

Data Visualization

BUS 230: Business and Economic Research and Communication

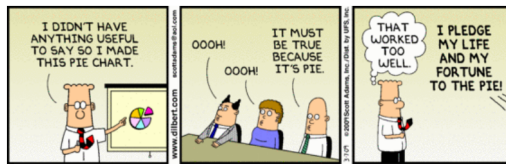
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Data Visualization

- Purpose of graphs and charts is to show a picture that can enhance a message, or quickly communicate a message, as compared to reporting descriptive statistics.
- Keep charts as simple as possible. Unnecessary ink like fancy formatting, pictures, clip art, etc., can distract an audience.
- Make sure charts communicate an *honest message*.
- We'll review some common chart types:
 - Pie charts
 - Bar charts
 - Line plots
 - Area charts
 - Scatter plots

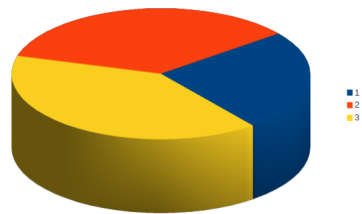
Pie Graphs

- Designed to relative sizes of categories which are part of a whole (percentages).
- Best when there are only a few categories.
- One problem with pie charts: human brain and eyes are not good at estimating or comparing angles.

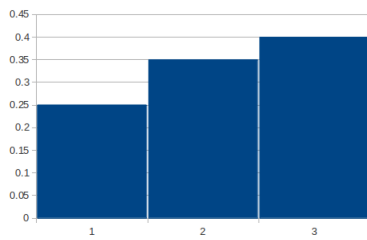


Pie Graphs

Really Stupid



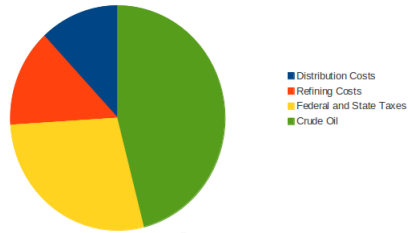
Bar Charts Make for Easier for Comparisons



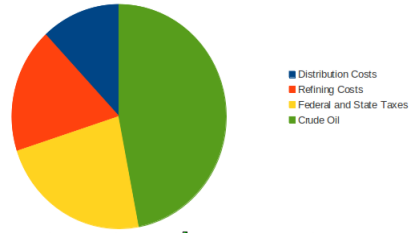
Pie Graphs

Comparing pie graphs to each other is nearly impossible.

2000 Average Distribution of Cost For 1 Gallon Gasoline



2004 Average Distribution of Cost For 1 Gallon Gasoline

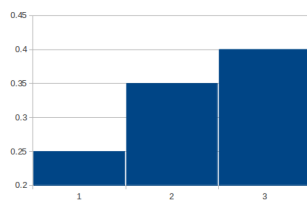


Bar Charts

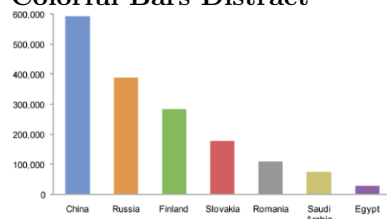
- Useful for making comparisons between groups.
- Can be useful for a small number, or a large number of groups.
- Does not require all parts add up to 100%.
- Smart bar charts:
 - NO 3-D!!
 - Minimal gaps between bars make for easier comparisons (not the Excel default!).
 - Begin vertical axis at 0 (not the Excel default!). Best with *ratio* data for each category.
 - *If it makes sense*, order items from smallest to largest.
 - Use differences in color only if it corresponds to differences in meaning or emphasis.

