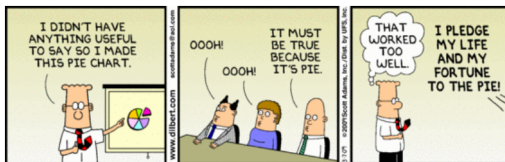


Data Visualization

BUS 230: Business and Economic Research and
Communication

- 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

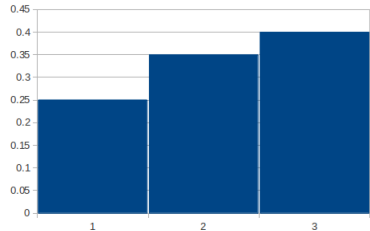
- Designed to relative sizes of categories which are part of a whole (percentages).
- Best when there are only a few categories.
- One problem with pie charts: human brain and eyes are not good at estimating or comparing angles.



Really Stupid

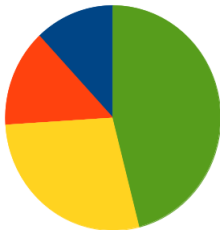


Bar Charts Make for Easier for Comparisons



Comparing pie graphs to each other is nearly impossible.

2000 Average Distribution of Cost For 1 Gallon Gasoline



- Distribution Costs
- Refining Costs
- Federal and State Taxes
- Crude Oil

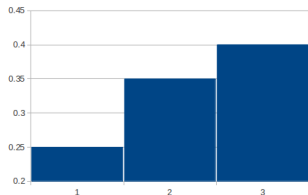
2004 Average Distribution of Cost For 1 Gallon Gasoline



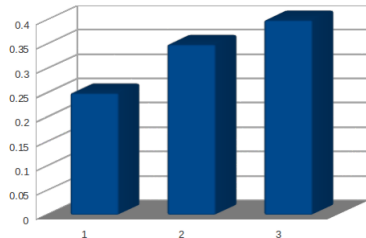
- Distribution Costs
- Refining Costs
- Federal and State Taxes
- Crude Oil

- 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.

