outer squares represent the proportion of the population not so accounted for.



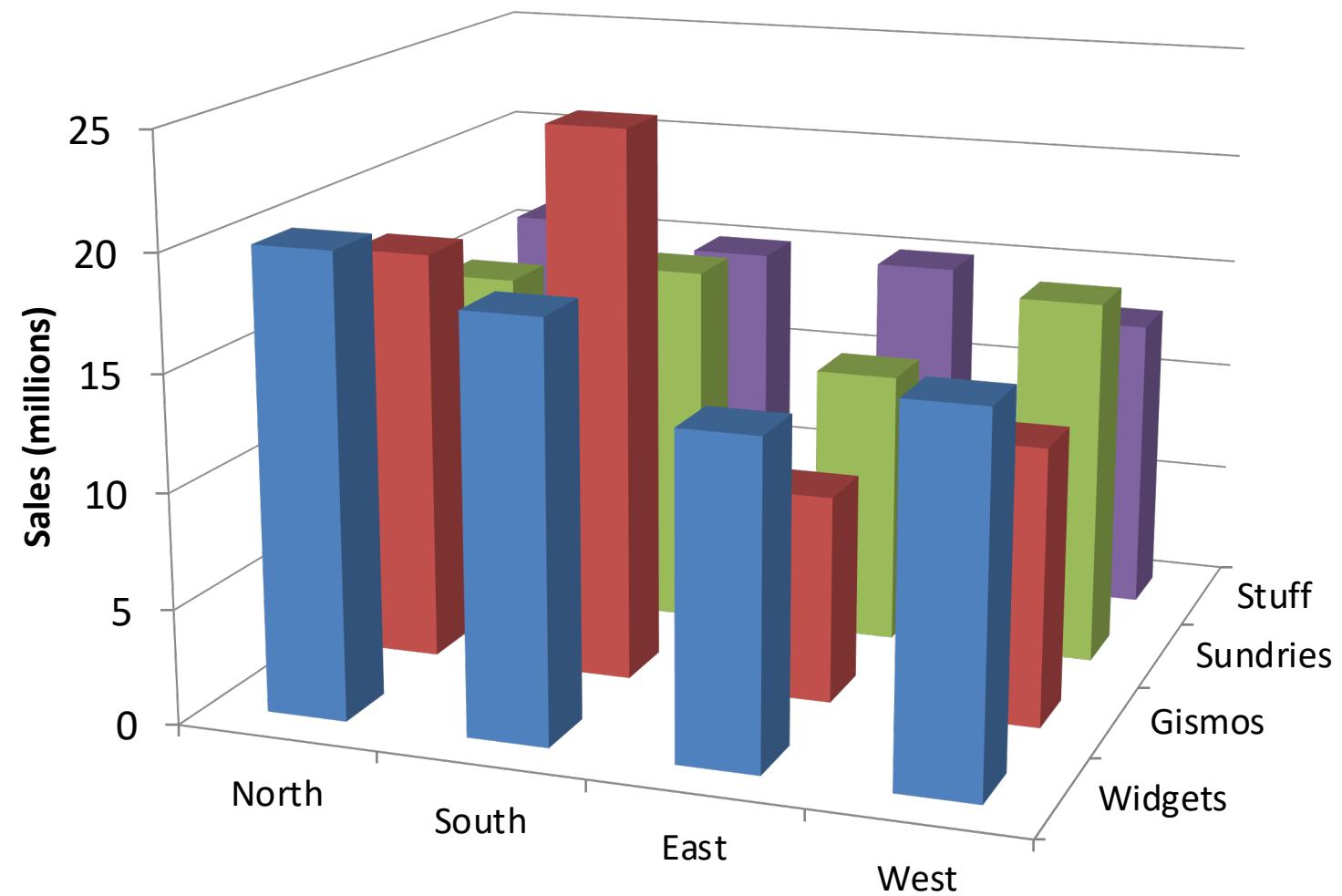
Attending School.



Terminology

- Multi-panel Plot: any plot with more than one panel.
- Small Multiples (Tufte): “a series of graphics, showing the same combination of variables, indexed by changes in another variable.” Tufte VDQI page 70
- Trellis Display or Faceted Graphs: Small multiples which often have structure imposed; e.g., ordering of panels.
 - Term trellis also used for a graphics system in S-Plus
 - Trellis thought to be trademarked by Tibco
 - Called lattice or faceted by R community
 - Called panel charts by Excel users

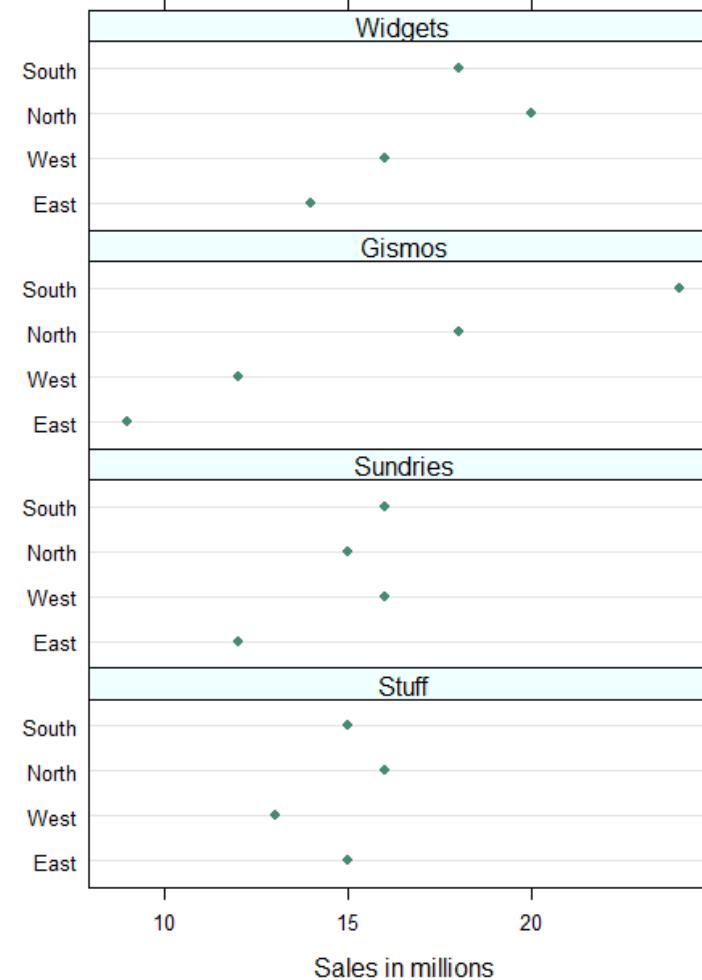
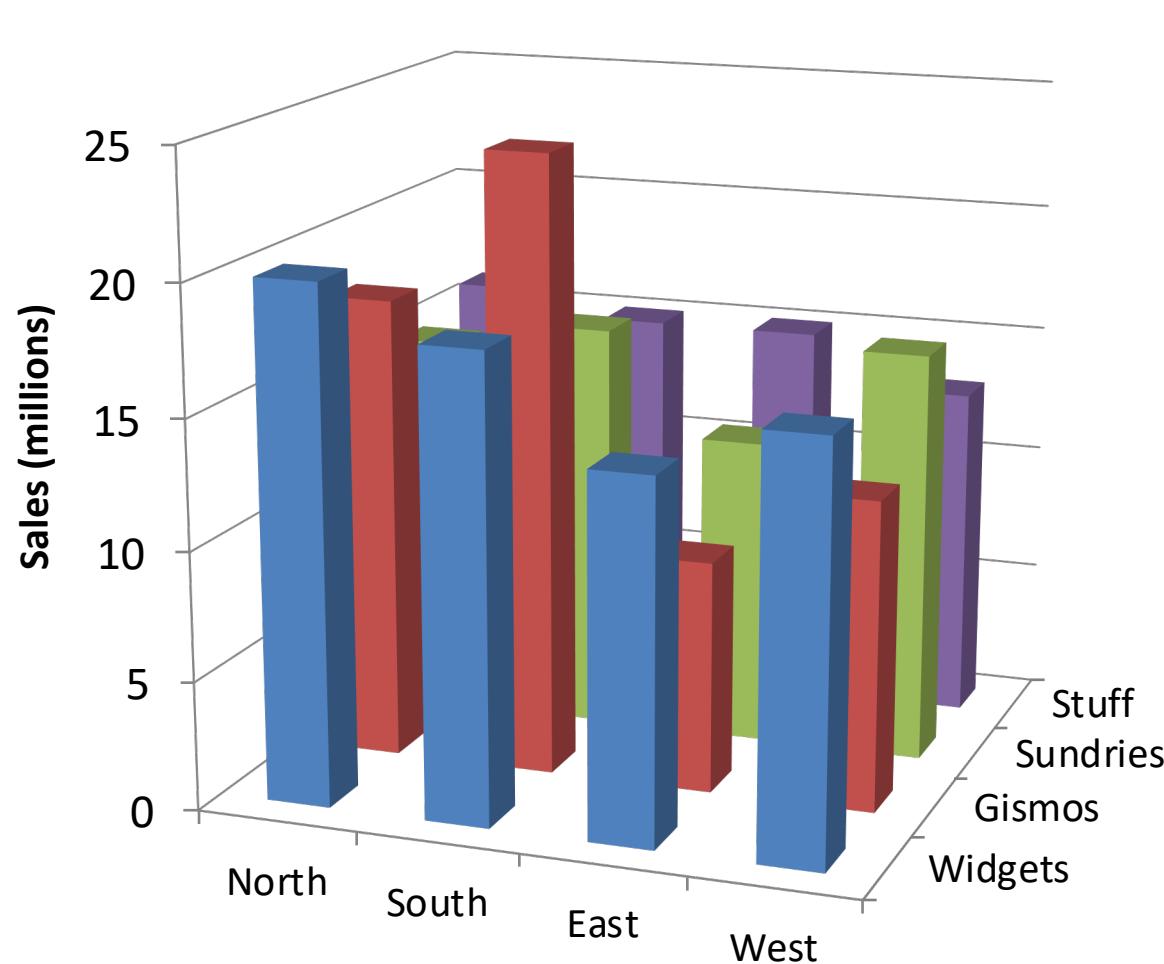
Before: 3-D Bar Chart