Dumb, Dumber, and Dumberer

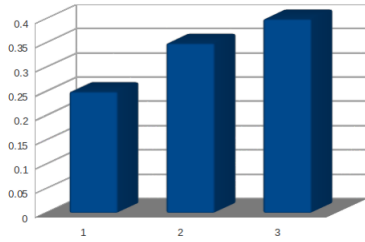
Vertical Axis Misrepresentation



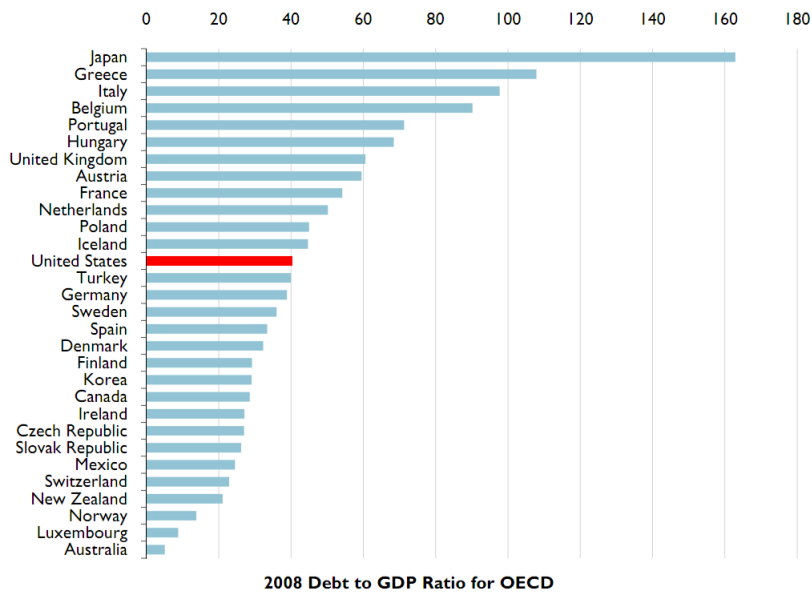
Colorful Bars Distract



3-D Makes Comparison More Difficult

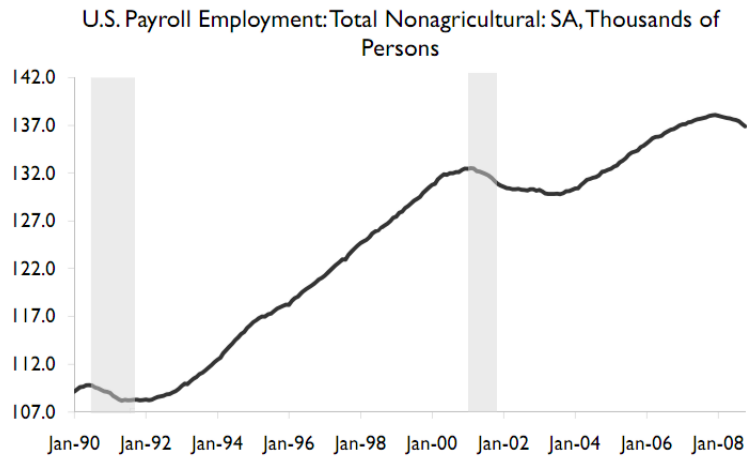


Good Example of a Bar



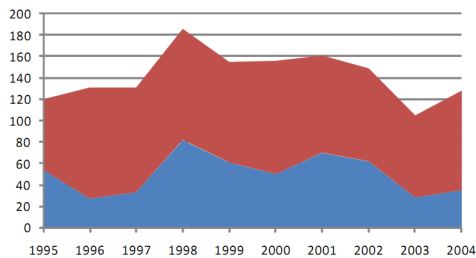
Line Chart

- Best with a single variable, measured over time.
- Also works well with a relative frequency of a single response category, measured over time.



