

ARC²S Group

Applied Research on Computational Complex Systems

Basic charts

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“Analisi e Visualizzazione di Reti Complesse” (9 credits)

Laurea Magistrale in **Informatica**

Università degli Studi di Torino

A.A. 2018/19

@giaruffo



MOTIVATION

Why visualize your data?

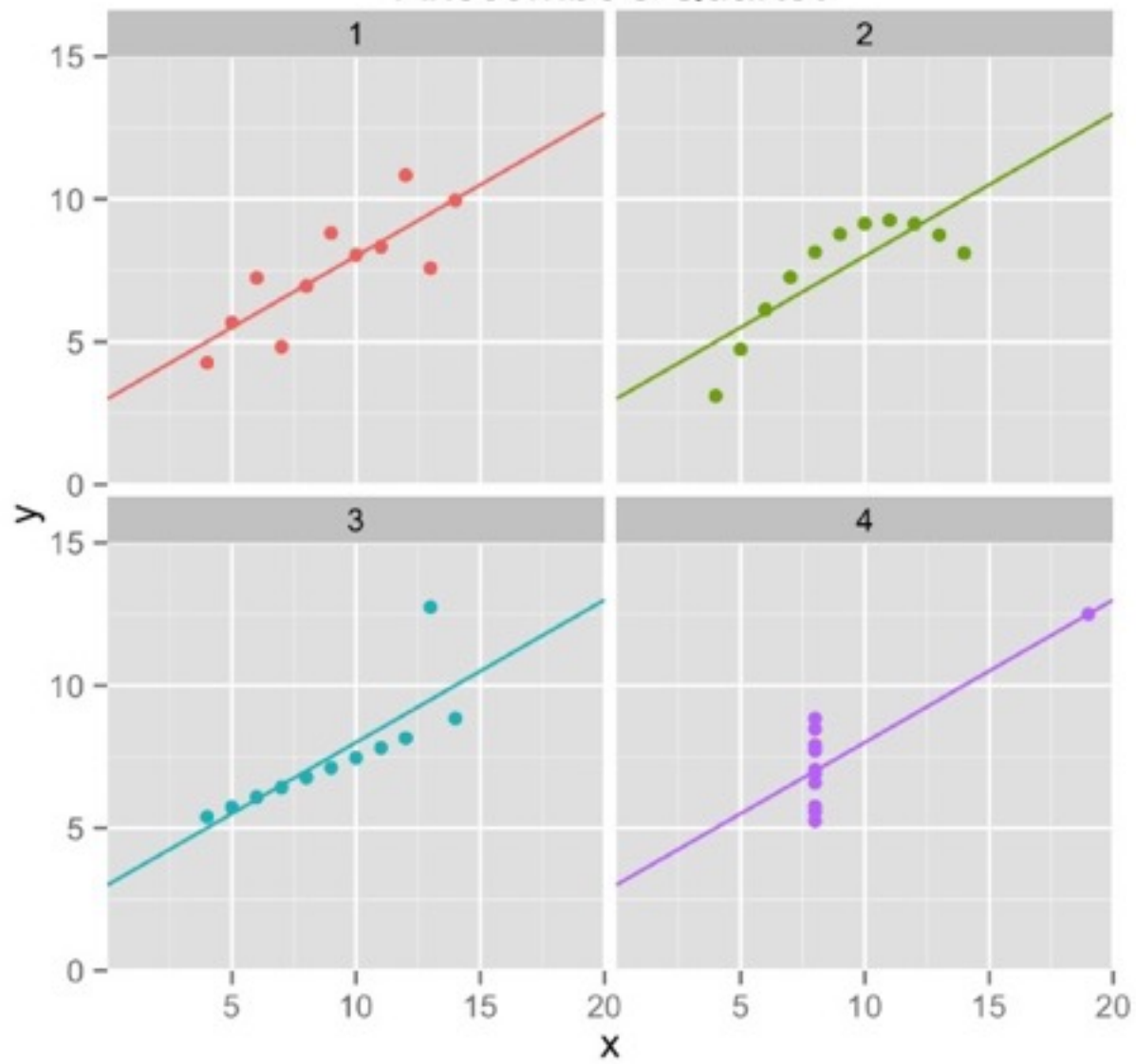
Anscombe's Quartet

Group1		Group2		Group3		Group4	
x,	y	x,	y	x,	y	x,	y
10,	8.04	10,	9.14	10,	7.46	8,	6.56
9,	6.95	8,	8.14	8,	6.77	8,	5.76
13,	7.58	13,	8.74	13	12.74	8,	7.71
9,	8.81	9,	8.77	9	7.11	8,	8.84
11,	8.33	11,	9.26	11	7.81	8,	8.47
14,	9.96	14,	8.10	14,	8.84	8,	7.04
6,	7.24	6,	6.13	6,	6.08	8,	5.25
4,	4.26	4,	3.10	4,	5.39	19,	12.50
12,	10.84	12,	9.13	12,	8.15	8,	5.56
7,	4.82	7,	7.26	7,	6.42	8,	7.91
5,	5.68	5,	4.74	5,	5.73	8,	6.89

Anscombe's Quartet

	Group 1	Group 2	Group 3	Group 4
mean(x)	9.00	9.00	9.00	9.00
mean(y)	7.50	7.50	7.50	7.50
var(x)	11.00	11.00	11.00	11.00
var(y)	4.13	4.13	4.12	4.12
correlation	0.82	0.82	0.82	0.82
lm intercept	3.00	3.00	3.00	3.00
lm x effect	0.50	0.50	0.50	0.50

Anscombe's Quartet



Anscombe's Quartet

- Lessons learned
 - Need to analyze AND visualize your data
 - Simple visualizations are often enough to reveal structure
- More information
 - http://en.wikipedia.org/wiki/Anscombe's_quartet

