

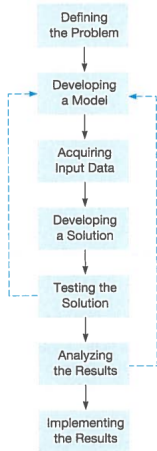
Today's Agenda

Exploring bivariate and multivariate visualizations

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Dataset 1: The Motivating Problem

The Quantitative Analysis Approach



What drives economic investment in US states?

Why do some states attract greater investment by companies and individuals than others?

Last Week: Univariate Analyses

Measures of Central Tendency

- Mean
- Median

Deviations from Central Tendency

- Standard deviation

Measures of Variability

- Range
- IQR

Numerical / Continuous Data

Histogram



The standard way to show a statistical distribution - keep the gaps between columns small to highlight the 'shape' of the data.

Boxplot



Summarise multiple distributions by showing the median (centre) and range of the data

Categorical / Discrete Data

Bar



See above. Good when the data are not time series and labels have long category names.

Ordered bar



Standard bar charts display the ranks of values much more easily when sorted into order.

Column



The standard way to compare the size of things. Must always start at 0 on the axis.

Ordered column

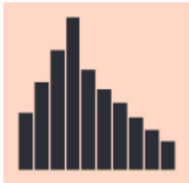


See above.

Bivariate and Multivariate Visualizations

1. Facets

Histogram

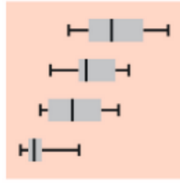


Ordered column



2.

Boxplot



3.

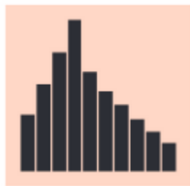
Scatterplot



Bivariate and Multivariate Visualizations

1. Facets

Histogram

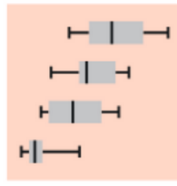


Ordered column



2.

Boxplot



3.

Scatterplot



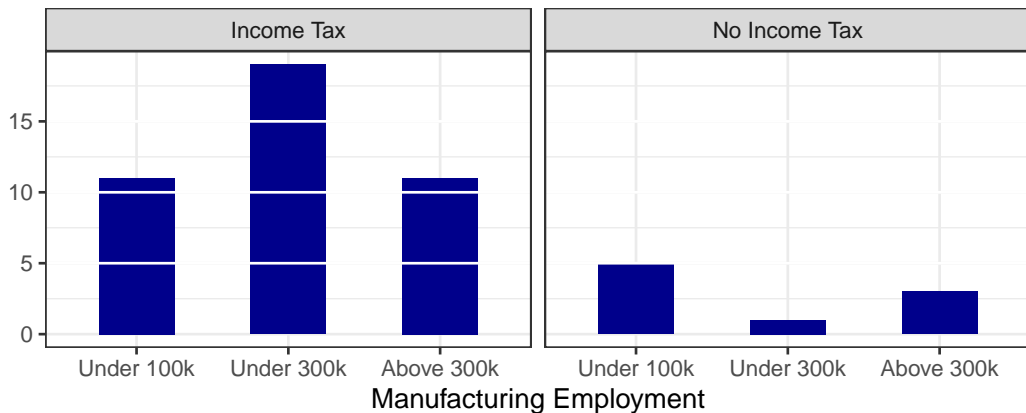
Bivariate Viz: Categorical x Categorical

1. Using Facets to Extend Univariate Visualizations

Make two bar plots of manufacturing category

- 1 One for states with an income tax, and
- 2 One for states without an income tax.

Bivariate Viz: Categorical x Categorical



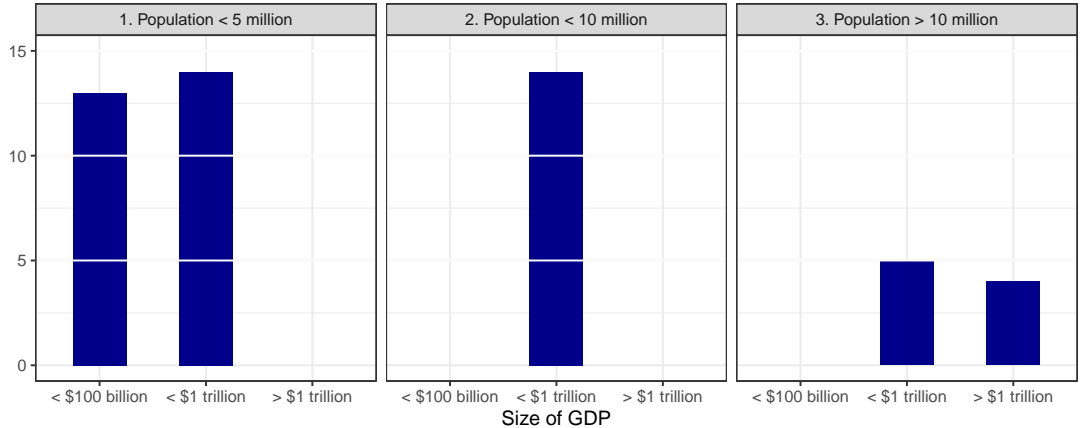
Bivariate Viz: Categorical x Categorical