Area Chart

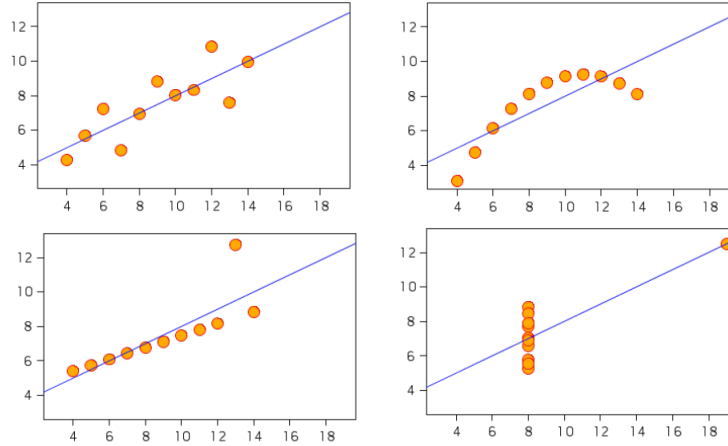
- An area chart is a line chart with the area underneath shaded.
- It is best with two lines in which one line represents a variable that is a subset of the other.
- Example: Total retail sales and Durable Goods sales.



Scatter Plots

- Scatter plots are useful for showing the association for two different ratio/interval data.
- Complement a Pearson or Spearman correlation coefficient.
- Illustrate additional detail besides the strength of the relationship.

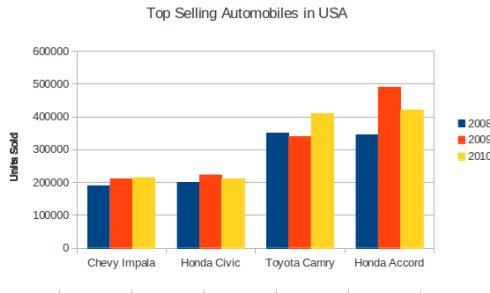
Scatter Plots



All of these sets of data have the same Pearson Correlation = 0.816.

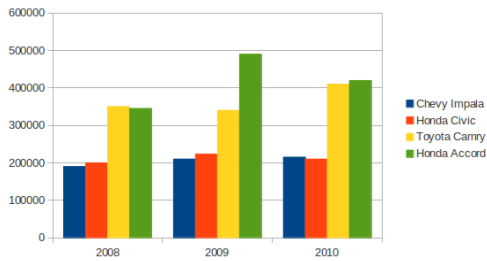
Multiple Bar Chart

- Multiple-bar chart can illustrate measures of multiple categories.
- Can make comparisons on sales of each car between the three years.
- Can make comparisons between each car, for a given year.
 - This is more difficult. Why?



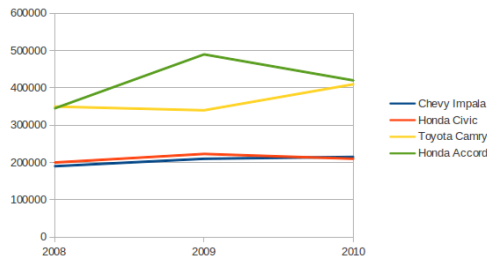
Multiple Bar Chart

- This one is easier for make comparisons between cars.
- Even worse though for changes over time.



Multiple Line Chart

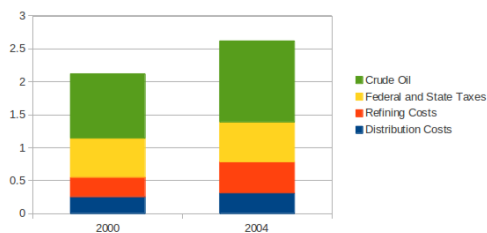
- A line graph effectively communicates movement over time.
- Comparing the height of the lines effectively communicates differences between cars.



Stacked Bar Chart

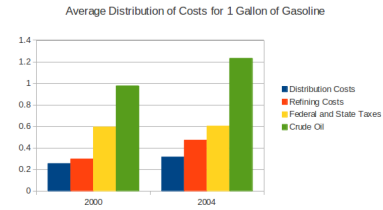
- Similar to a Multiple Bar Chart, except bars are stacked on top of one another, instead of placed next to one another.
- Difficult to make the following comparisons:
 - Relative costs of each category within a single year.
 - Relative costs of each category between 2000 and 2004.