BASIC CHARTS

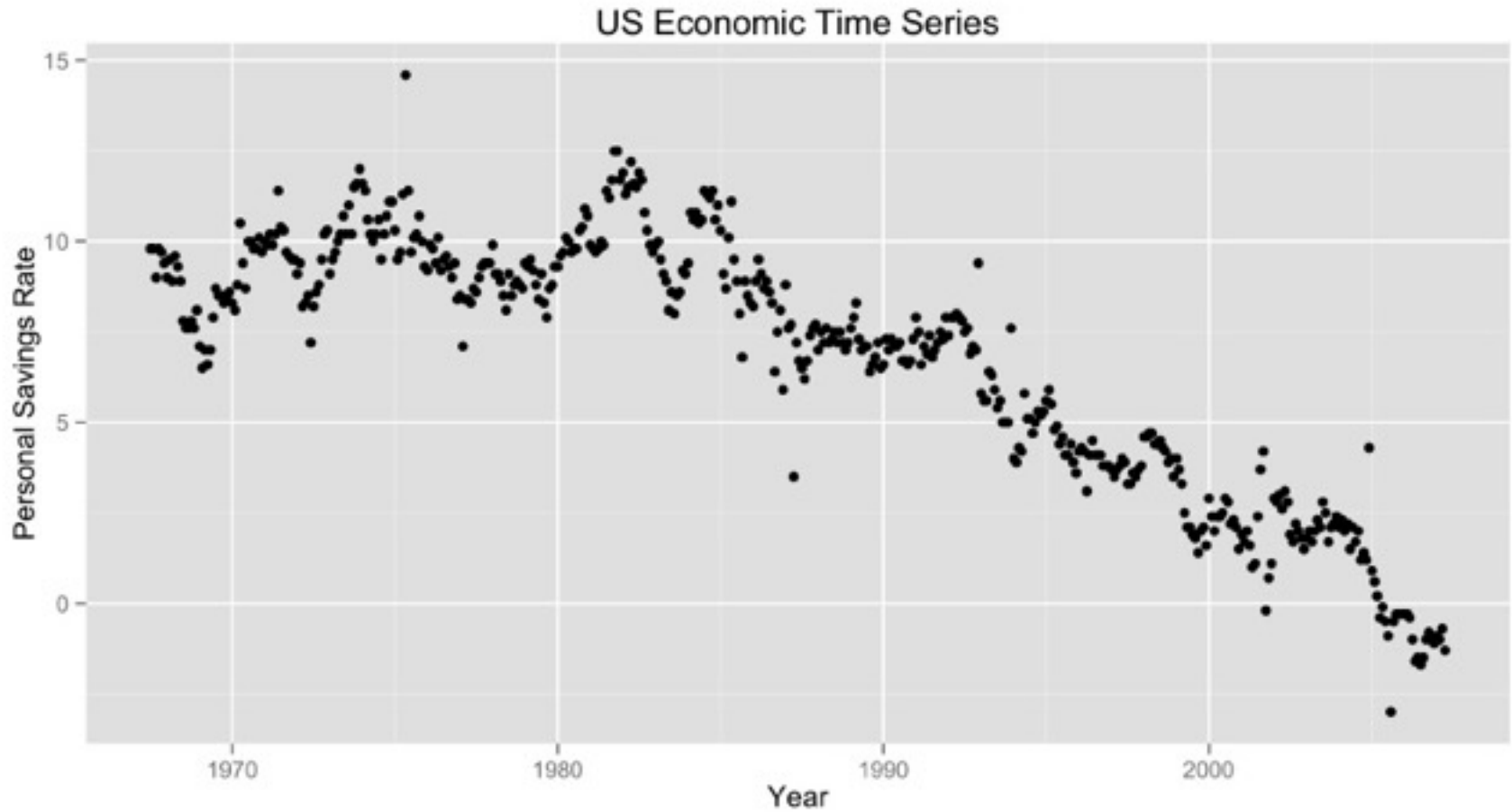
Shown using Python and plot.ly

introduction

```
pip install plotly
```

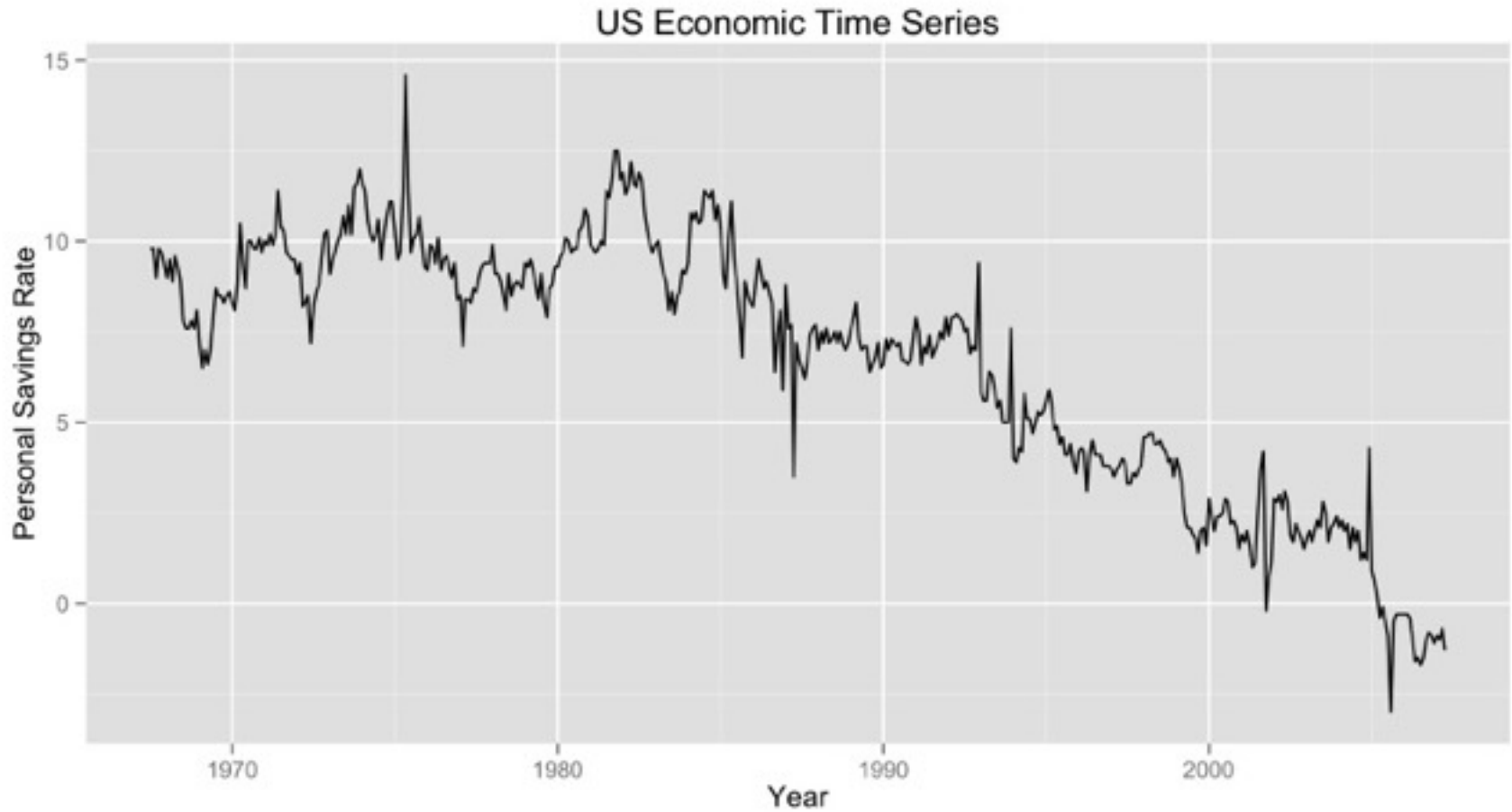
```
open “dv1_basicCharts.ipynb”  
    interactive python notebook
```


Scatterplot



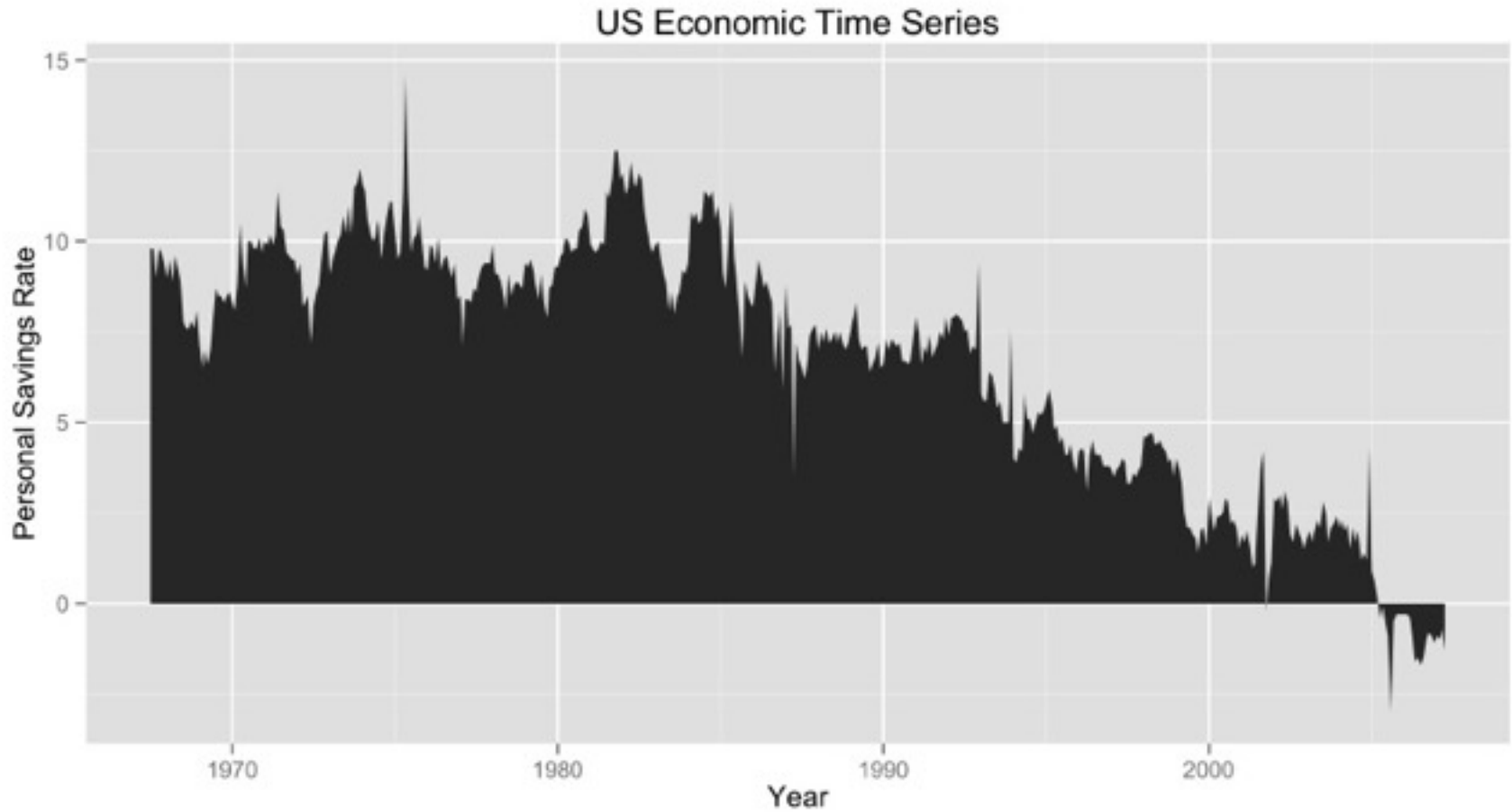
Generated using R and ggplot (with economics dataset)

Line Chart



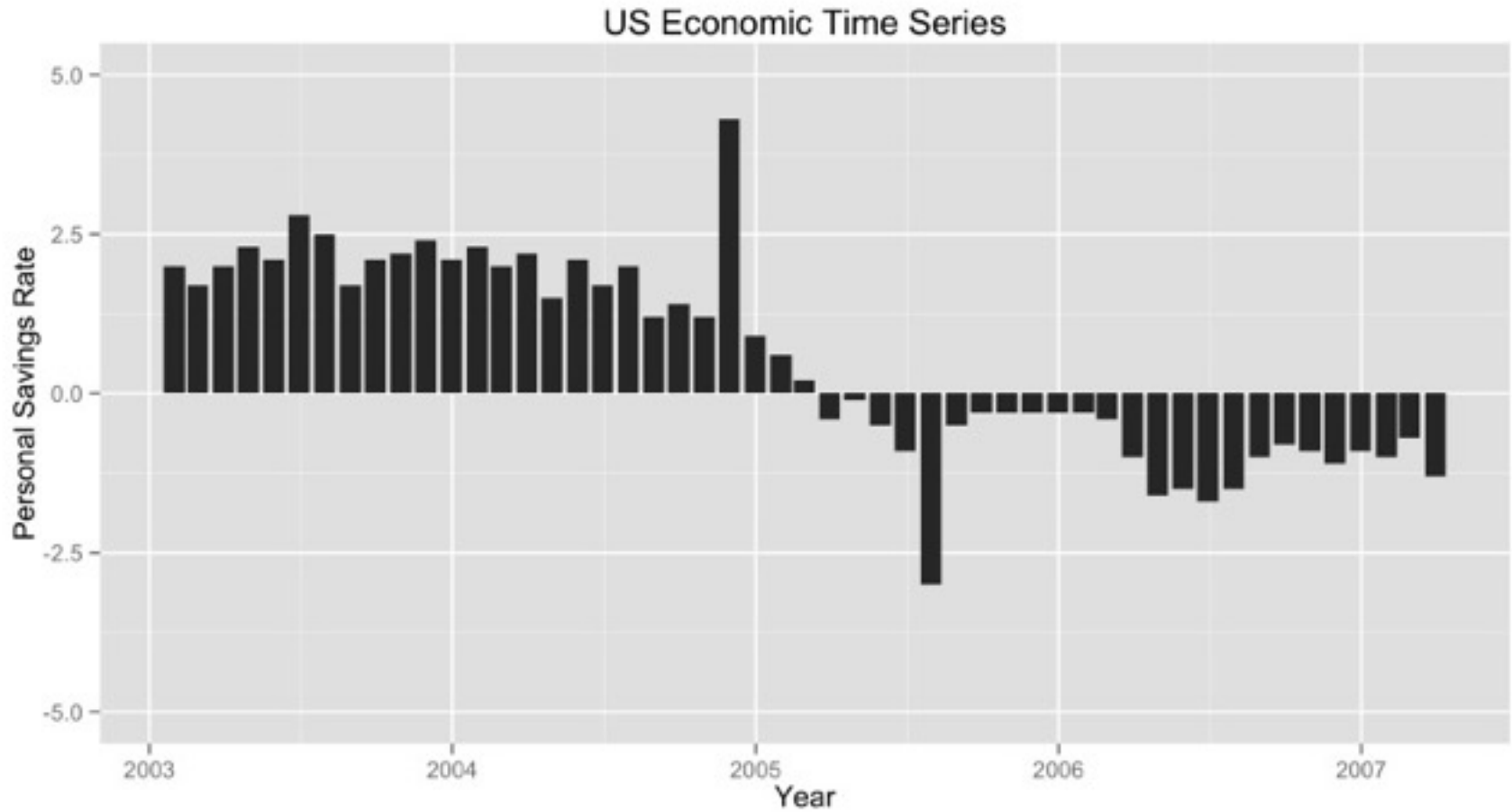
Generated using R and ggplot (with economics dataset)