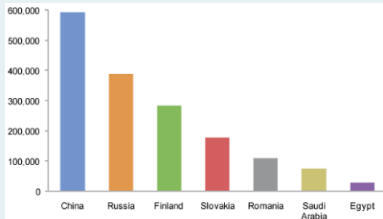
Vertical Axis Misrepresentation

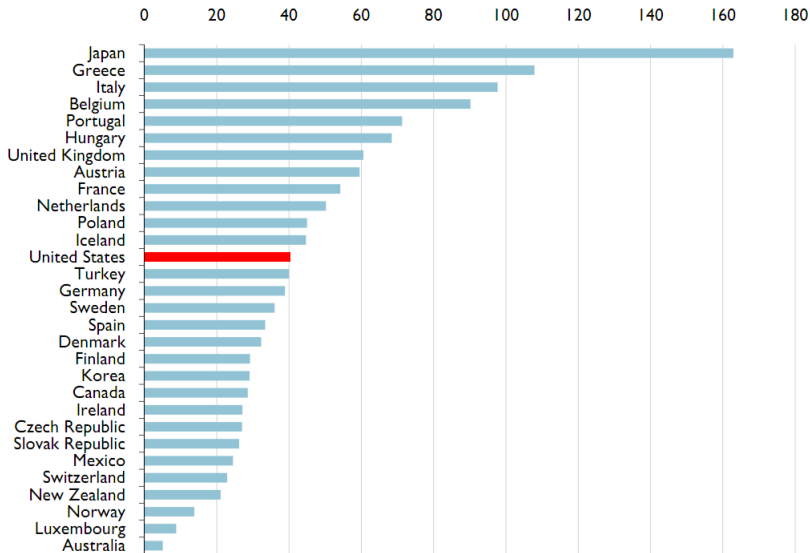


3-D Makes Comparison More Difficult



Colorful Bars Distract

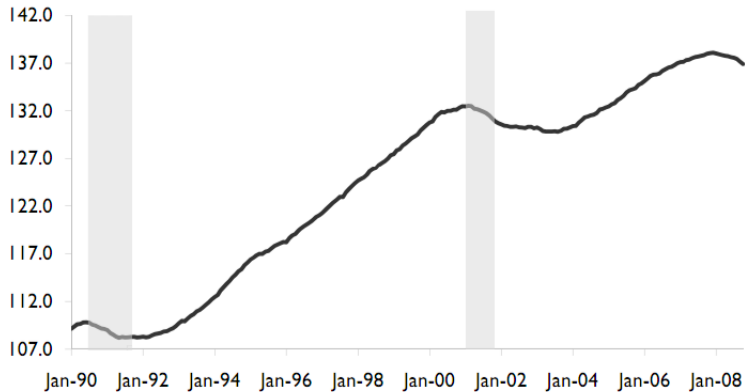




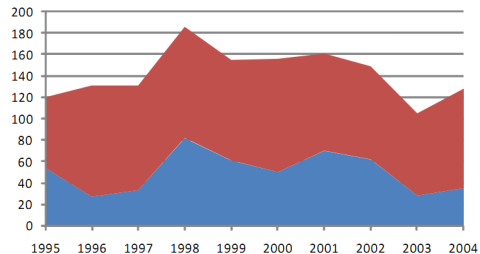
2008 Debt to GDP Ratio for OECD

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

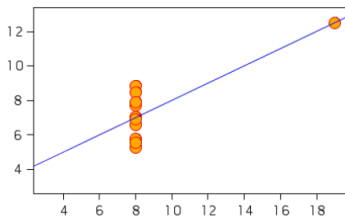
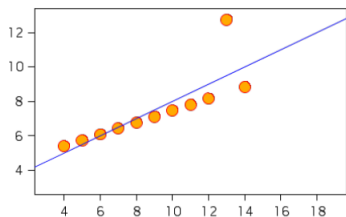
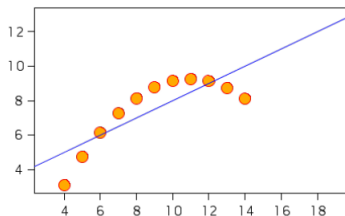
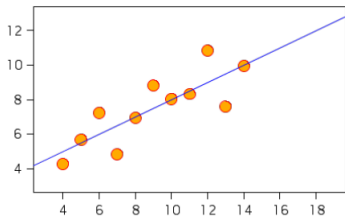
U.S. Payroll Employment: Total Nonagricultural: SA, Thousands of Persons



- 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.

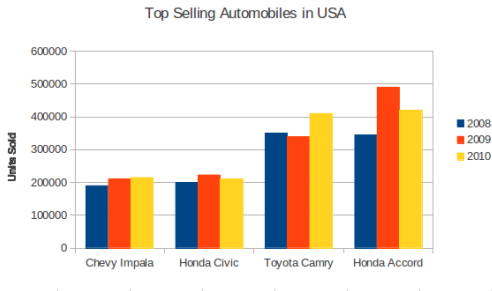


- Scatter plots are useful for showing the association for two different ratio/interval data.
- Complement a Pearson or Spearman correlation coefficient.
- Illustrate additional detail besides the strength of the relationship.

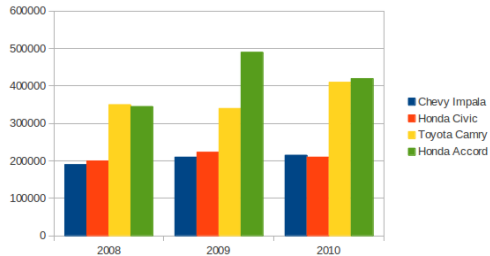


All of these sets of data have the same Pearson Correlation = 0.816.

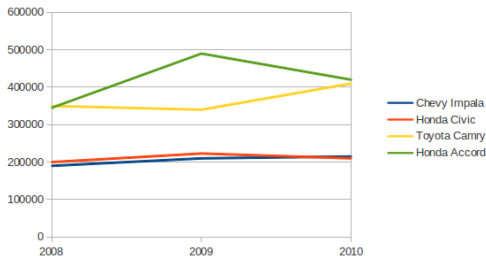
- Multiple-bar chart can illustrate measures of multiple categories.
- Can make comparisons on sales of each car between the three years.
- Can make comparisons between each car, for a given year.
 - This is more difficult. Why?



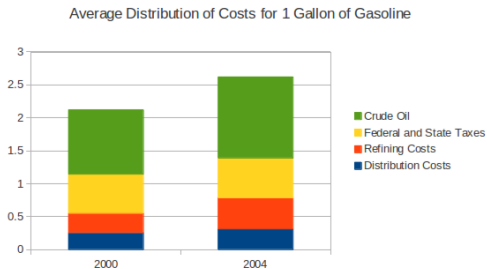
- This one is easier for make comparisons between cars.
- Even worse though for changes over time.



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

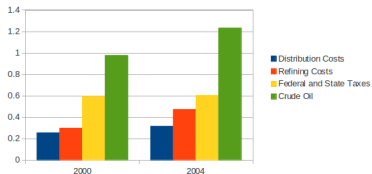


- Similar to a Multiple Bar Chart, except bars are stacked on top of one another, instead of placed next to one another.
- Difficult to make the following comparisons:
 - Relative costs of each category within a single year.
 - Relative costs of each category between 2000 and 2004.