Average Distribution of Costs for 1 Gallon of Gasoline

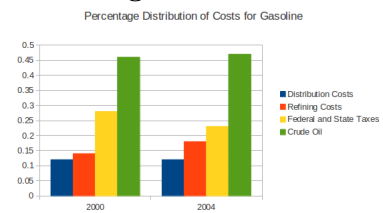


Choices for a Multiple Bar Chart

Actual Costs in Dollars

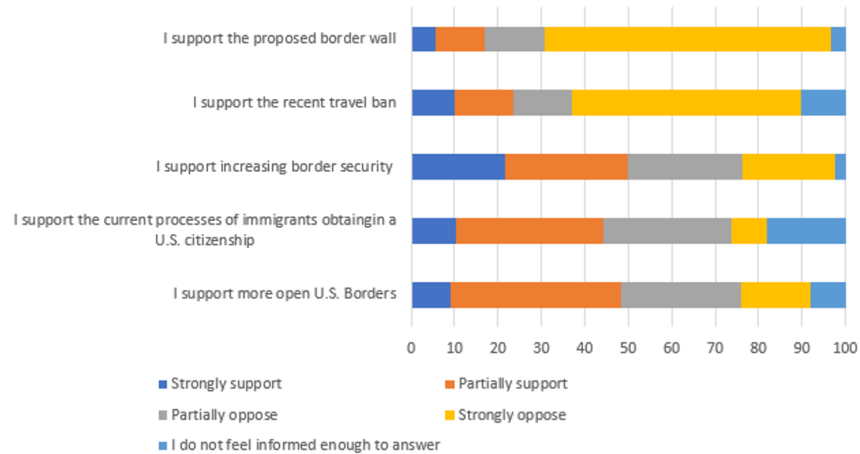


Percentage of Costs



Bar Charts for Ordinal Data

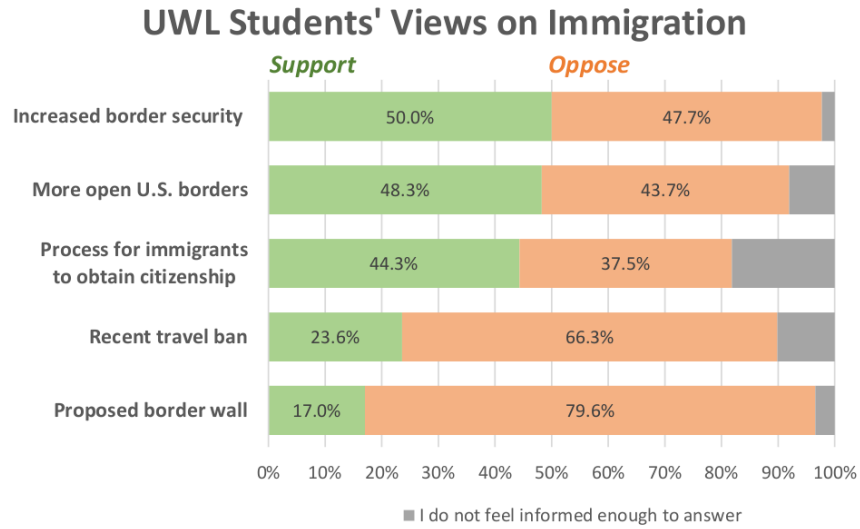
UWL College Students' Views on Immigration