1. Using Facets to Extend Univariate Visualizations

Make three bar plots of GDP category

- 1 `pop_category = "Under 5 million"`
- 2 `pop_category = "Under 10 million"`
- 3 `pop_category = "Above 10 million"`

Bivariate Viz: Categorical x Categorical



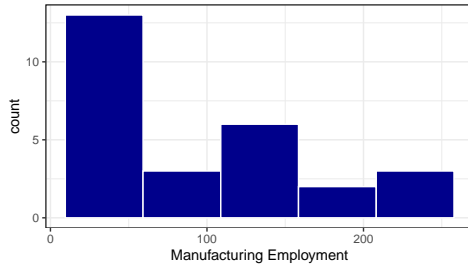
Bivariate Viz: Numerical x Categorical

1. Using Facets to Extend Univariate Visualizations

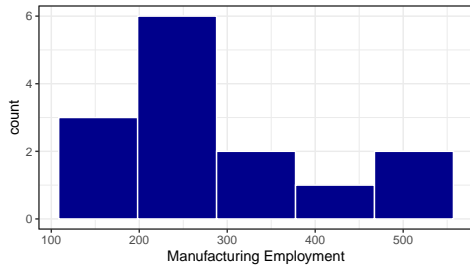
Make three histograms of manufacturing employment (5 bins)

- 1 `pop_category = "Under 5 million"`
- 2 `pop_category = "Under 10 million"`
- 3 `pop_category = "Above 10 million"`

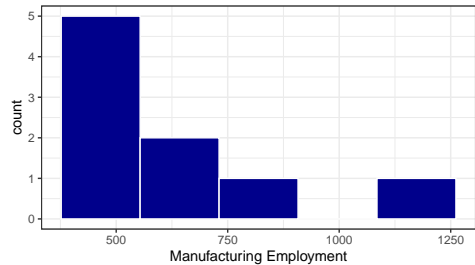
Small States



Medium States

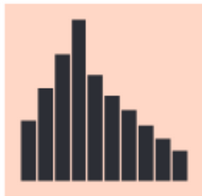


Large States



1. Facets

Histogram

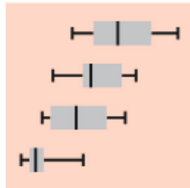


Ordered column



2.

Boxplot



3.

Scatterplot

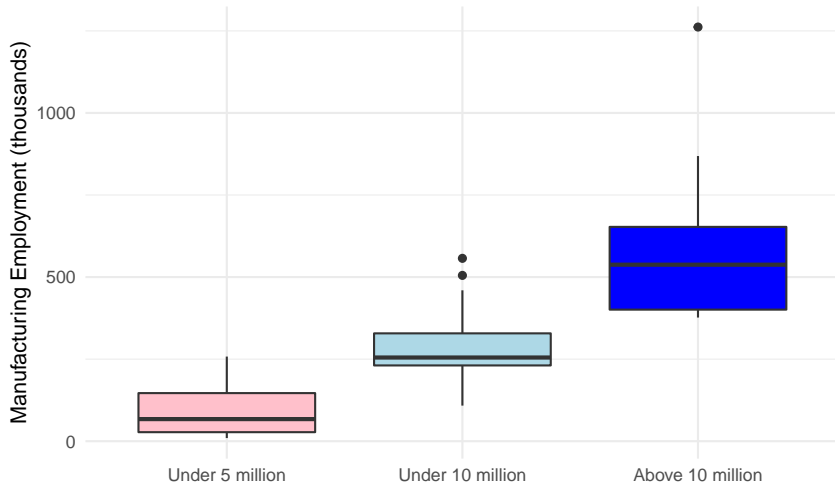


Using Box Plots: Numerical x Categorical

Remake the last visualization using a box plot instead of histograms with facets.

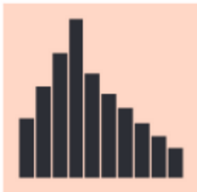
e.g. separate boxes for each population category

Bivariate Viz: Numerical x Categorical



1. Facets

Histogram

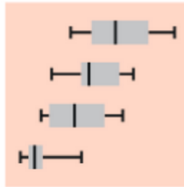


Ordered column



2.

Boxplot



3.