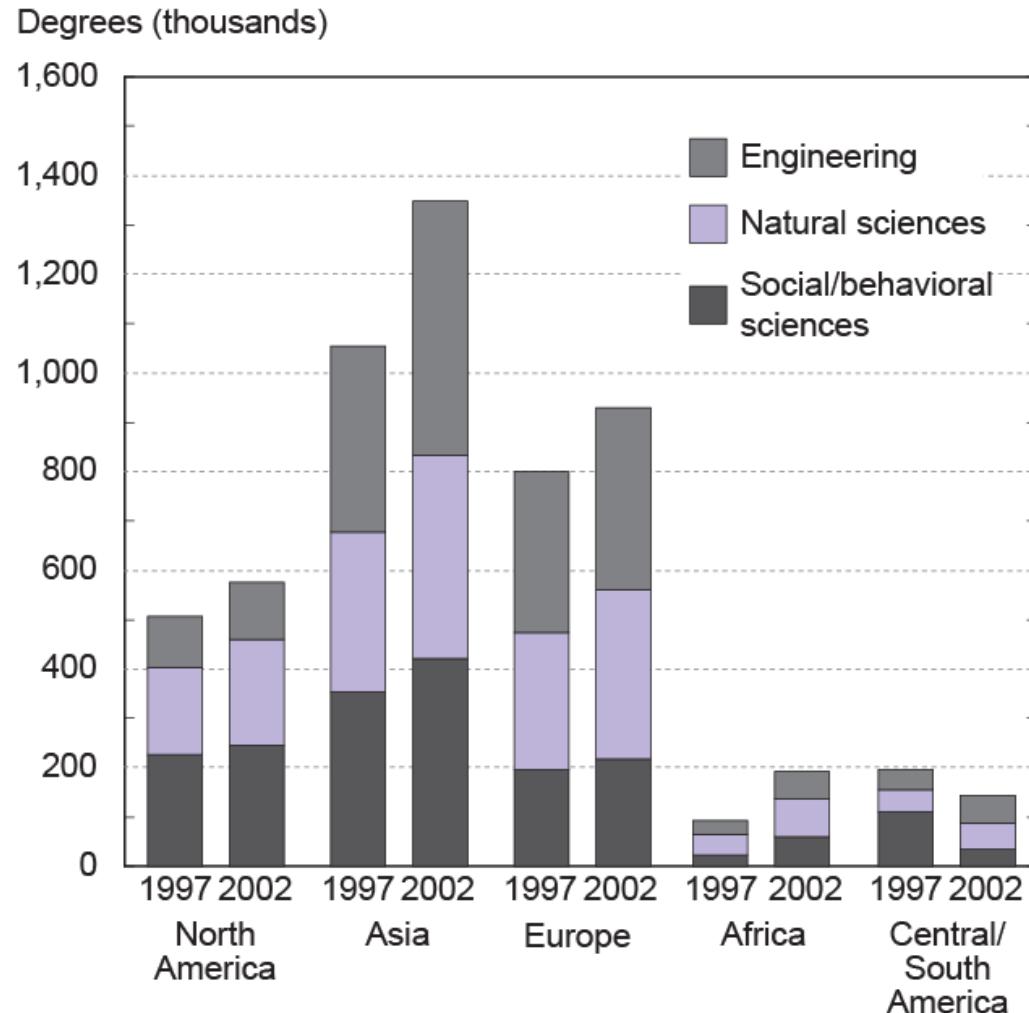
Trellis Display of Same Data



Comparison



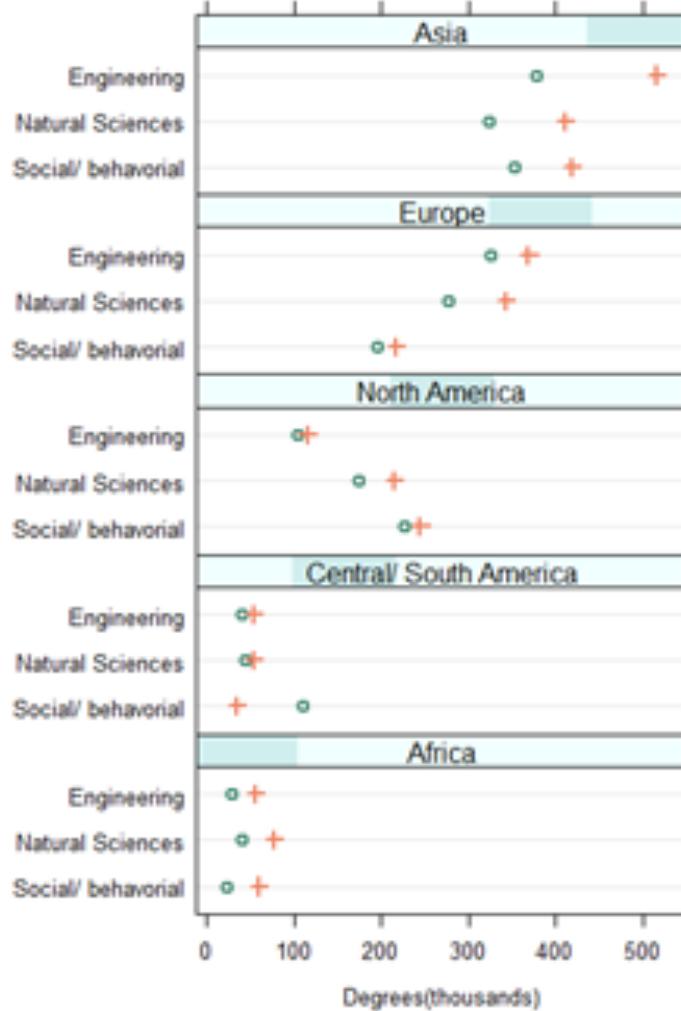
Before: Grouped and Stacked Bar Charts



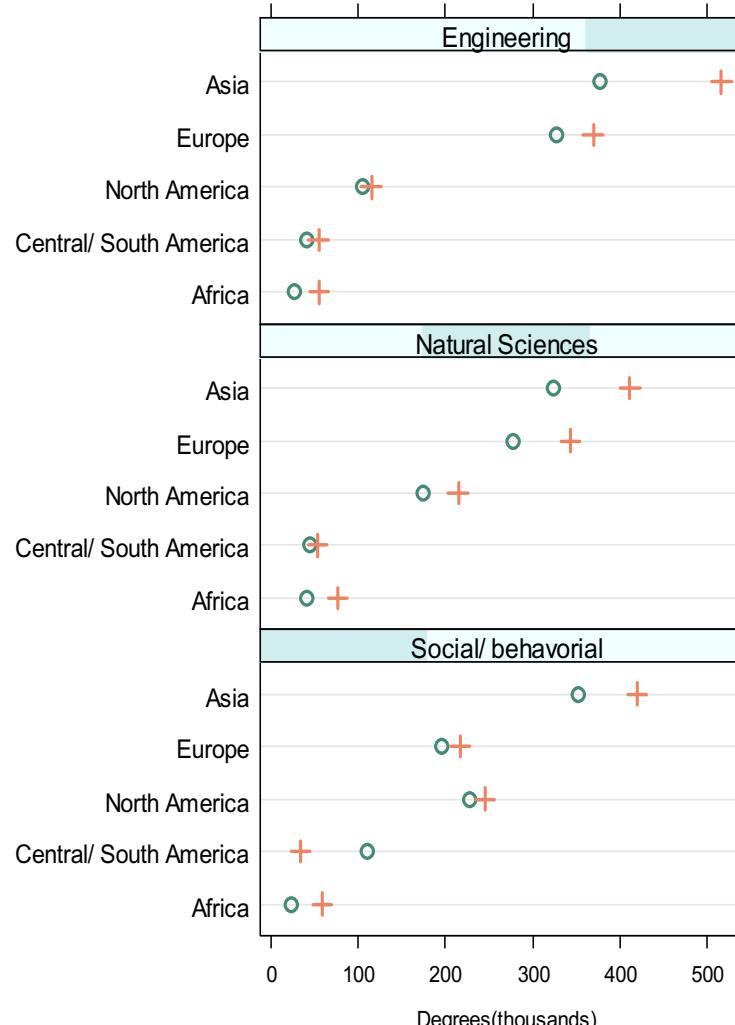
Source: National Science Foundation Science and Engineering Indicators 2006

Left and right plots emphasize different aspects of the data.