Area Chart



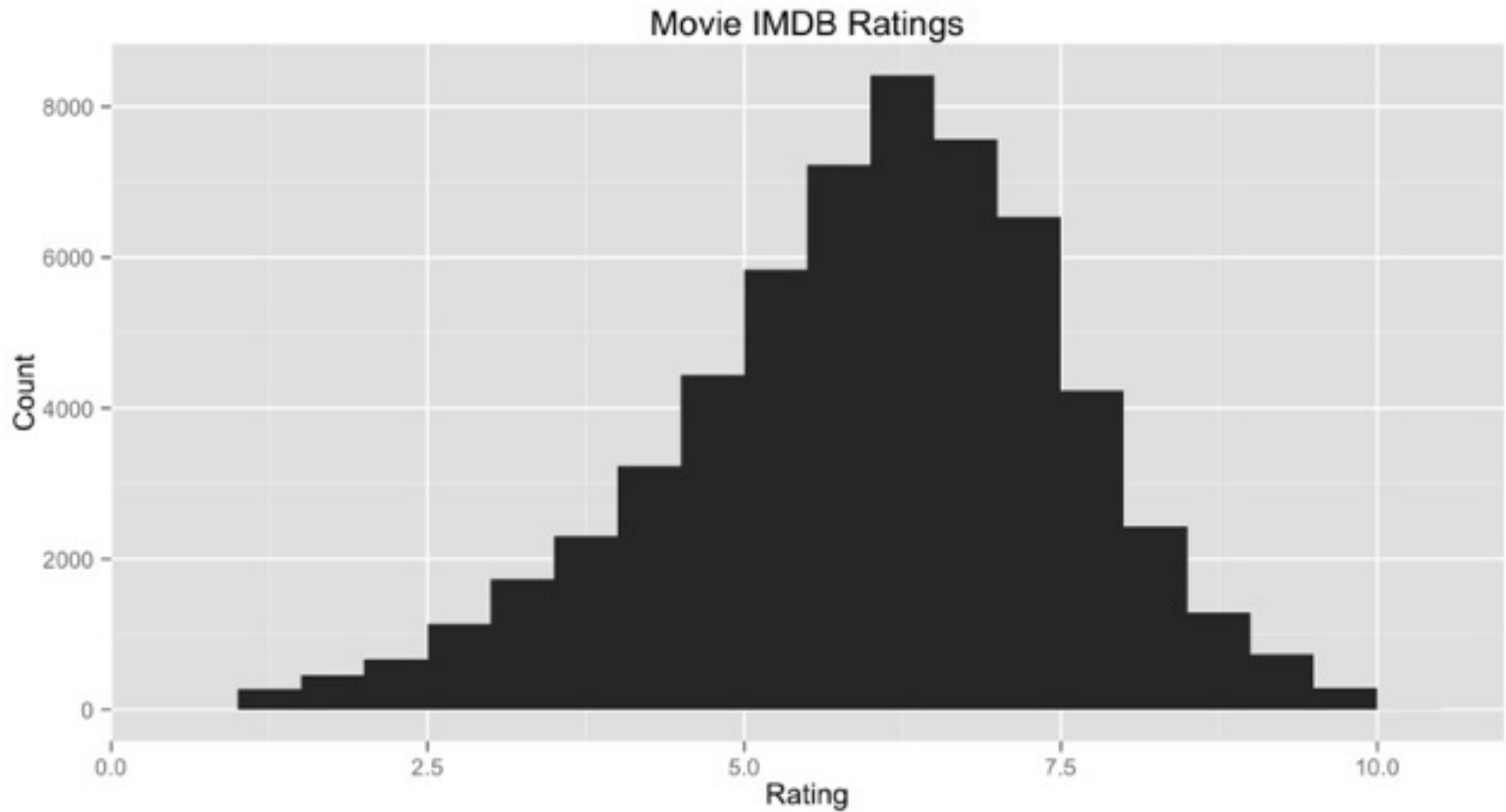
Generated using R and ggplot (with economics dataset)

Bar Chart



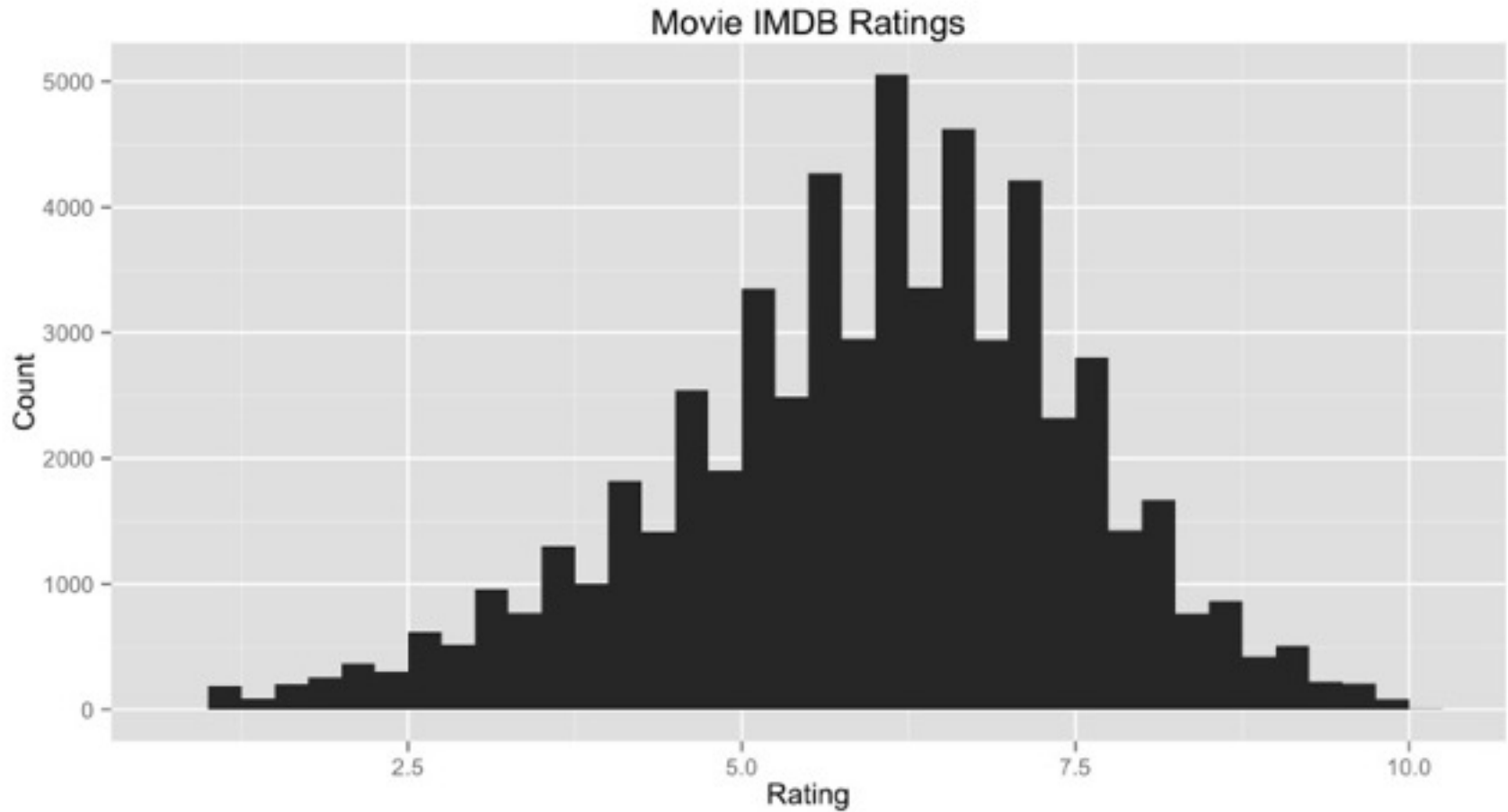
Generated using R and ggplot (with economics dataset)

Histogram



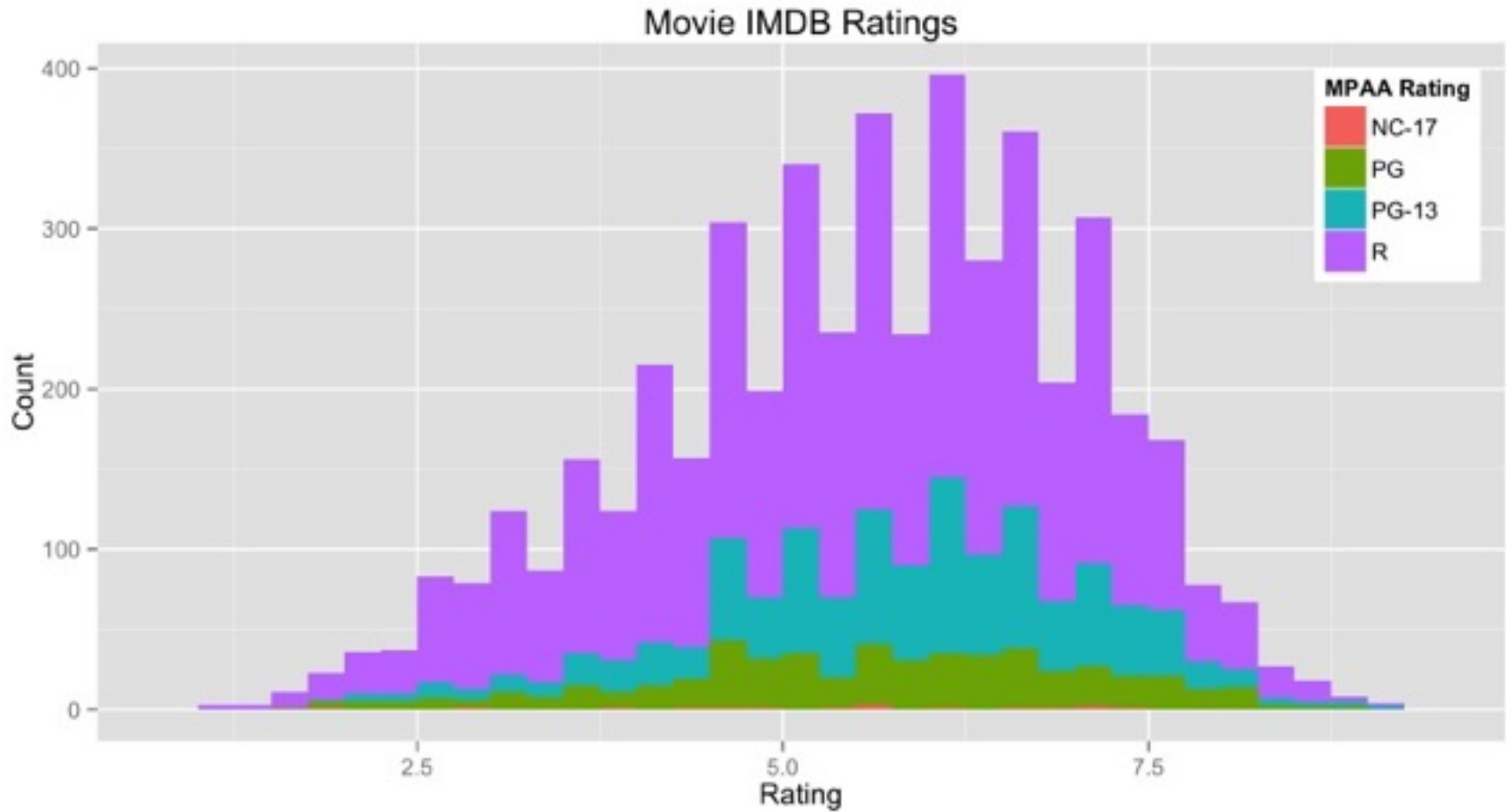
Generated using R and ggplot (with economics dataset)