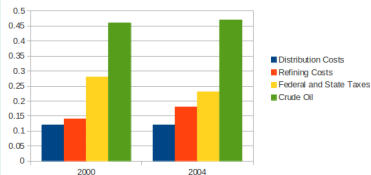
Actual Costs in Dollars

Average Distribution of Costs for 1 Gallon of Gasoline

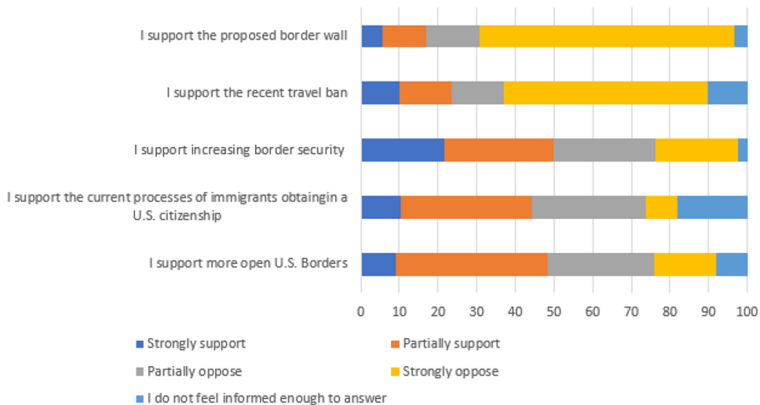


Percentage of Costs

Percentage Distribution of Costs for Gasoline

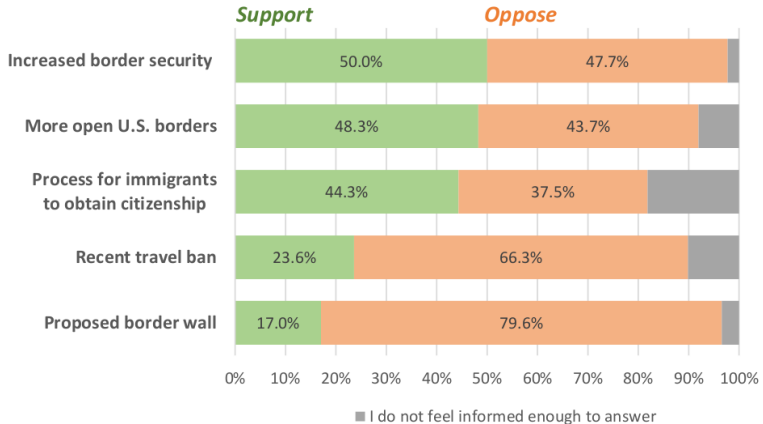


UWL College Students' Views on Immigration

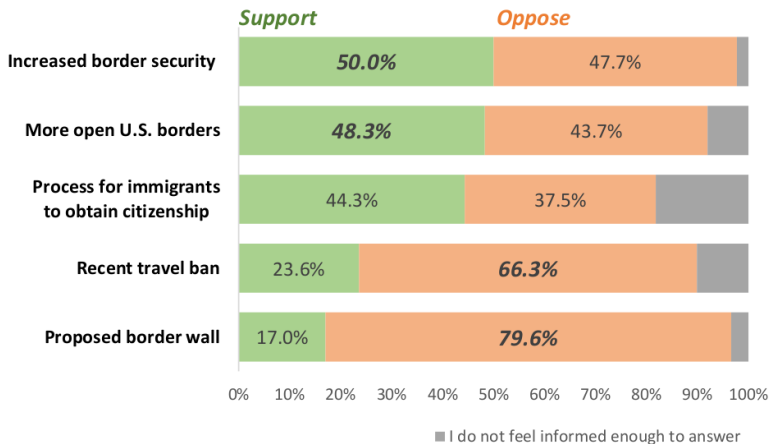


- Takes time to process assignment of colors to responses
- Large gaps: Space on graph not dedicated to communicating message
- Difficult to measure quantities of individual bars

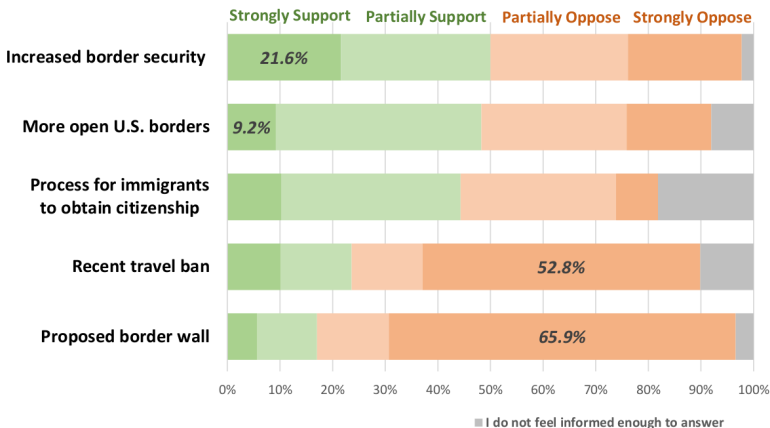
UWL Students' Views on Immigration



UWL Students' Views on Immigration



UWL Students' Views on Immigration



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)

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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?
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