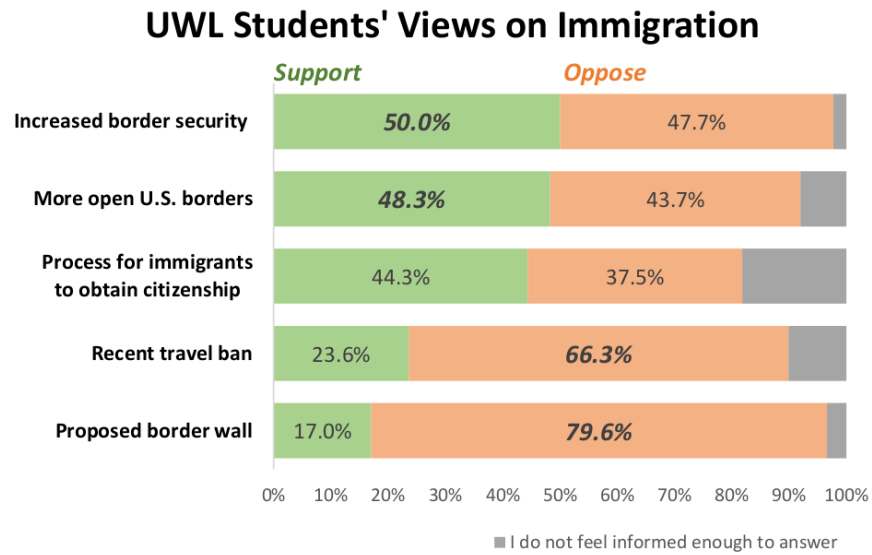
Problems

- Takes time to process assignment of colors to responses
- Large gaps: Space on graph not dedicated to communicating message
- Difficult to measure quantities of individual bars

Ordinal Bar Chart: Redesigned

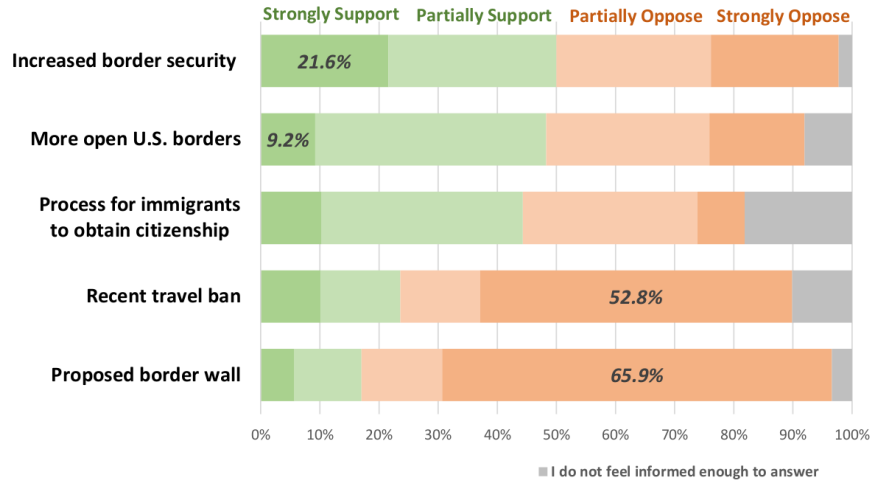


Ordinal Bar Chart: Highlight Majorities



Ordinal Bar Chart: All Categories

UWL Students' Views on Immigration



Best Practices: Communicating Information

The Right Amount of Information

- Not so much that it overwhelms
- Not so little that a visual is unnecessary.

Direct Attention Purposefully

- Use changes in color, font, etc. to direct attention to what you will discuss.
- Use minimally (see above)
- Changes can distract: It will direct attention, is it in the direction you want your audience to think?

How Much to Discriminate?

- How big of a change in color, font, etc?
- Big enough to see differences
- Right amount to convey meaning (eg: ordinal bars above)

Best Practices: Use of Space

Make the Most of the Space

- Small gaps between bars
- Zoom in on scatter plots (do not exclude too much, though)
- Think about necessity and placement of labels, legends.

Labels and Legends

- Think about how hard it is, how much time it takes, to make sense of labels and legends.
- Some labels unnecessary? Remove them.
- Labels are necessary? Where to put them so they are immediately seen, matched with geometries?
- Legends necessary? Be careful, difficult to use.