Histogram



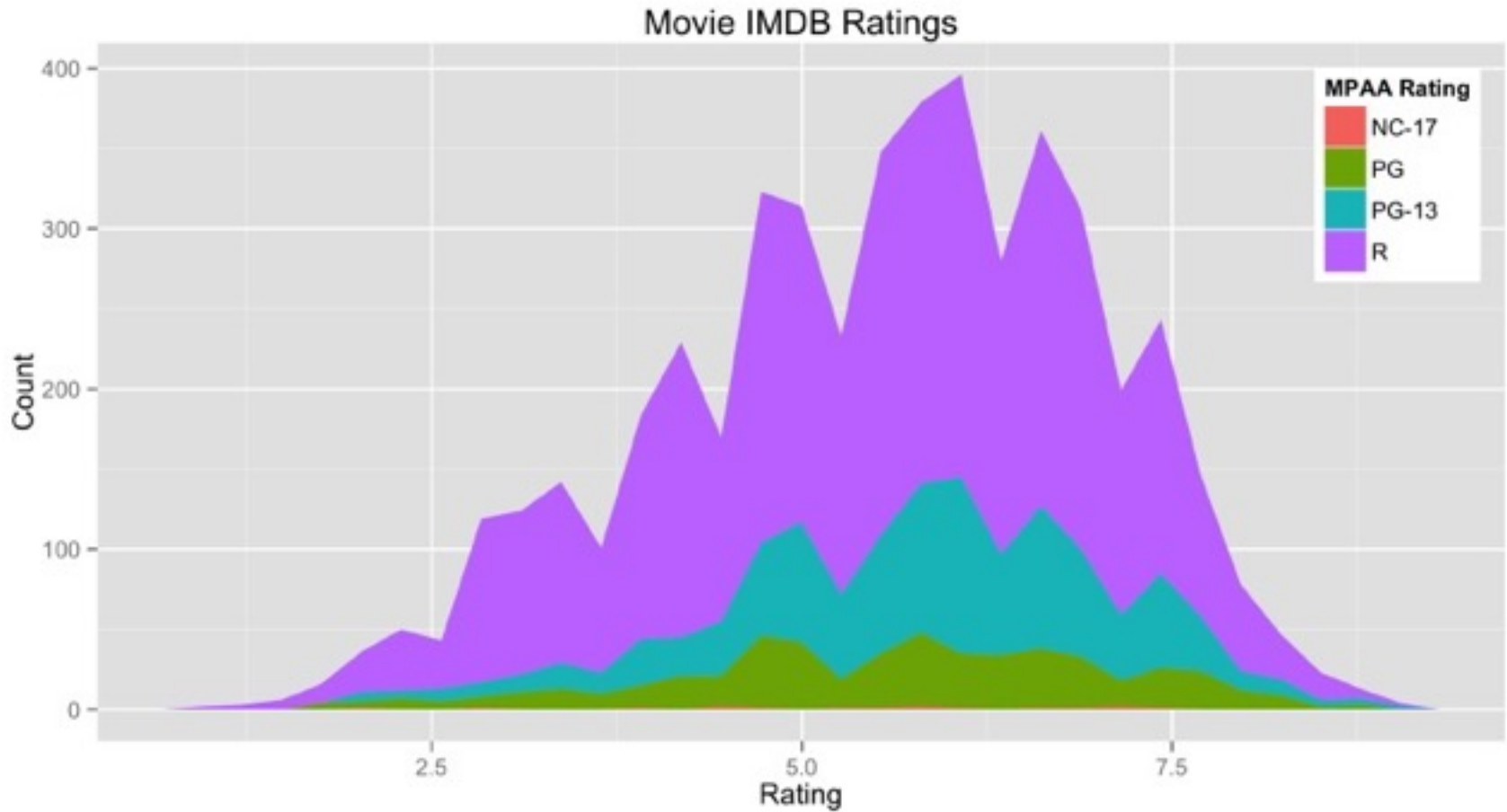
Generated using R and ggplot (with economics dataset)

Stacked Bar Chart



Generated using R and ggplot (with economics dataset)

Stacked Area Chart



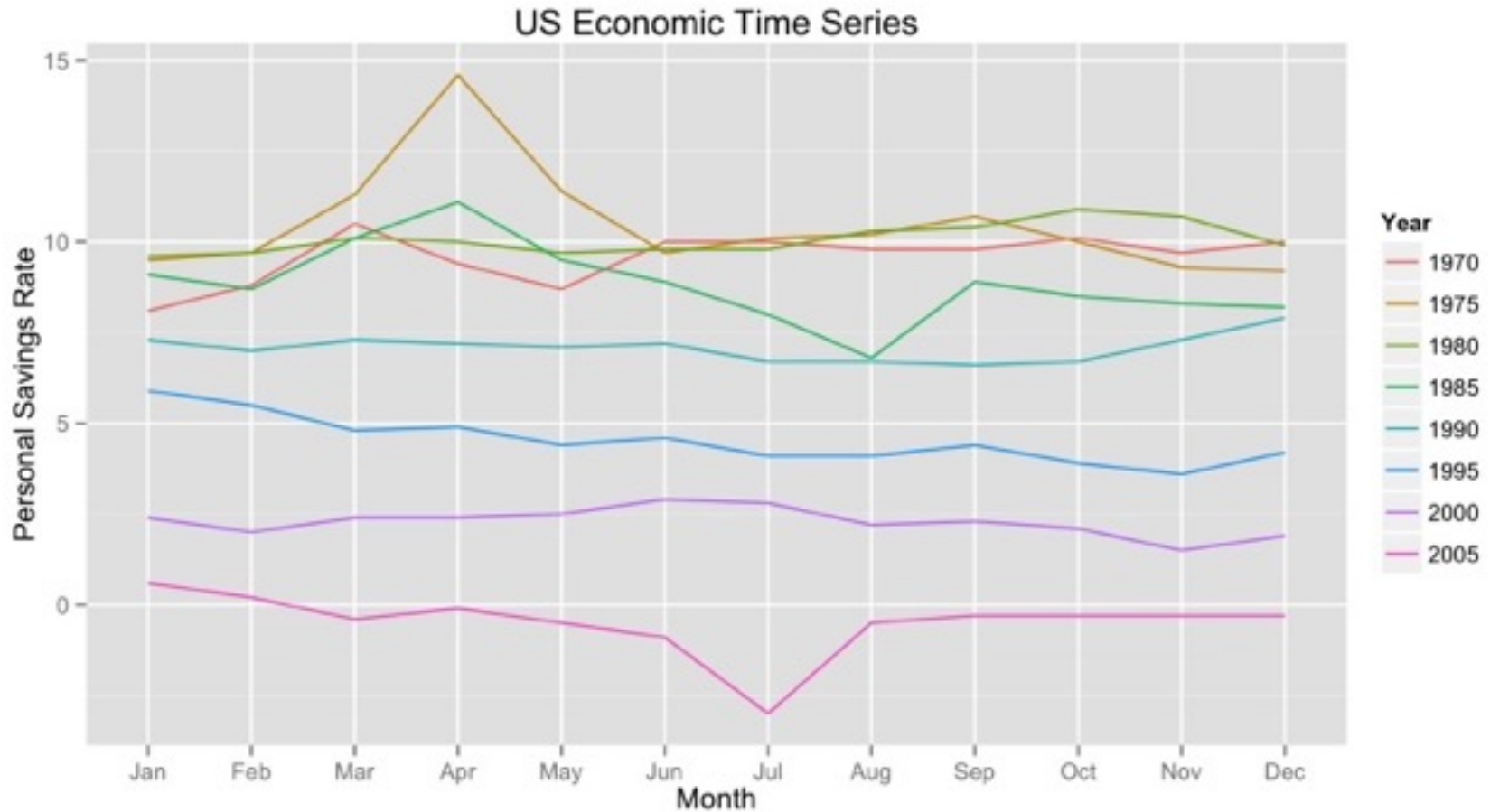
Generated using R and ggplot (with economics dataset)

Box and Whisker Plot



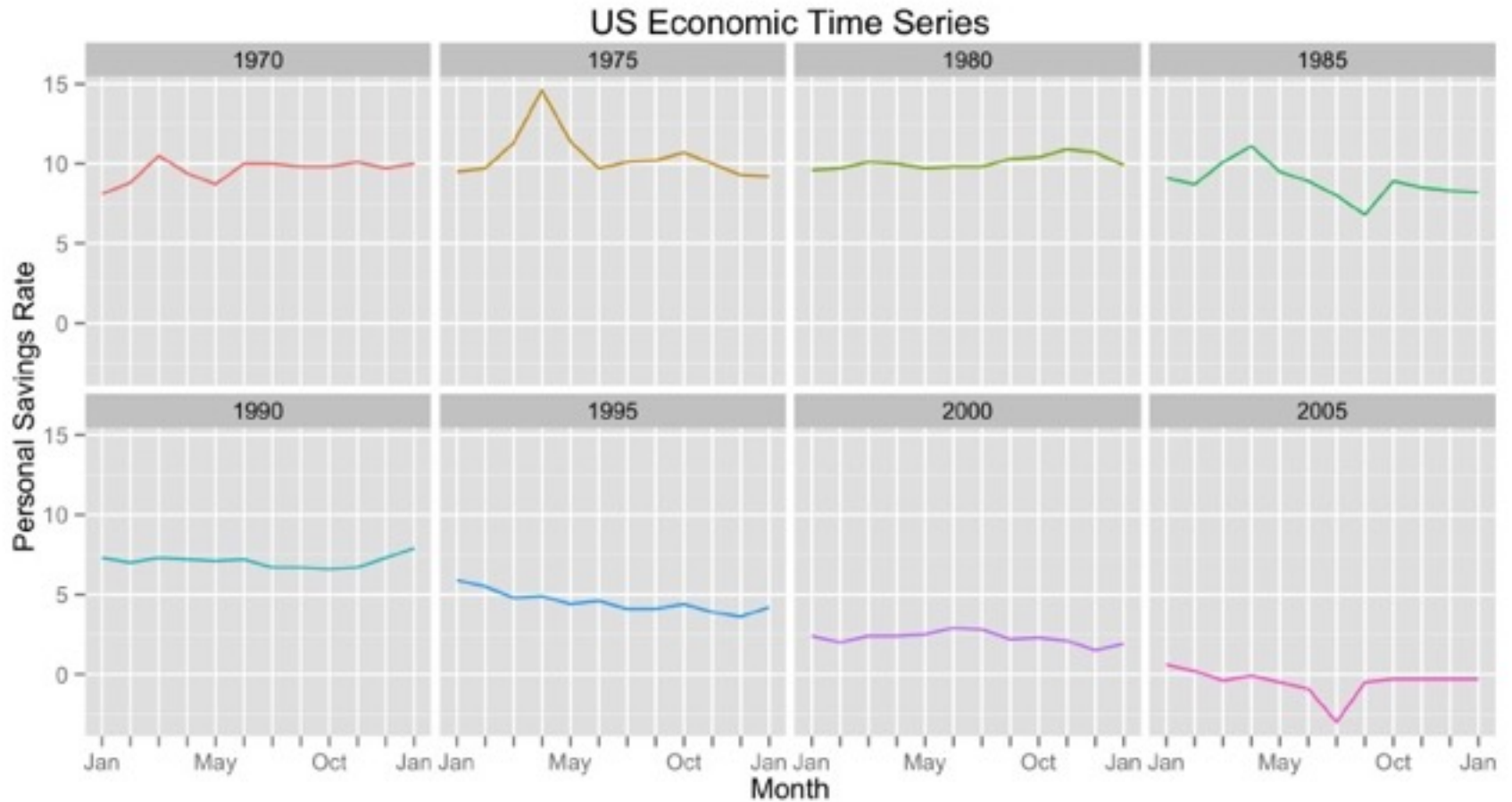
Generated using R and ggplot (with economics dataset)

Multiline Chart



Generated using R and ggplot (with economics dataset)