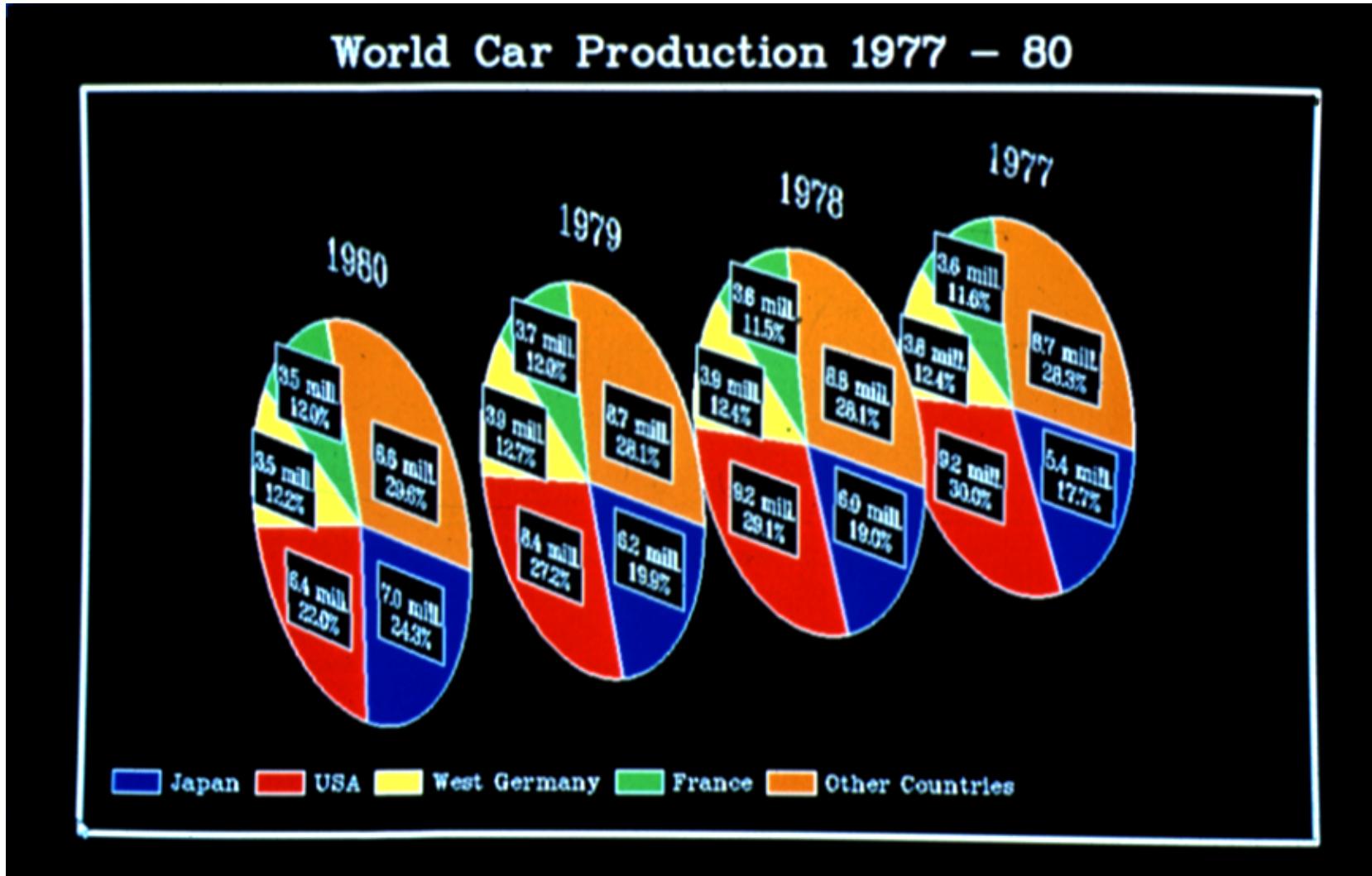
1997 ● 2002 +



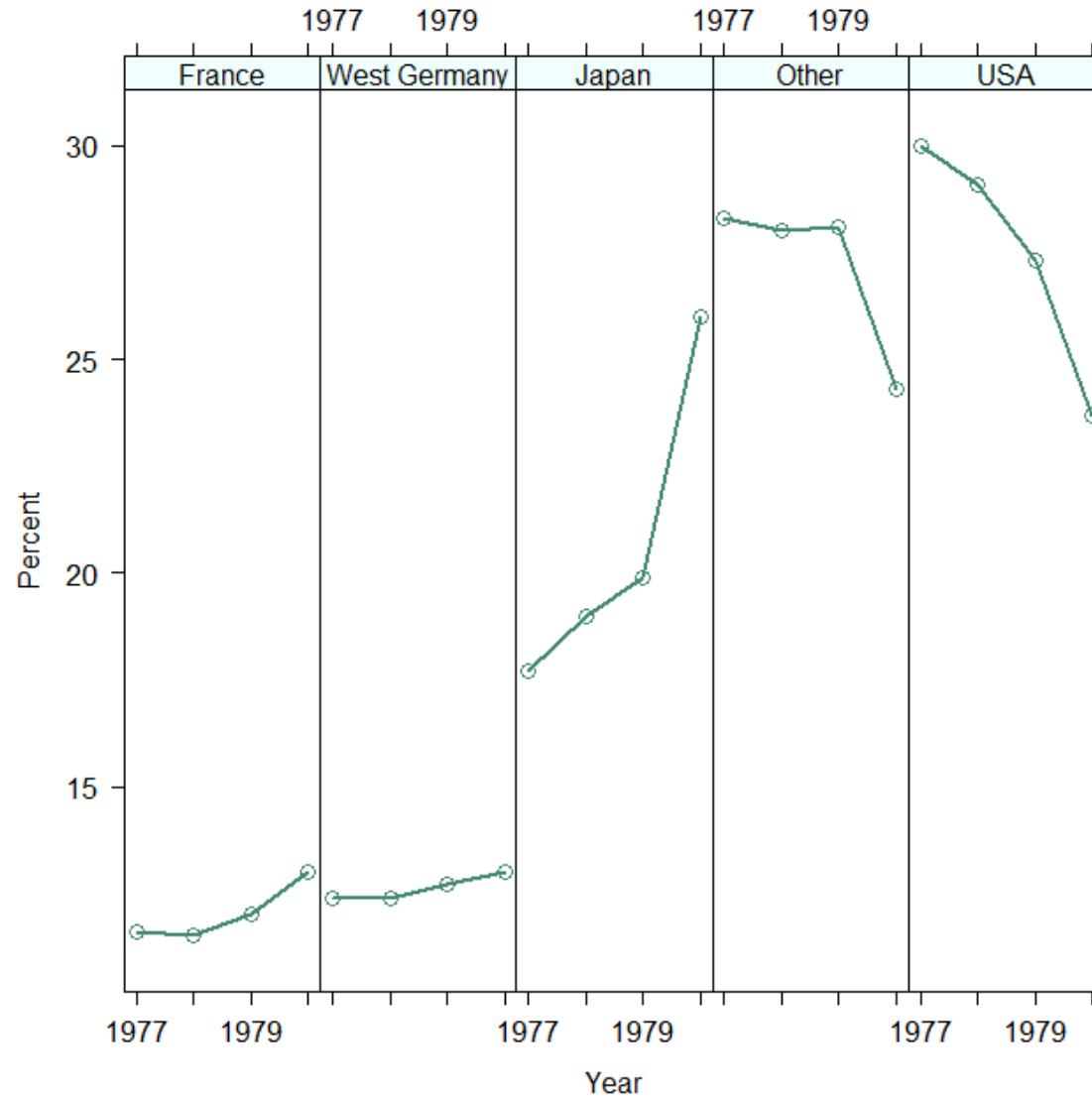
1997 ● 2002 +



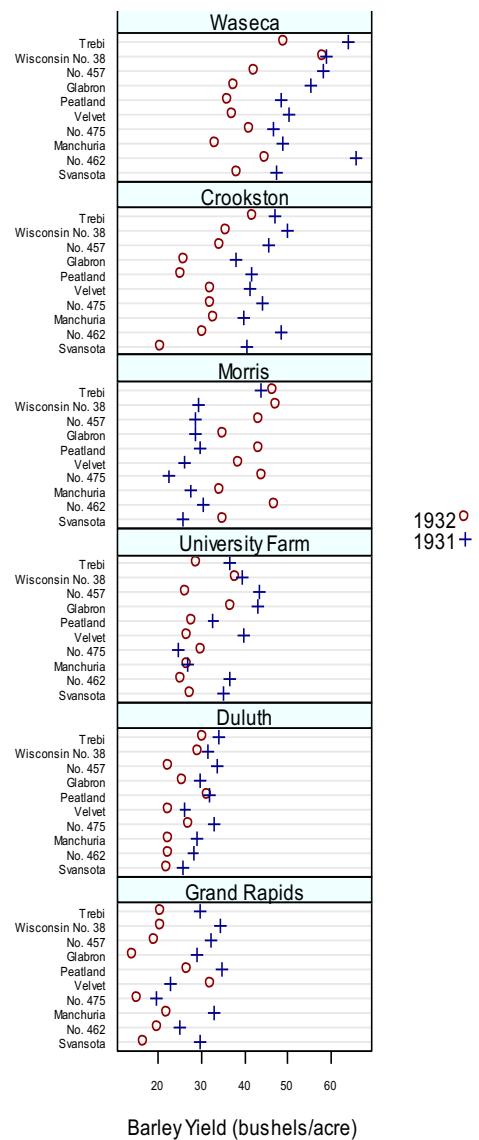
Before: Multiple Pie Charts