Scatterplot

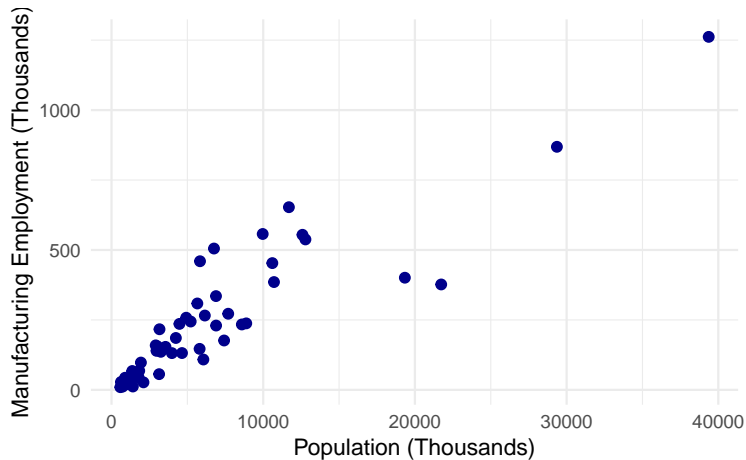


Using Scatter Plots: Numerical x Numerical

Do states with bigger populations have higher levels of employment in manufacturing?

Make a scatter plot of manufacturing employment and population.

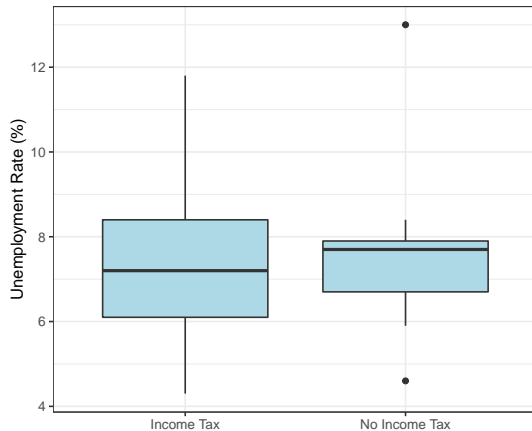
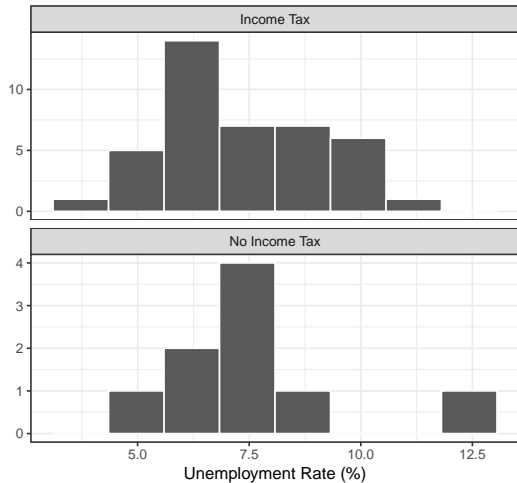
Bivariate Viz: Numerical x Numerical



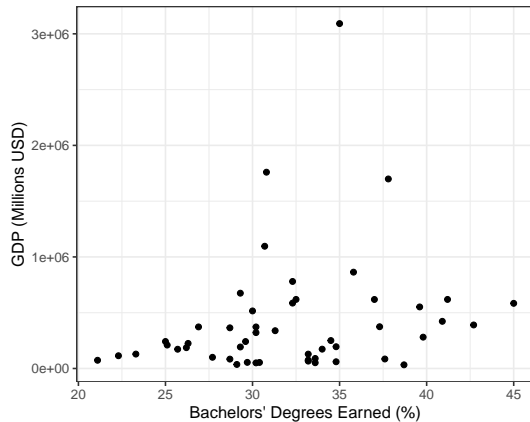
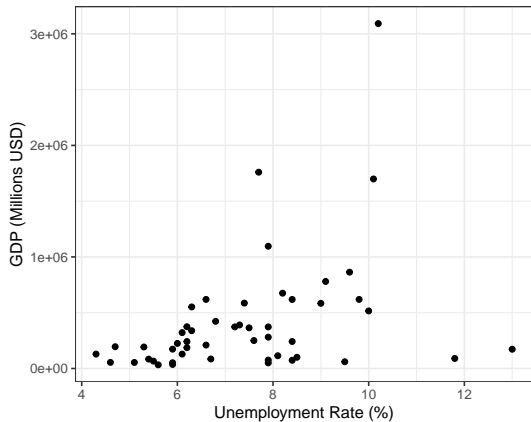
Time to Practice!

- 1 Make two histograms of unemployment, one for states with an income tax and one for states without.
- 2 Remake the above as a box plot
- 3 Make and analyze the following four scatter plots:
 - GDP (actual) x Unemployment
 - GDP (actual) x Bachelors' Degrees
 - GDP (rate) x Unemployment
 - GDP (rate) x Bachelors' Degrees

Unemployment x Income Taxes



Scatter plots of GDP (actual)



Scatter plots of GDP (rate)