Small Multiples

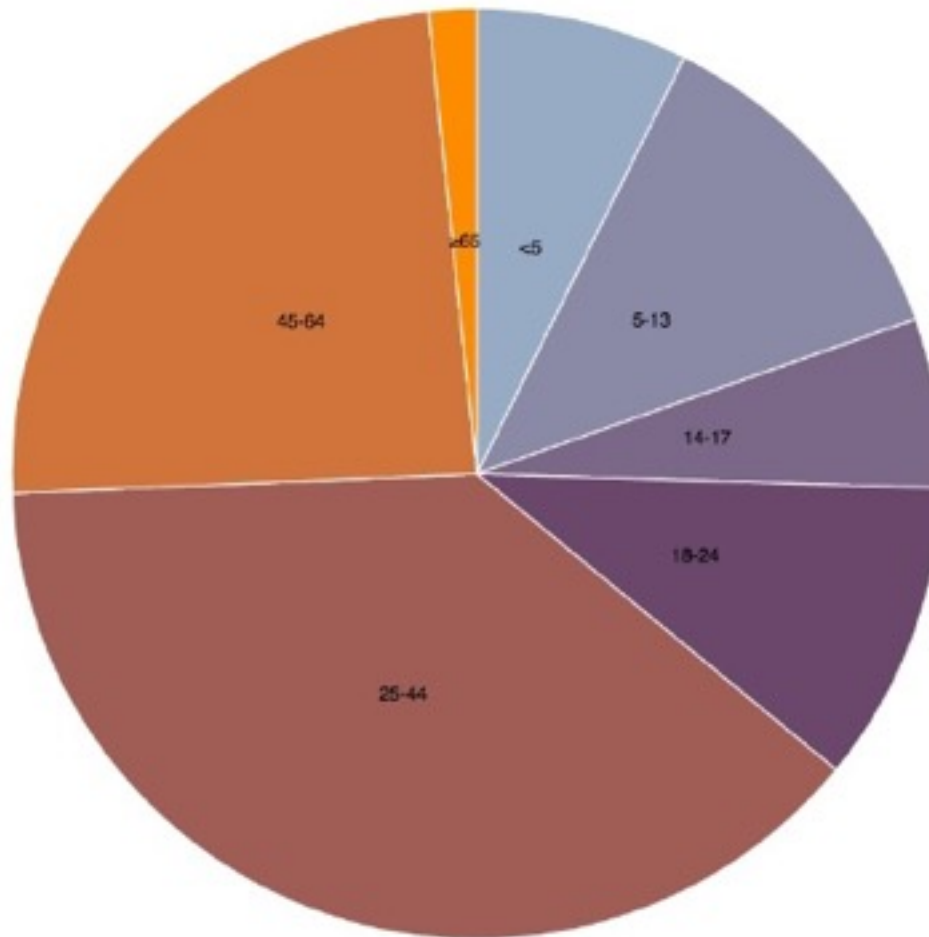


Generated using R and ggplot (with economics dataset)