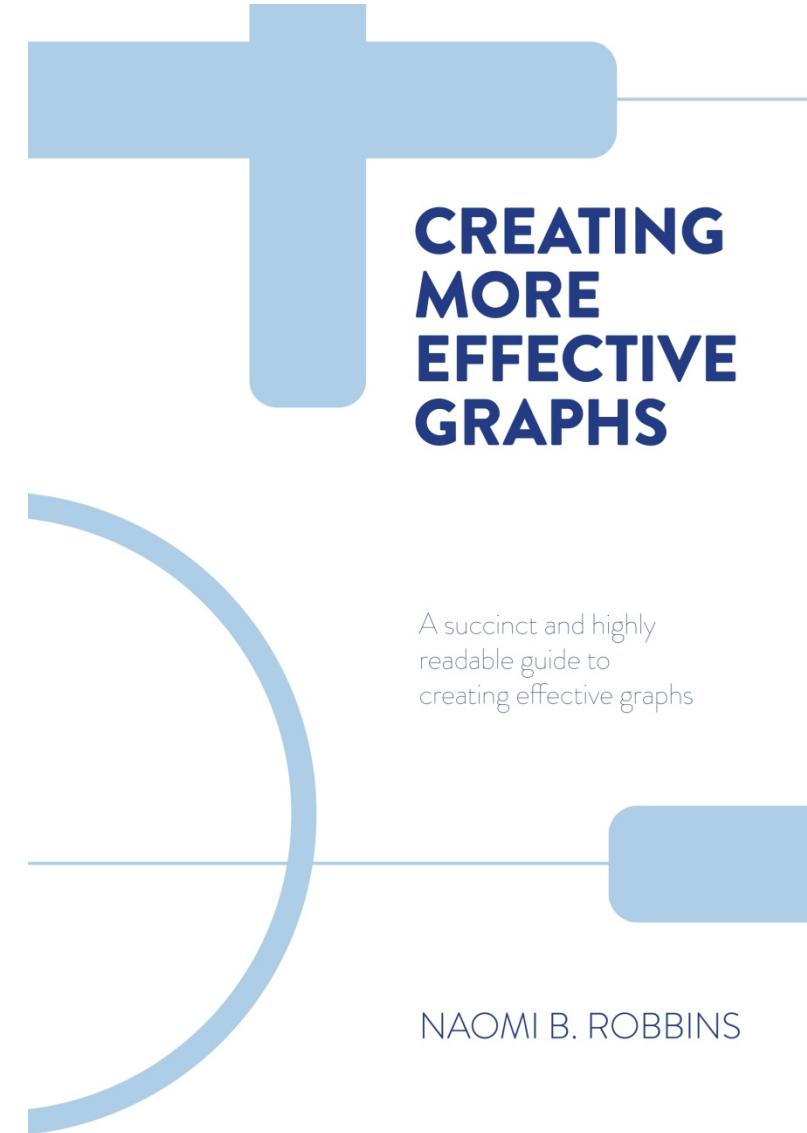
Trellis Display



Trellis Display: Barley Example

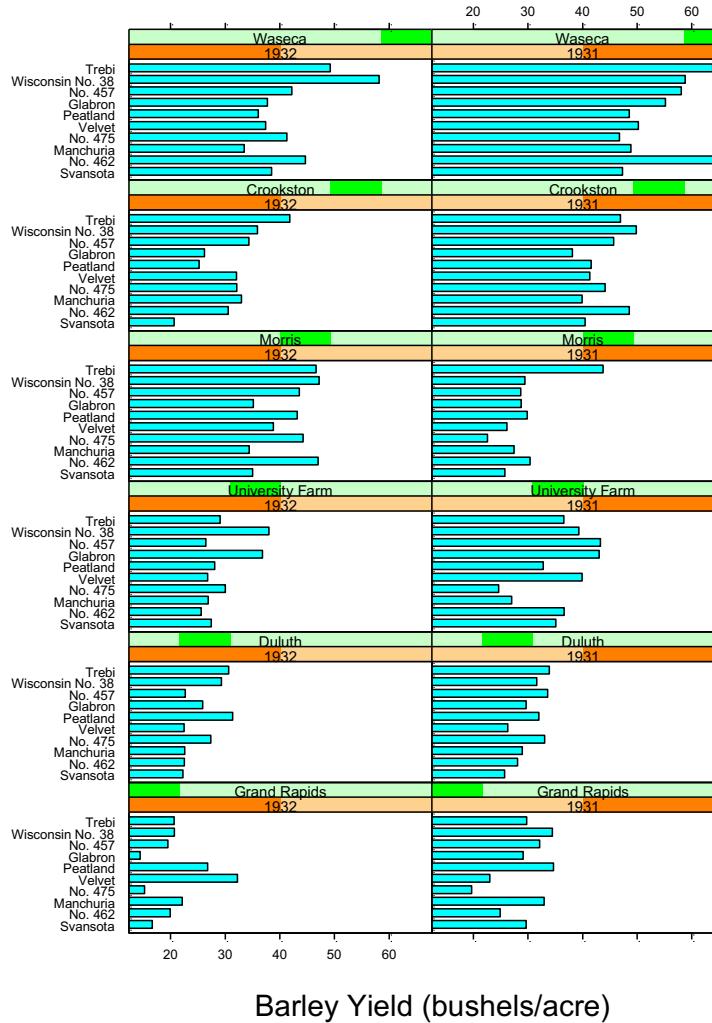


New Cover Design

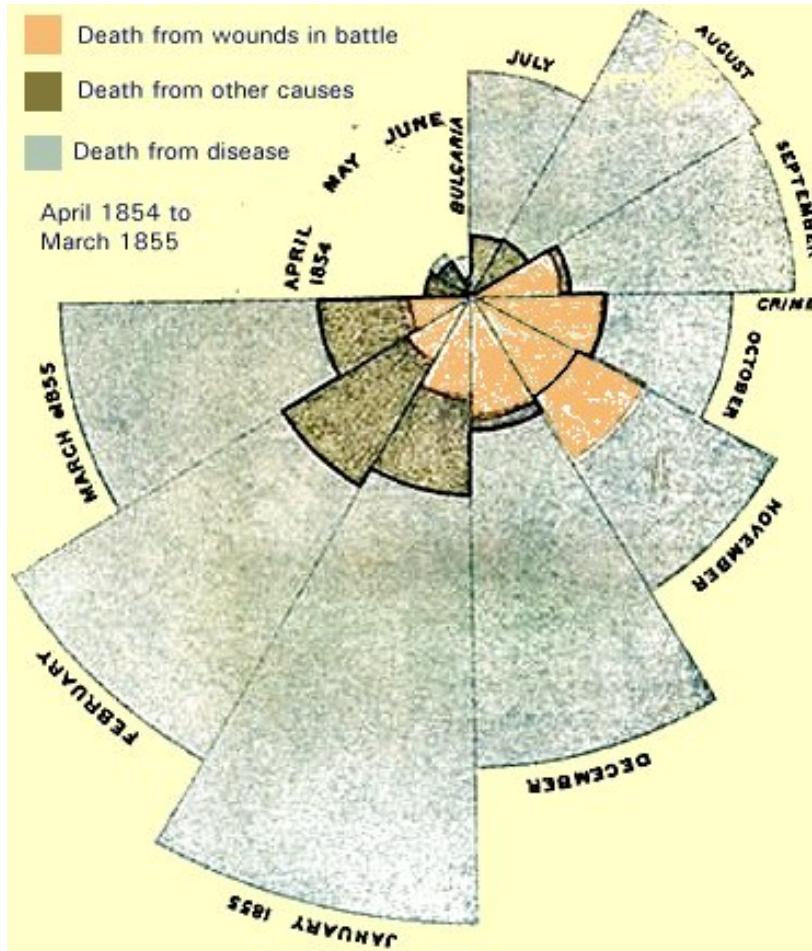


A succinct and highly
readable guide to
creating effective graphs

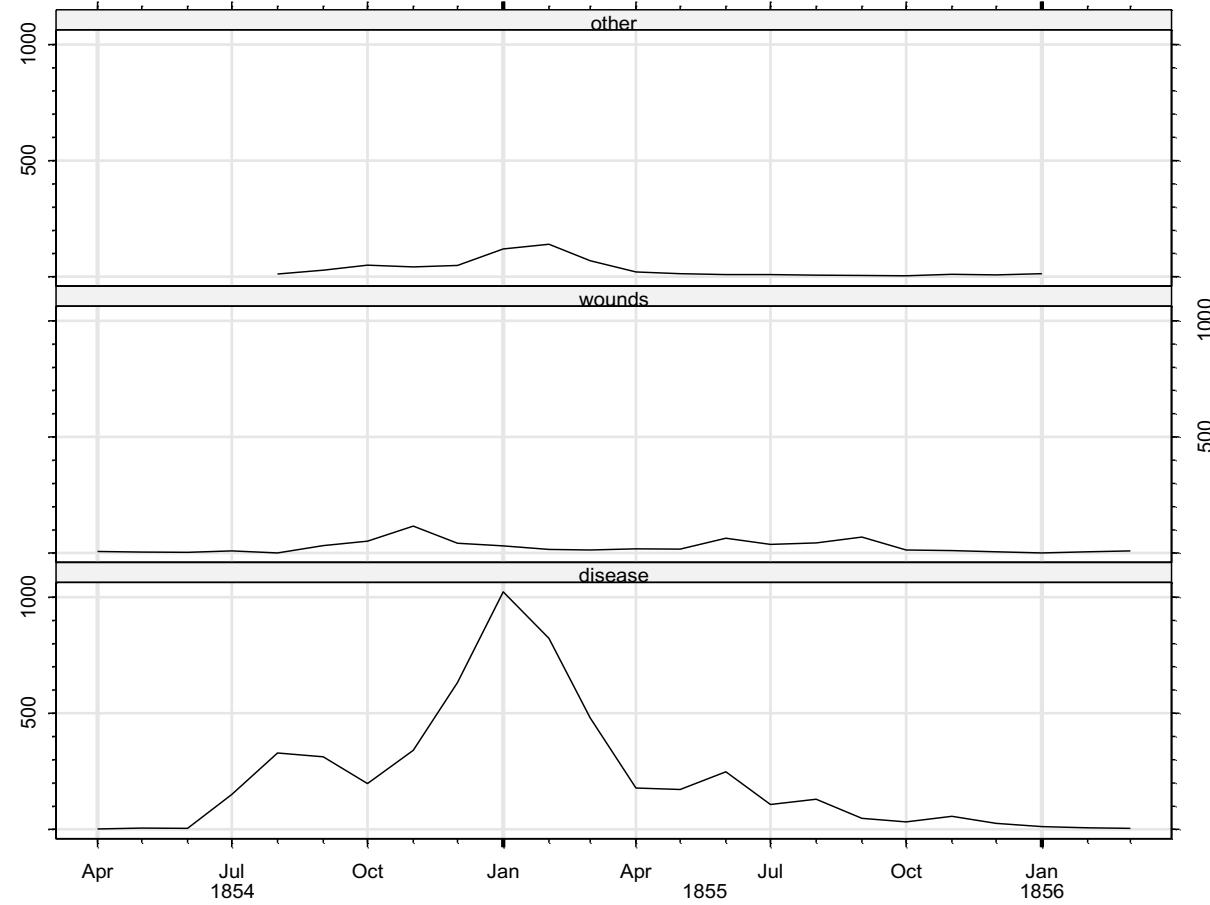
Trellis - Barley Example



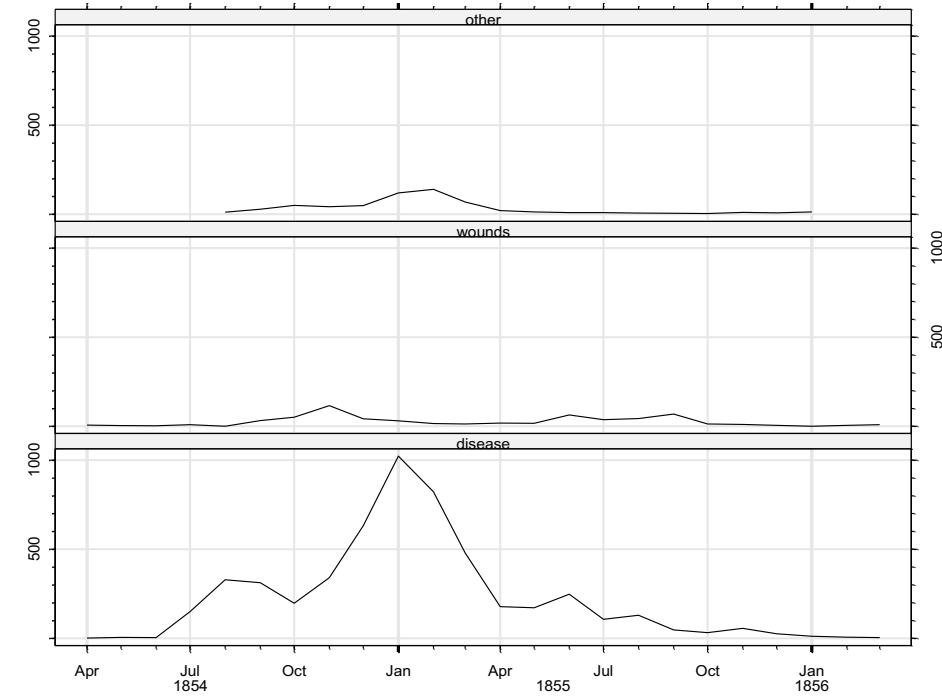
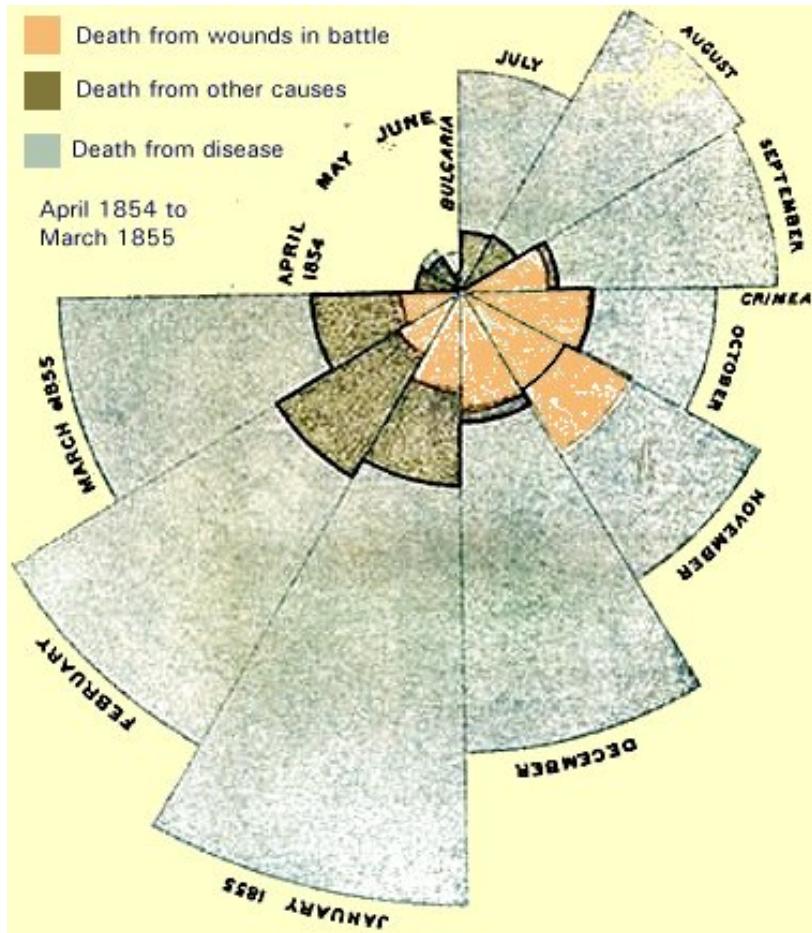
Nightingale's Rose