MORE CHARTS

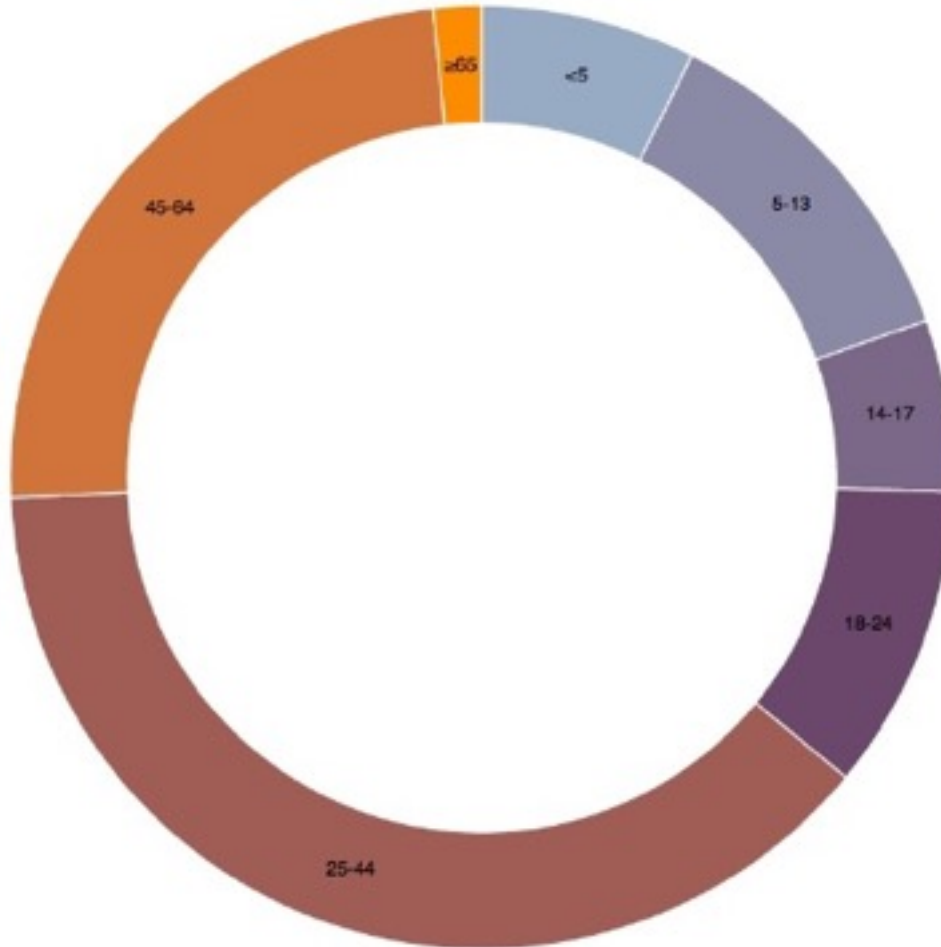
Shown using D3.js

Pie Chart



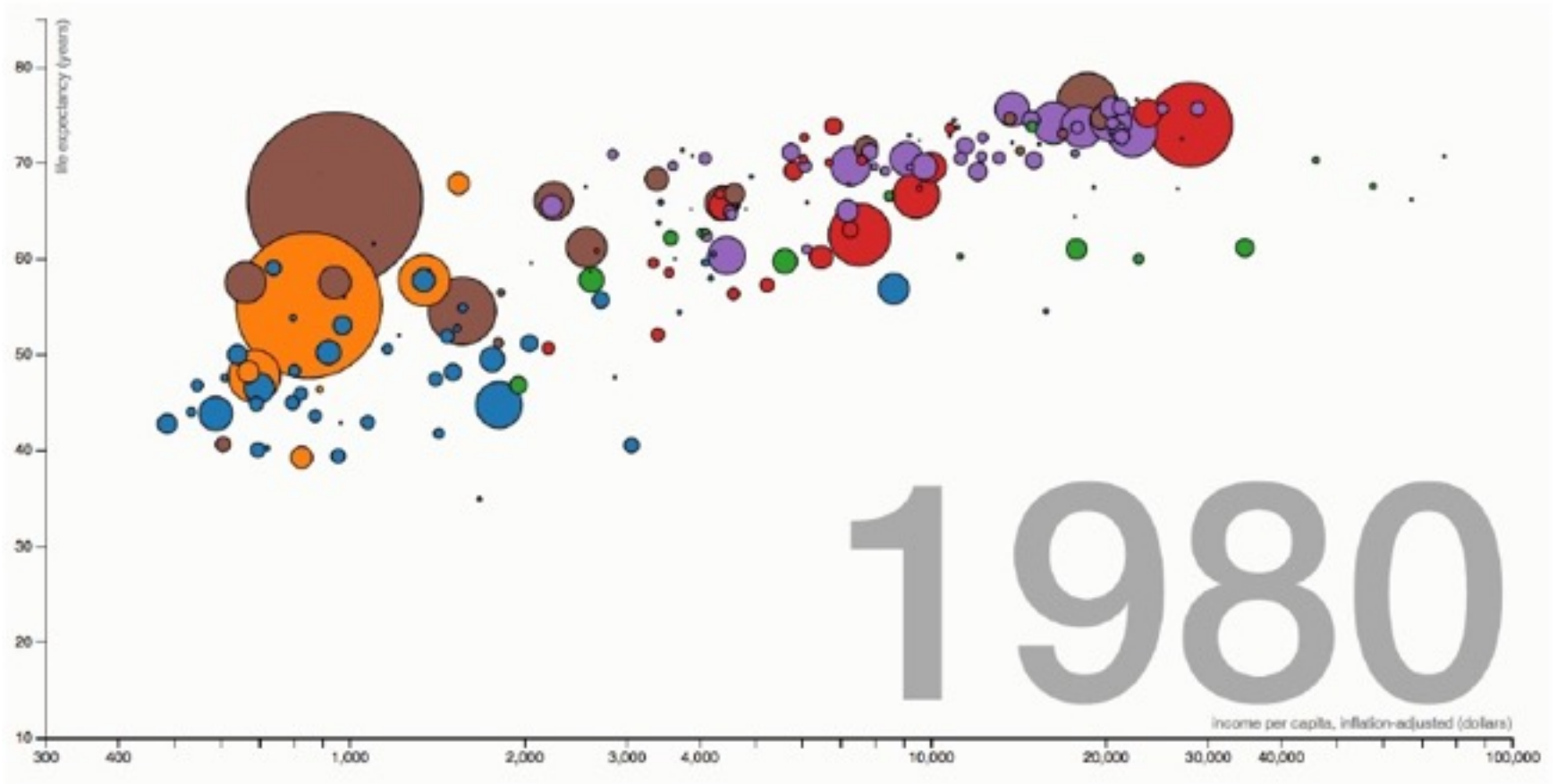
<http://bl.ocks.org/3887235>

Donut Chart



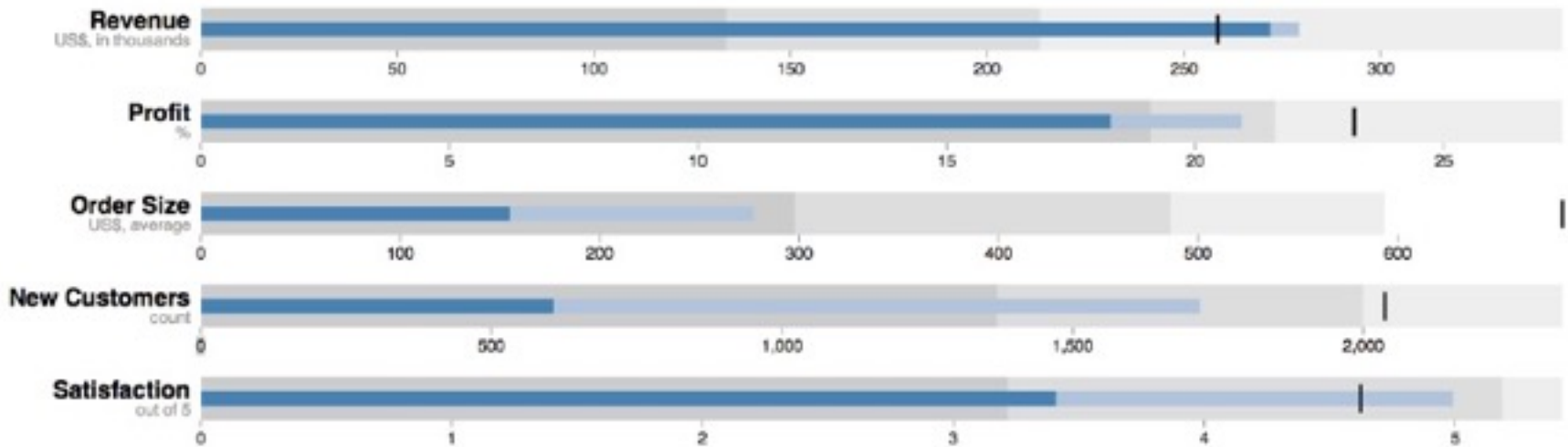
<http://bl.ocks.org/3887193>

Bubble Chart



<http://bost.ocks.org/mike/nations/>

Bullet Chart

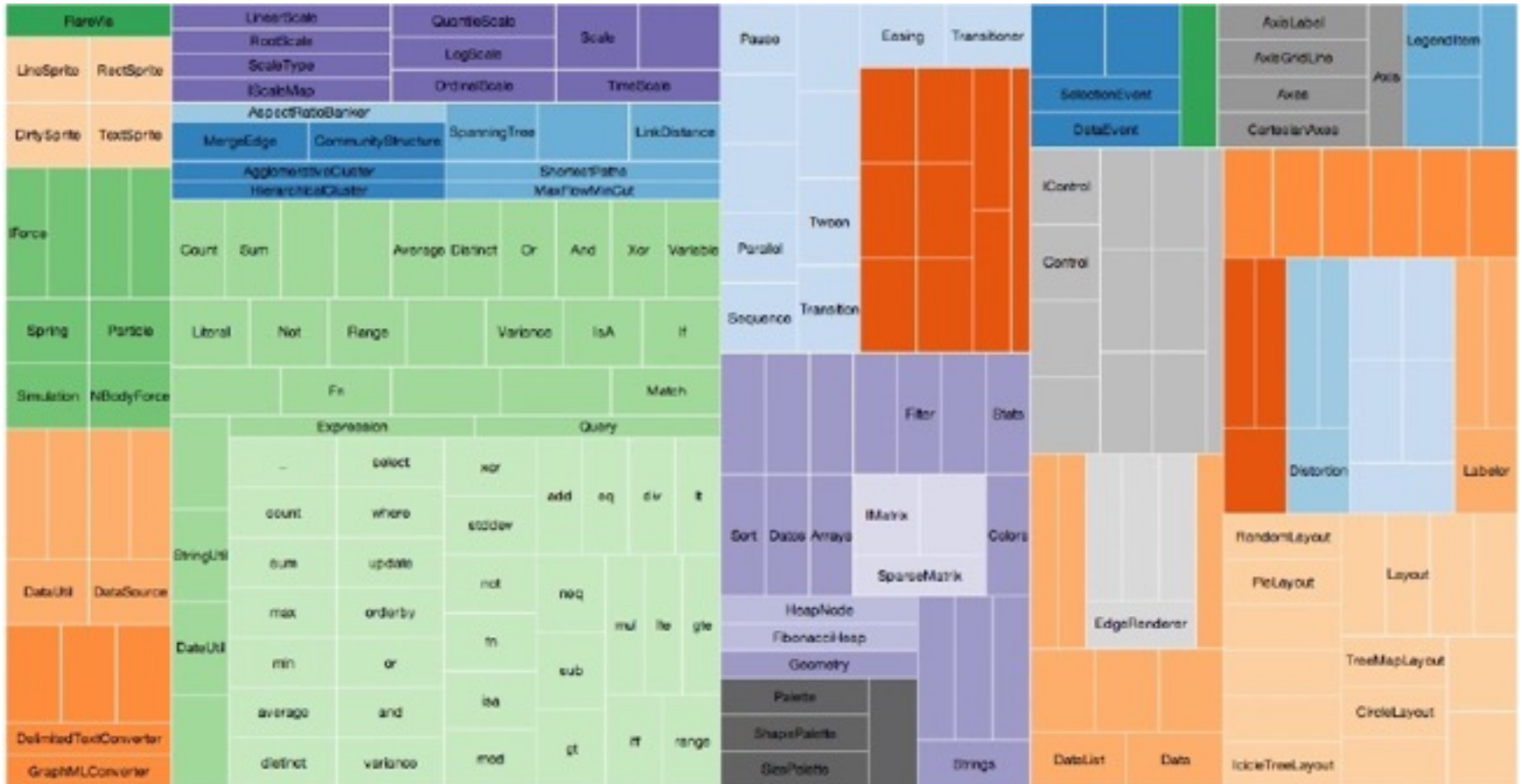


Heatmap



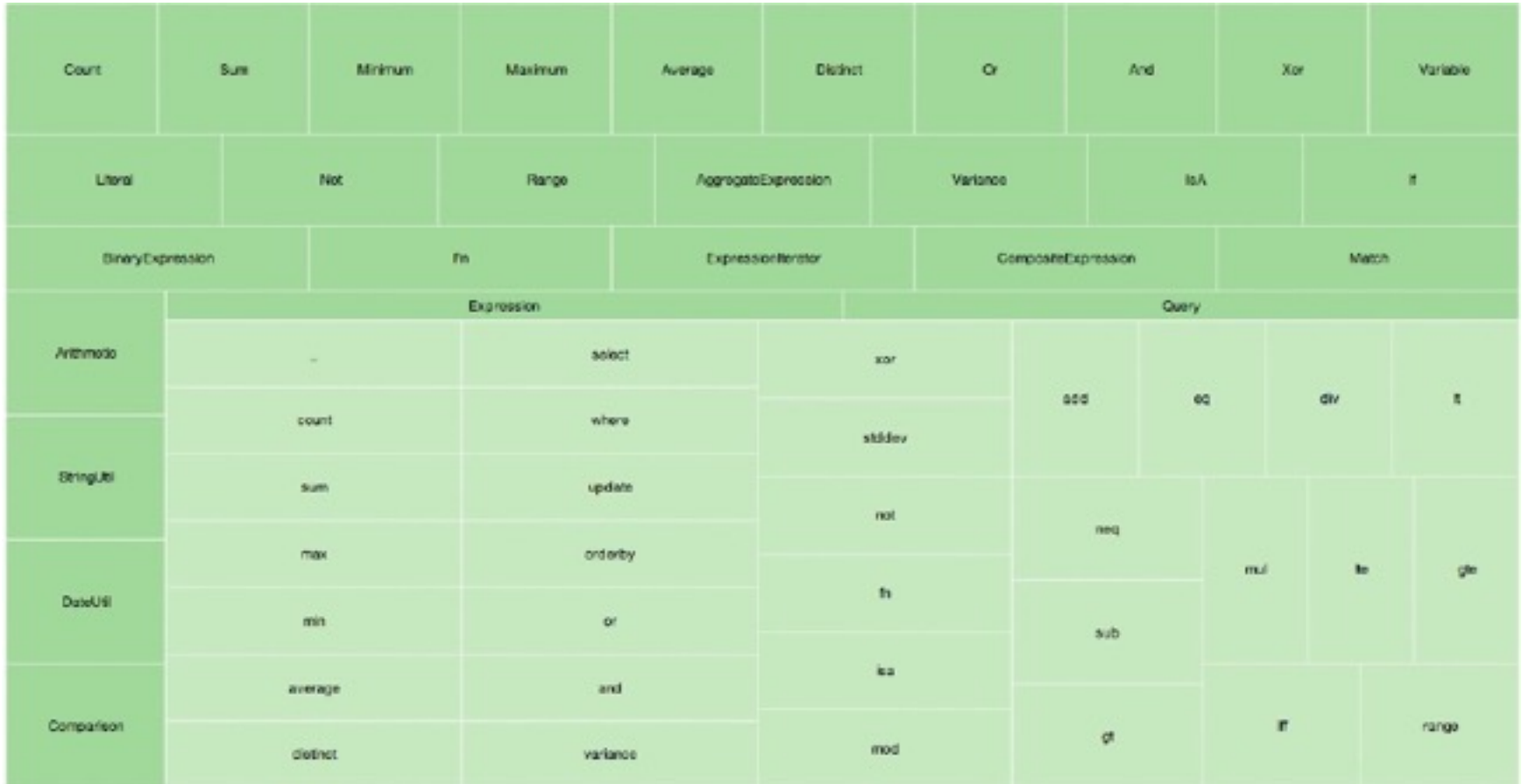
<http://mbostock.github.com/d3/talk/20111018/calendar.html>