Trellis Display of Nightingale Data



No Ambiguity with Trellis Plot



Quotes

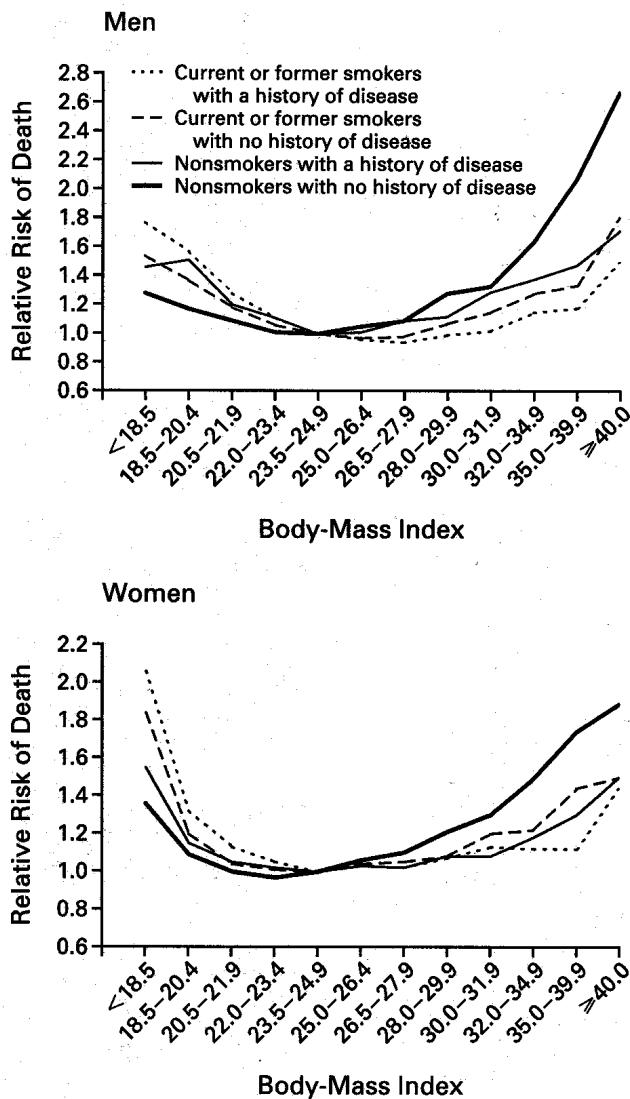
- “The number of times that dot charts and multipanel trellis displays were used in the *after* figures demonstrates their usefulness.” Robbins. *Creating More Effective Graphs*. page 327.
- “At the heart of quantitative reasoning is a single question: *Compared to what?* Small multiple designs, multivariate and data bountiful, answer directly by visually enforcing comparisons of changes, of the differences among objects, of the scope of alternatives. For a wide range of problems in data presentation, small multiples are the best design solution.” Tufte. *Envisioning Information*. page 67

Multi-panel graphs

» Scatterplot matrices

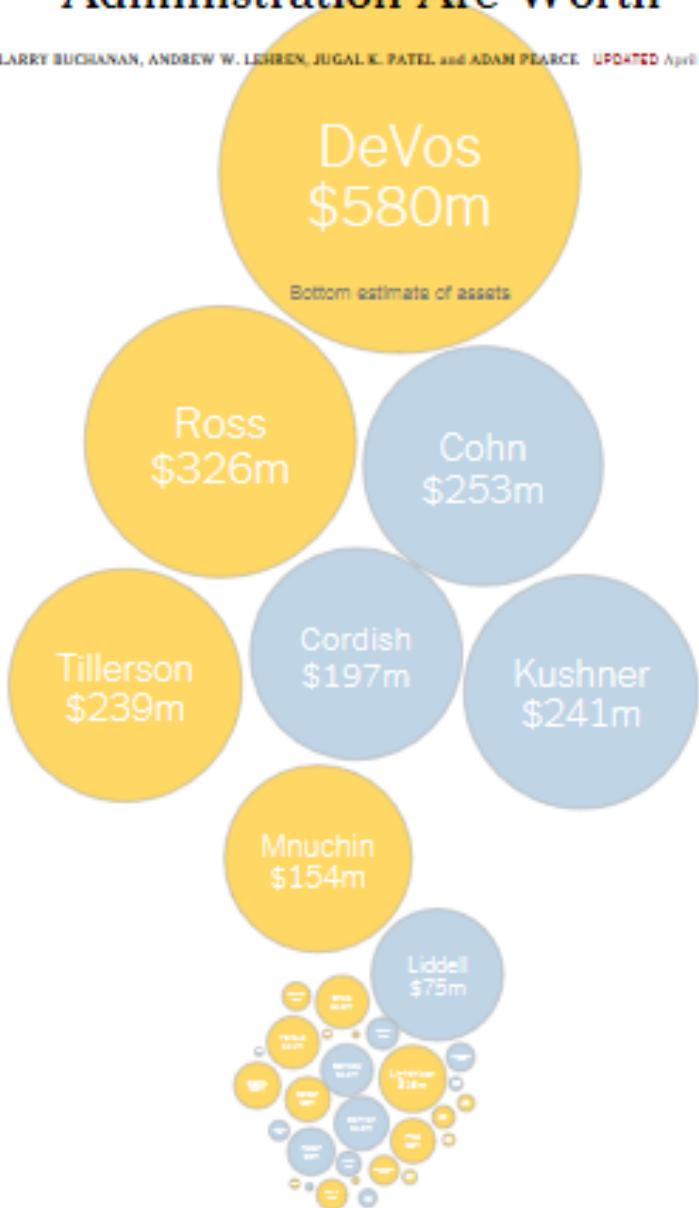
- Scatterplot matrices
- Trellis / faceting / small multiples / lattice /panel graphs
- One common scale
- Linked micromaps

Comparisons with different scales



How Much People in the Trump Administration Are Worth

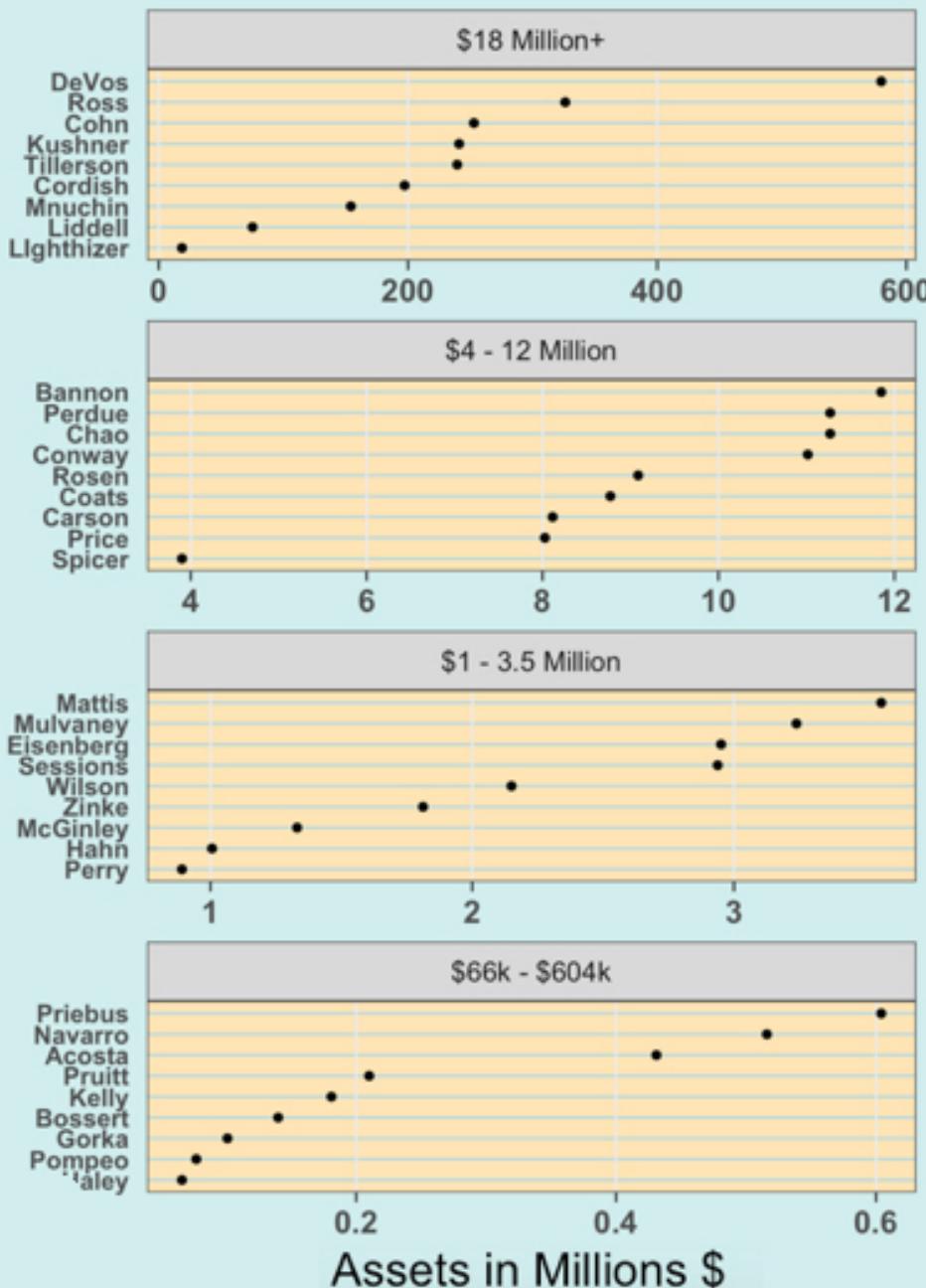
By LARRY BUCHANAN, ANDREW W. LEHREN, JUGAL K. PATEL and ADAM PEARCE | UPDATED April 3, 2017



Source:
NYT 3 Apr. 2017
Updated

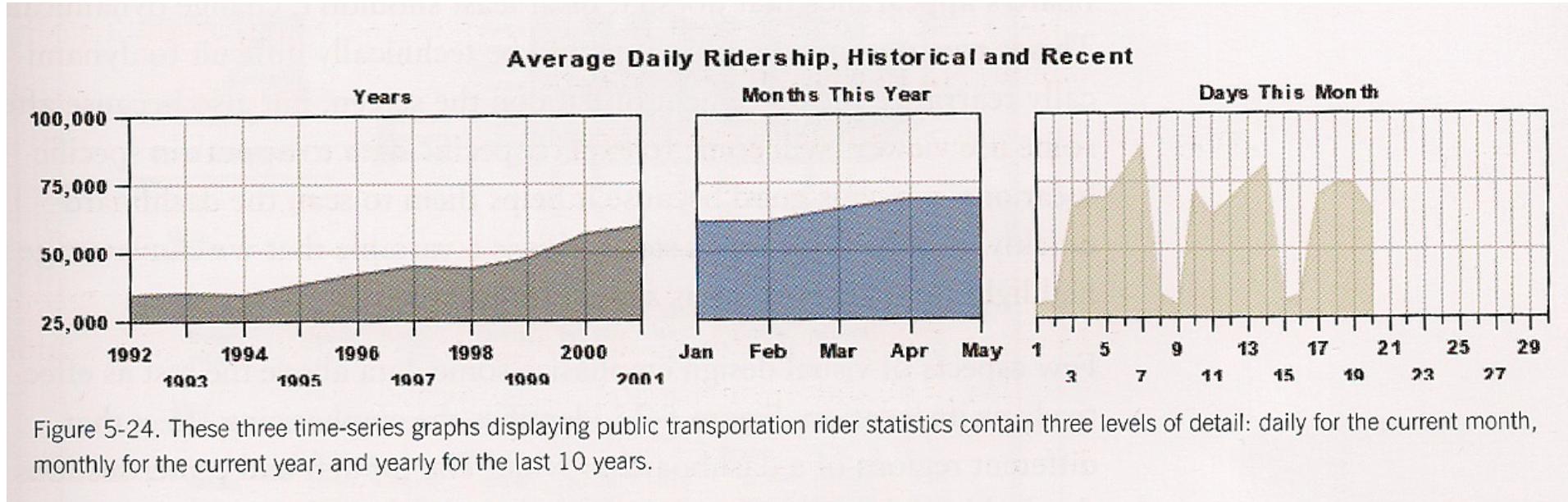
Value of Assets			
Name	Bottom Estimate	Top Estimate	
 Betsy DeVos Secretary of Education	\$579,783,484	\$1,521,271,091+	
 Jared Kushner Senior adviser to the president for strategic planning	\$241,037,233	\$735,684,002+	
 Wilbur L. Ross Secretary of Commerce	\$326,224,177	\$687,221,016+	
 Gary D. Cohn Director of the National Economic Council	\$252,952,172	\$611,081,045+	
 Reed Cordish Special assistant to the president for intragovernmental and technology initiatives	\$197,281,047	\$424,021,002+	
 Steven T. Mnuchin Secretary of the Treasury	\$154,137,166	\$350,509,015+	
 Rex W. Tillerson Secretary of State	\$239,488,353	\$350,214,001+	
 Chris Liddell Director of strategic initiatives for the White	\$75,262,171	\$196,543,002	