Treemap



<http://mbostock.github.com/d3/talk/20111018/treemap.html>

Treemap



<http://mbostock.github.com/d3/talk/20111018/treemap.html>

Dot Matrix Chart

SPANDAU



REINICKENDORF



CHARLOTTENBURG-WILMERSDORF



MITTE



STEGLITZ-ZEHLENDORF

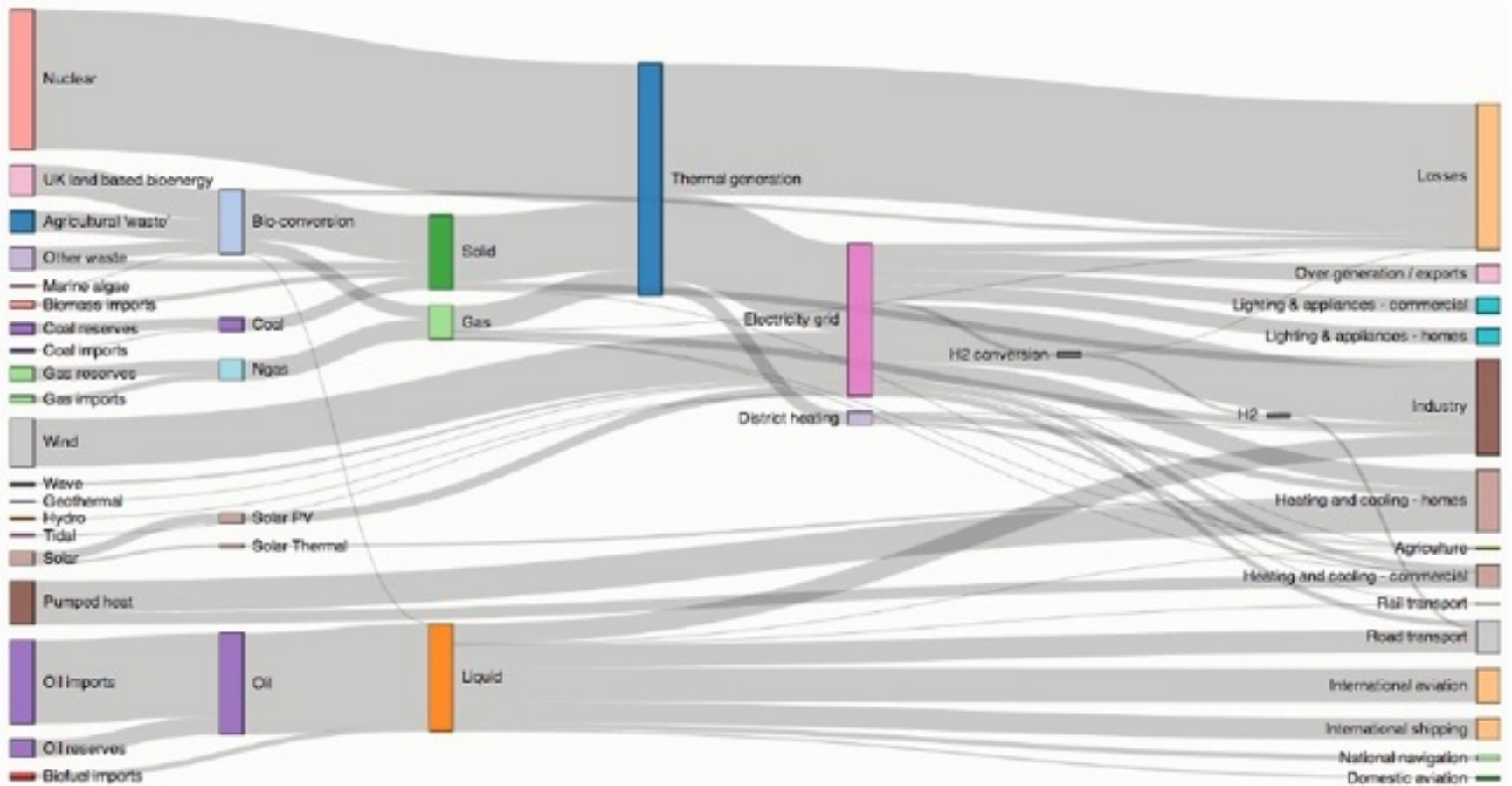


TEMPELHOF-SCHÖNEBERG



From "The Form of Facts and Figures" by Christian Behrens

Sankey Diagram

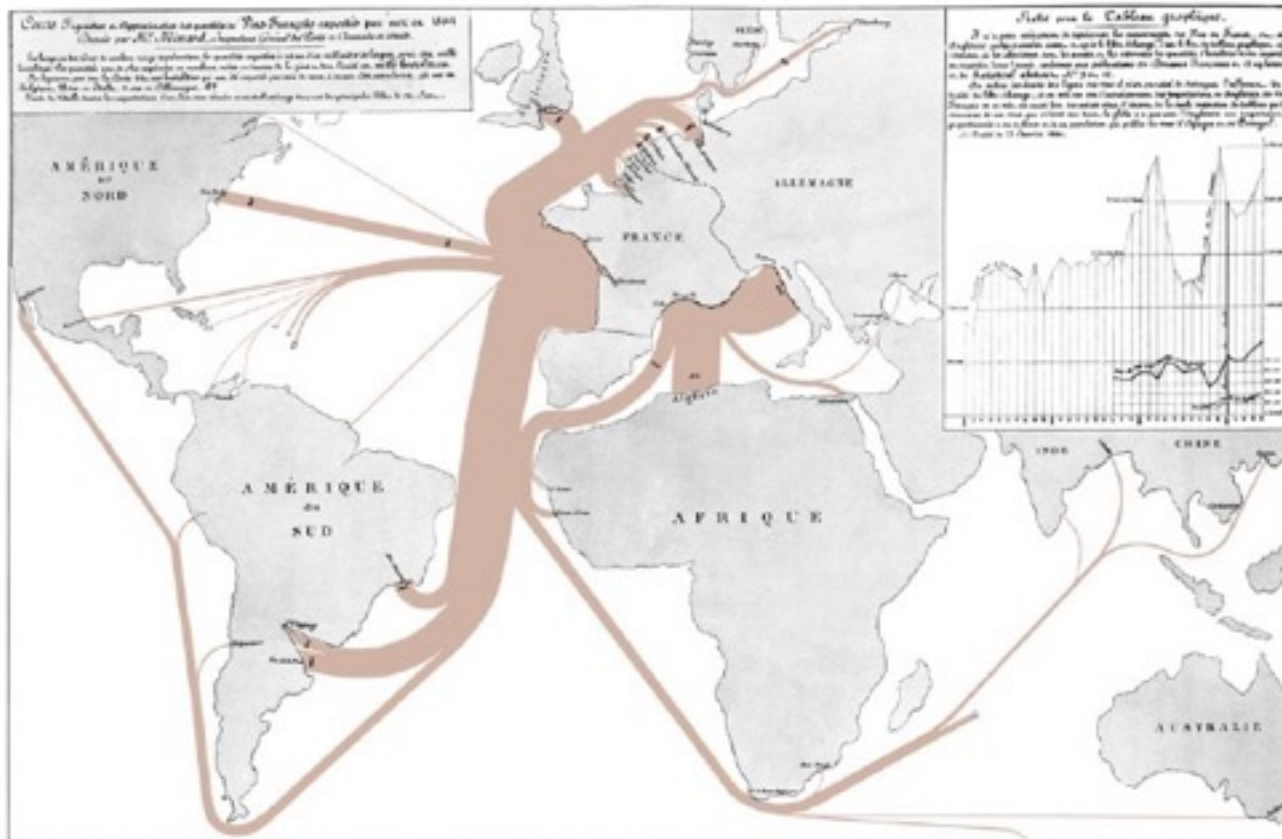


<http://bost.ocks.org/mike/sankey/>

BASIC MAPS

A small selection of examples

Flow Map



Charles Joseph Minard, *Tableaux Géographiques et Cartes Économiques de M. Minard*, 1845-1869, a portfolio of his work held by the Bibliothèque de l'École Nationale des Ponts et Chaussées, Paris.

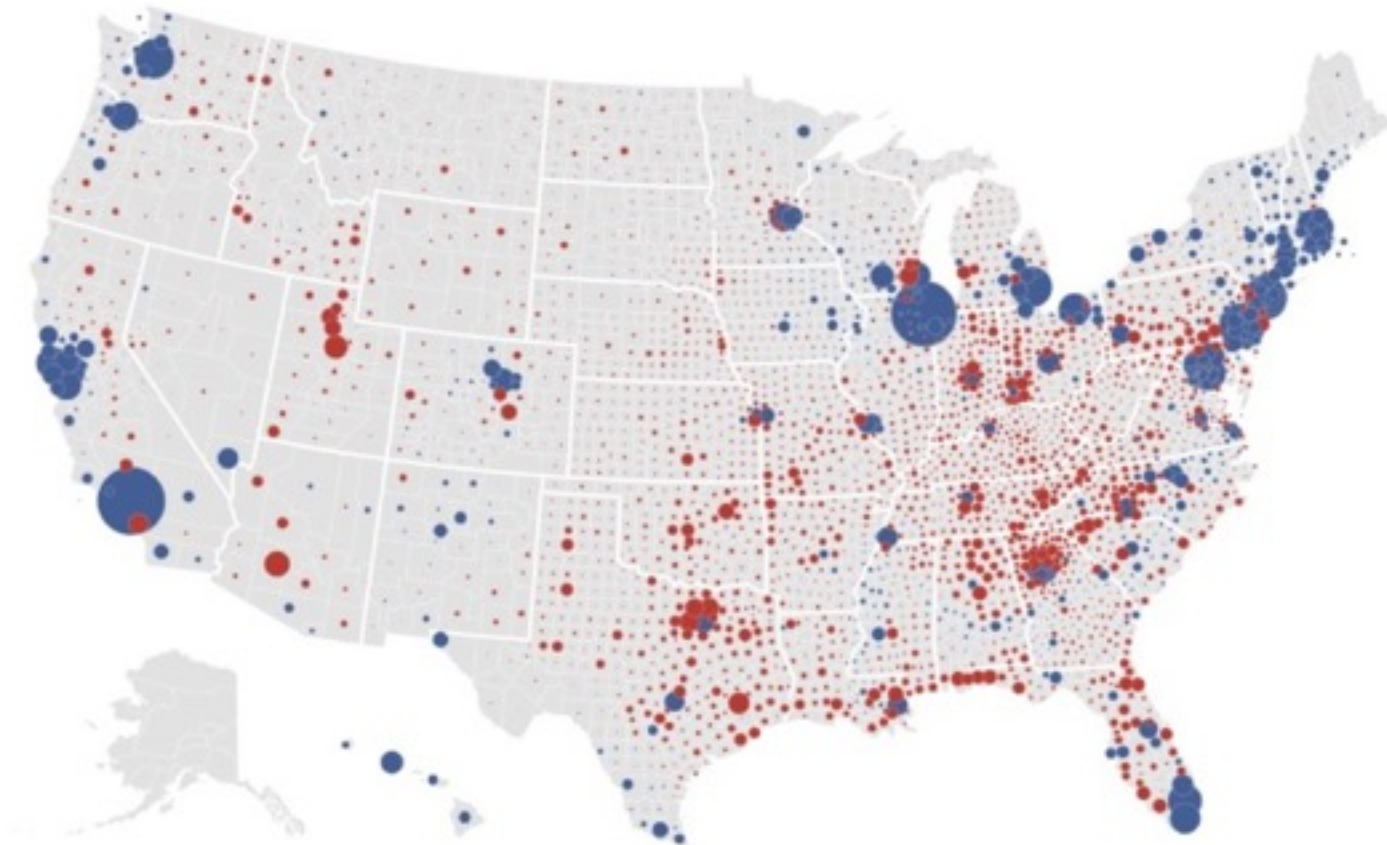
http://en.wikipedia.org/wiki/File:Minard%E2%80%99s_map_of_French_wine_exports_for_1864.jpg

Diagram/Topological Map



http://api.bart.gov/assets/BART_cc_map.png

Proportional Symbol Map

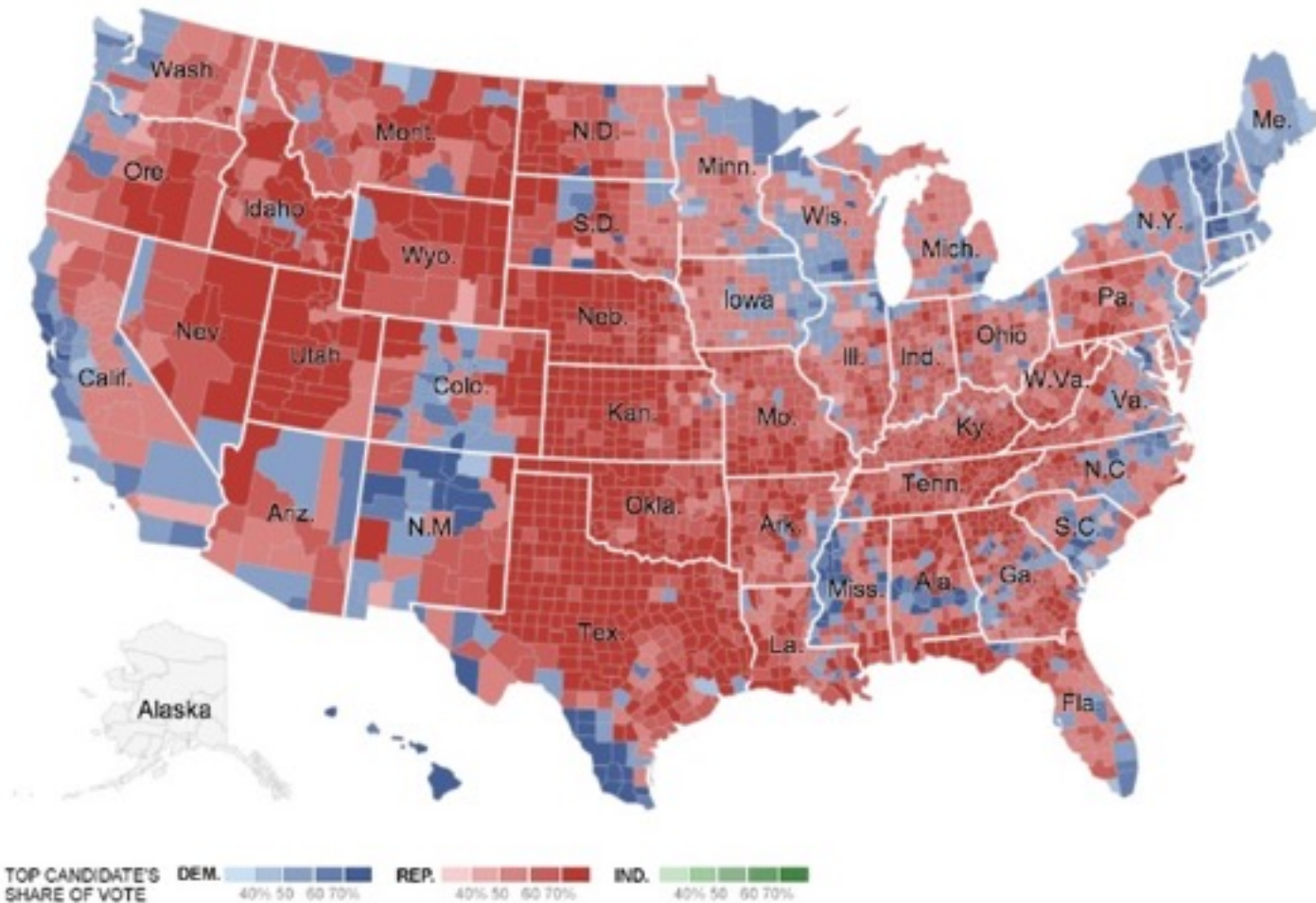


MARGIN OF
VICTORY

Circle size is proportional to the amount
each county's leading candidate is ahead