How Much People in the Trump Administration Are Worth



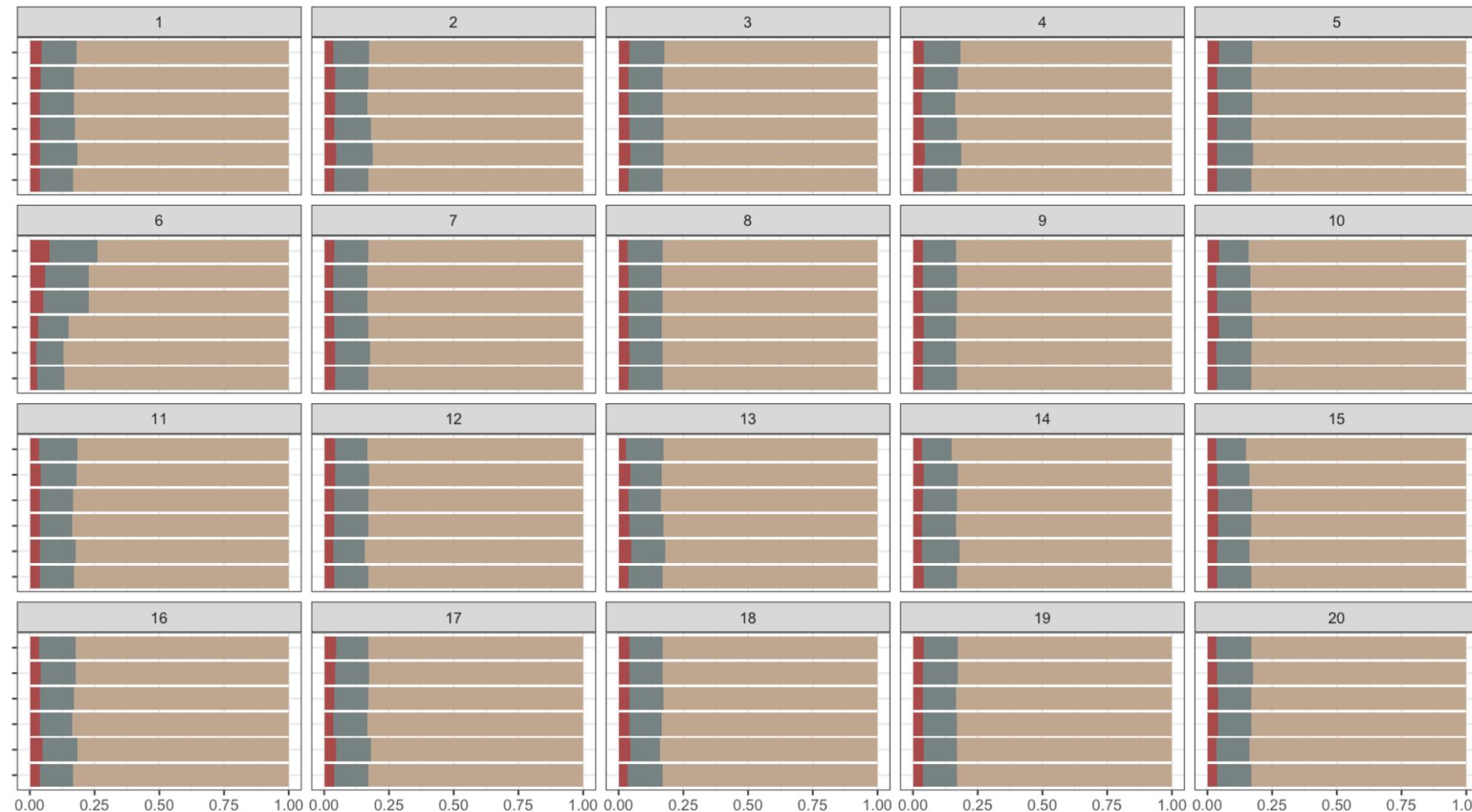
Source:
Joyce Robbins

Multi-foci figure

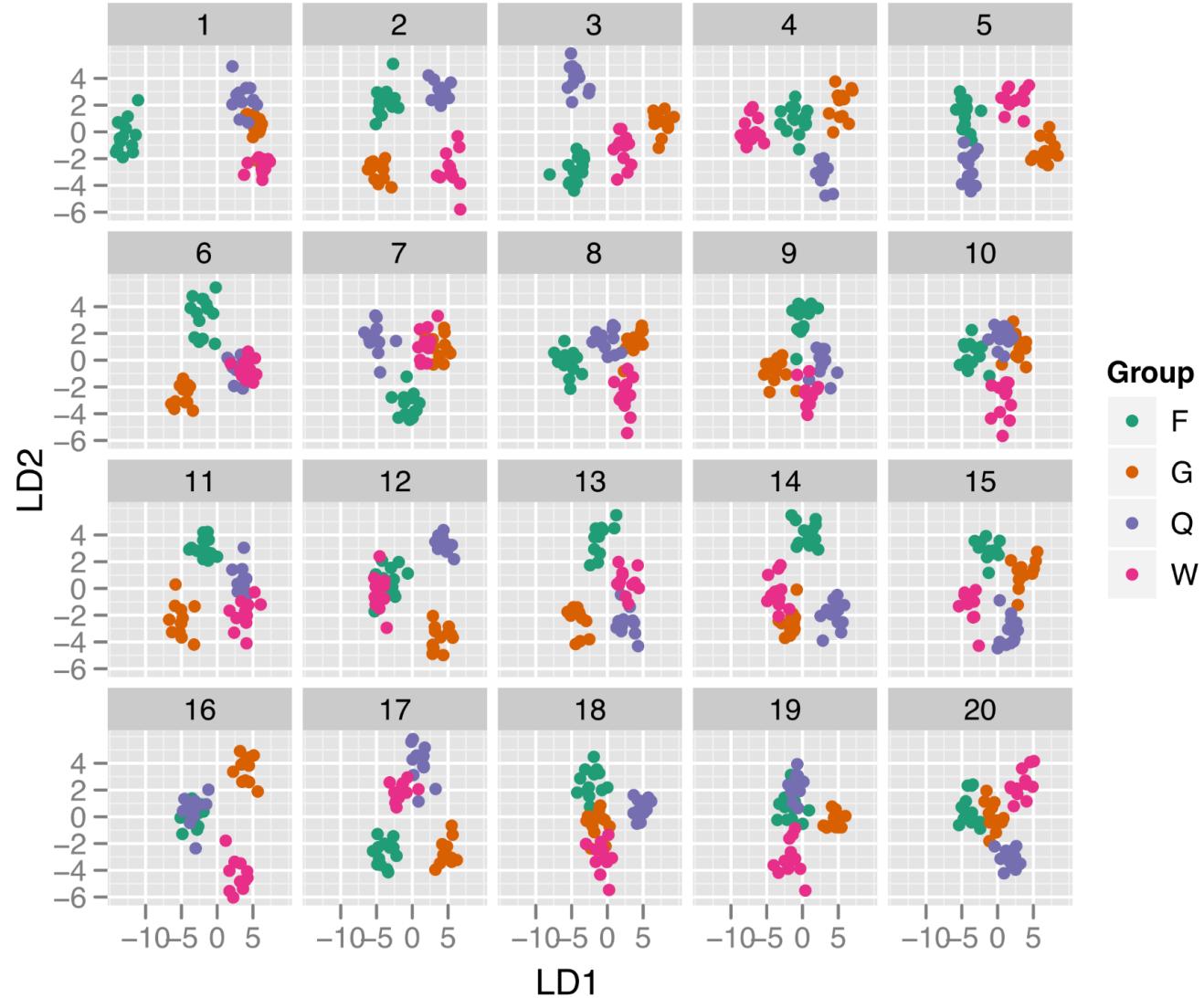


Slide from Di Cook's Nullibar Talk

A grade % and cuisine



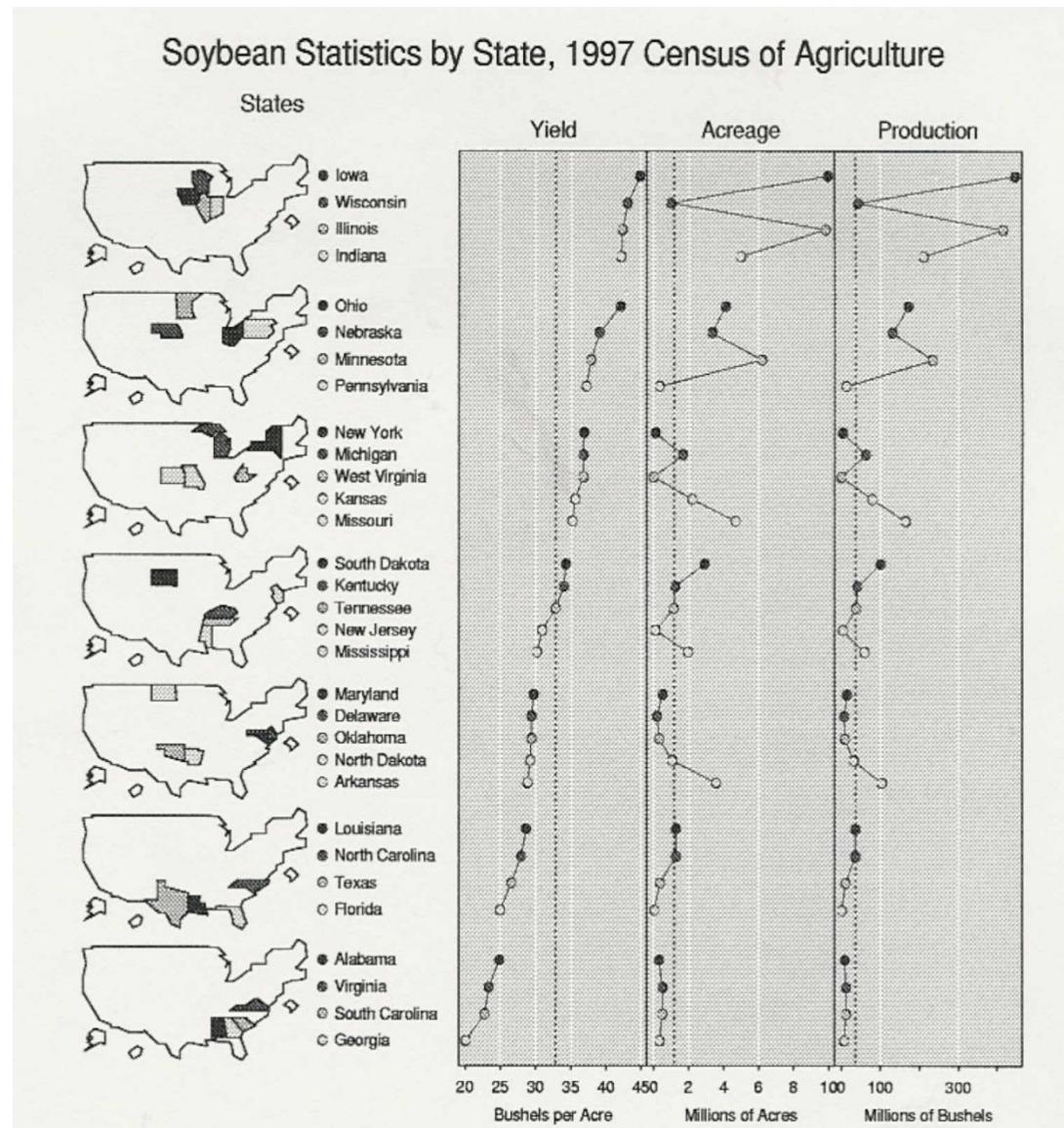
Another



Multi-panel graphs

- Scatterplot matrices
- Trellis / faceting / small multiples / lattice /panel graphs
- One common scale
- Linked micromaps

Linked Micromap



Must Read

Carr, Daniel and Linda Pickle. 2010. *Visualizing Data Patterns with Micromaps*. Chapman and Hall/CRC, Boca Raton, FL.

Conclusions

- Multi-panel charts are often clearer than more commonly used charts
- They are underused.
- They often avoid the need for color.
- They aid comparisons.
- They avoid the need for legends.

References

- Cleveland, William S. 1993. *Visualizing Data*. Hobart Press, Summit, NJ.
- Cleveland, William S. 1994. *The Elements of Graphing Data*. Hobart Press, Summit, NJ
- Few, Stephen. 2006. *Information Dashboard Design: the Effective Visual Communication of Data*. O'Reilly.
- Robbins, Naomi B. 2013. *Creating More Effective Graphs*, Chart House, Ramsey, NJ
(Reprinted from Wiley (2005))
- Robbins, Naomi B. 2006. "Dot Plots: A Useful Alternative to Bar Charts,"
<http://www.b-eye-network.com/view/2468>

References - continued

Tufte, Edward. 2001. *The Visual Display of Quantitative Information*. Graphics Press, Cheshire, CT.

Tufte, Edward. 1990. *Envisioning Information*, Graphics Press, Cheshire, CT.

US Bureau of the Census. 1874. *Statistical Atlas of the United States*. <https://fraser.stlouisfed.org/title/64> Accessed June 7, 2019.

Useful Web Site

Jon Peltier has utilities to draw many of these charts in Excel.

<https://www.peltiertech.com>

Contact Information

Naomi B. Robbins
NBR
11 Christine Court
Wayne, NJ 07470
Phone: (973) 694-6009

naomi@nbr-graphs.com

<http://www.nbr-graphs.com>

<http://www.forbes.com/sites/naomirobbins/>

twitter: [@nbrgraphs](https://twitter.com/nbrgraphs)

Author of *Creating More Effective Graphs*