<http://elections.nytimes.com/2012/results/president>

Choropleth



<http://elections.nytimes.com/2012/results/president>

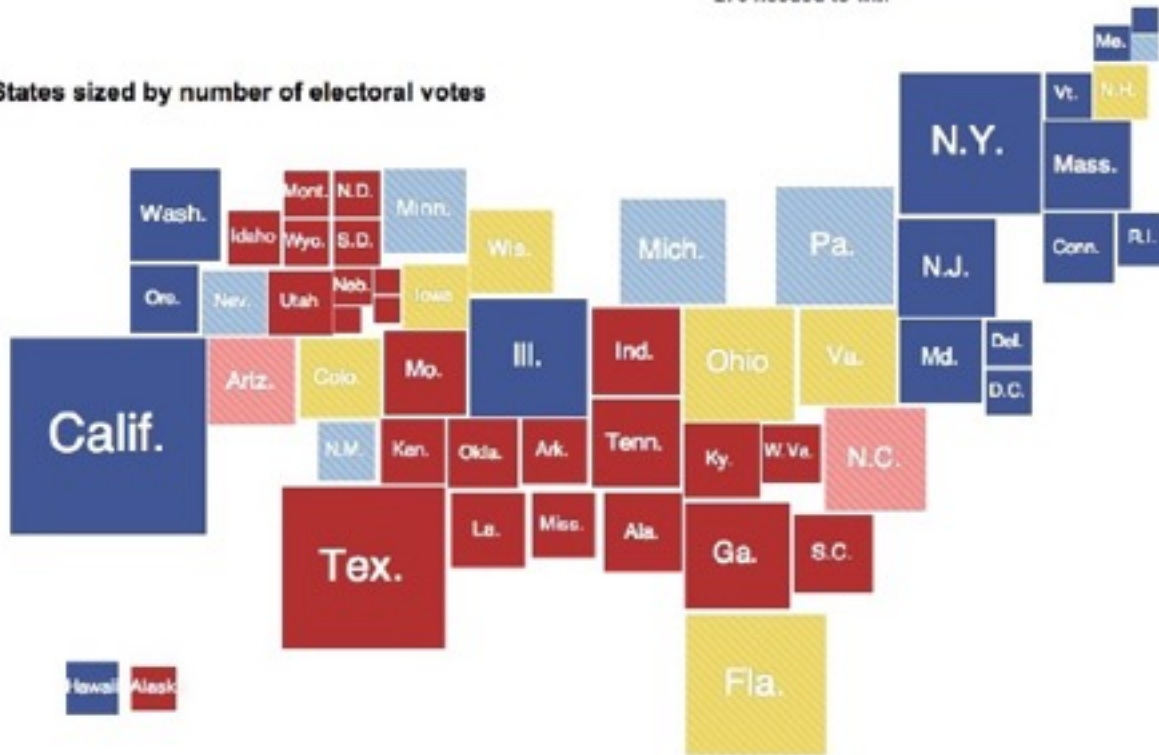
Cartogram

Obama **243** Needs 27 to win
ELECTORAL VOTES

Needs 64 to win **206** Romney
ELECTORAL VOTES



States sized by number of electoral votes

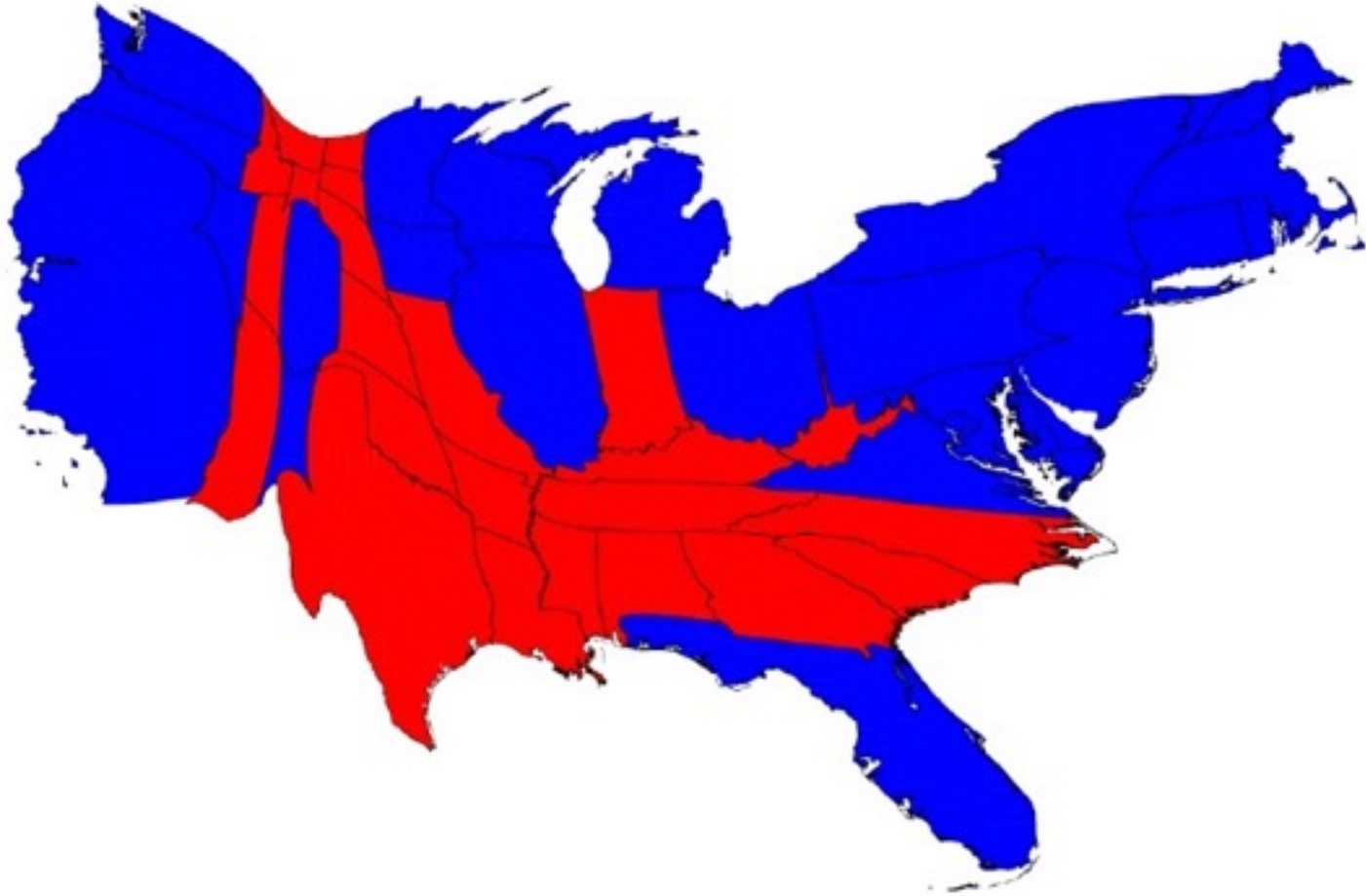


Maine and Nebraska give two electoral votes to the statewide winner and allocate the rest by congressional district.

Geographic View



Cartogram



<http://www-personal.umich.edu/~mejn/election/2012/>

EXERCISE

Can you identify each type of chart?

Chart Identification

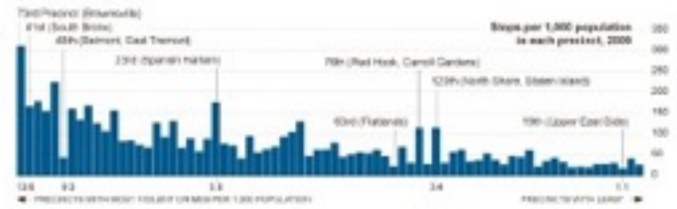
- Brooklyn
- Queens
- Manhattan
- Lower East Side
- South Bronx
- Fulton Street, Brooklyn
- Brownsville, Brooklyn
- Jackson Heights, Queens
- Northeast Queens
- Roosevelt Island



Circles indicate the number of stops at each address or location in 2009 as reported by the New York Police Department. Click in to the map to view details for the stops at each block.

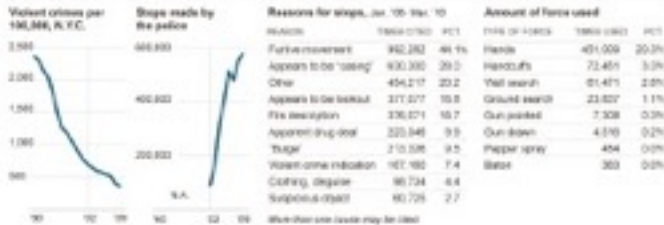
Intense Policing

Residents of some parts of the city feel the police presence much more acutely than others. Although frequency of stops is roughly commensurate with the crime rate over broad areas, the police presence in some places is disproportionate.



By the Numbers

The number of stops has increased to nearly 600,000 in a year.



Differences between the precincts with the highest and lowest rates of stops in 2009



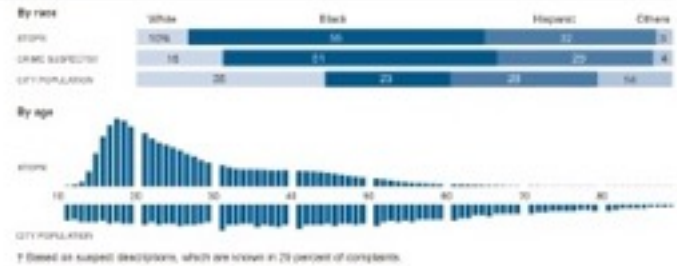
	New York City total	10 highest crime precincts	5 lowest crime precincts	7th Precinct (Brownsville)
Stops per 100 residents	8.0	16.9	2.7	21.8
Share of city's population	100%	14%	9%	1%
Share of the city's crime	100%	22%	2%	3%
Share of police stops	100%	24%	4%	3%

PROPORTION OF STOPS RESULTING IN:	New York City total	10 highest crime precincts	5 lowest crime precincts	7th Precinct (Brownsville)
Use of force	24%	21%	26%	26%
Arrest	8%	8%	7%	2%
Frisk	67%	66%	47%	46%

CHARACTERIZATION PAYS TO STOP IN:	New York City total	10 highest crime precincts	5 lowest crime precincts	7th Precinct (Brownsville)
NUMBER OF STOPS	+18%	+11%	-13%	+2%
NUMBER OF CRIMES	+44%	+10%	+21%	+8%

Who Gets Stopped

Mostly young, mostly minorities. More than 80 percent are male.



RESOURCES

Where to learn more

Resources

- Data Visualisation Catalogue
<http://www.datavizcatalogue.com/index.html>
- Common Static Visualization Types
http://guides.library.duke.edu/vis_types
- Wikipedia: Charts
<http://en.wikipedia.org/wiki/Chart>
- Chart Chooser
<http://labs.juiceanalytics.com/chartchooser/index.html>
- Visual.ly Learn Center
<http://visual.ly/learn>
- Christian Behrens, "The Form of Facts and Figures," Master's Thesis, Potsdam University of Applied Sciences, 2008.

Questions?

*Thanks to
Sophie J. Engle
San Francisco University*

for ideas, suggestions, slides, links, and much other stuff