Introduction to Data Visualization

Multipanel Figures

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Multipanel figures

- Large and complex datasets often contain much more information to show in a single figure panel.

- We need multipanel figures where each figure shows some subset of the data.

  - *Small multiples have multiple panels arranged in a regular grid. Each panel shows a different subset of the data but all panels use the same type of visualization.*

  - *Compound figures consist of separate figure panels assembled in an arbitrary arrangement (doesn't have to be grid-based) and showing entirely different visualizations (possibly even different datasets.)*

Small Multiples

- The term "small multiple" was popularized by Tufte.
- An alternative term, "trellis plot," was popularized around the same time at Bell Labs.
- The idea is
  - *to slice the data into parts according to one or more data dimensions,*
  - *visualize each data slice separately*
  - *arrange the individual visualizations into a grid*
- Columns, rows, or individual panels in the grid are labeled by the values of the data dimensions that define the data slices.

Faceting

- Small multiples technique is also sometimes referred to as "faceting," named after the methods that create such plots in the widely used ggplot2 plot library

  – *e.g., the ggplot2 funct*

Dimension 1	Dimension 2	Value
Dim1_v1	Dim2_v1	v1
Dim1_v1	Dim2_v1	v2
Dim1_v1	Dim2_v2	v3
Dim1_v2	Dim2_v1	v4
Dim1_v2	Dim2_v2	v5
Dim1_v2	Dim2_v1	v6
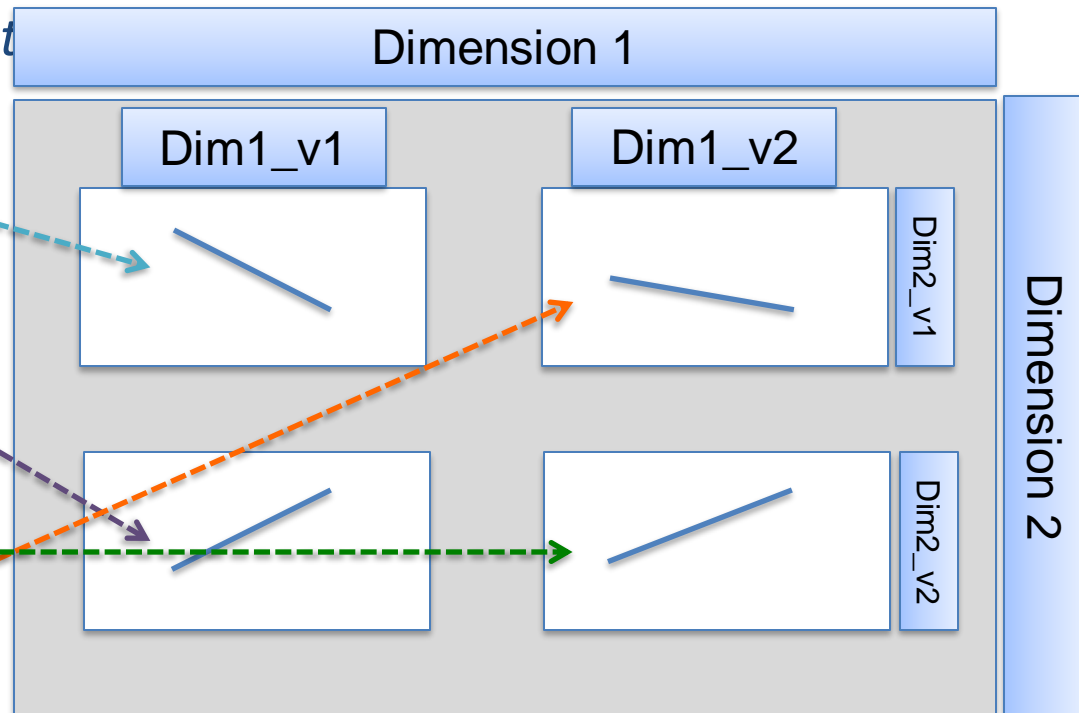
Faceting-example 1

- We can subdivide Titanic dataset by the class in which each passenger traveled and by whether a passenger survived or not.
    - *3 (classes) x 2 (survival status) = 6 panels (slices of data).*
    - *Color can be used for gender-based visualization*
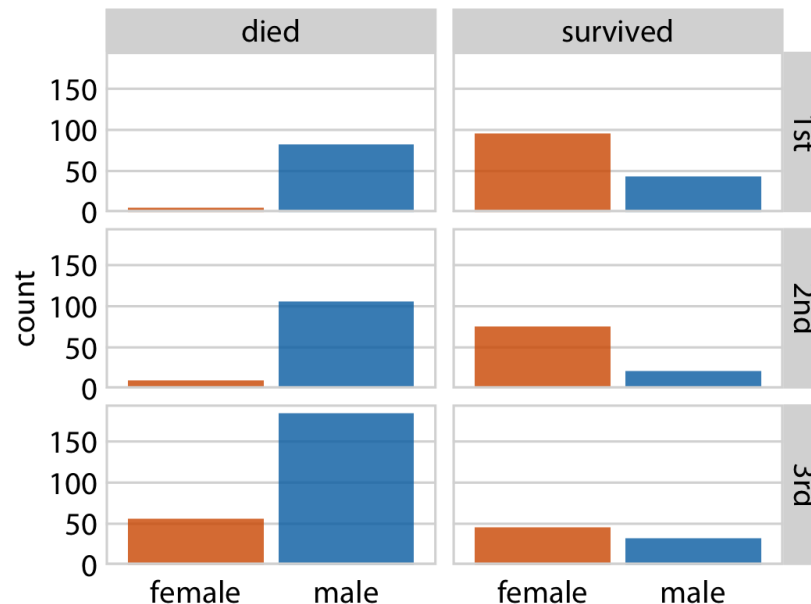
facet_grid(class ~ surv)

Faceting-example 1I

- The Internet Movie Database (IMDB)
  - *Relationship between the average ranking of a movie and the number of votes the movie has received.*
 - *For movies released over a 100-year time period.*
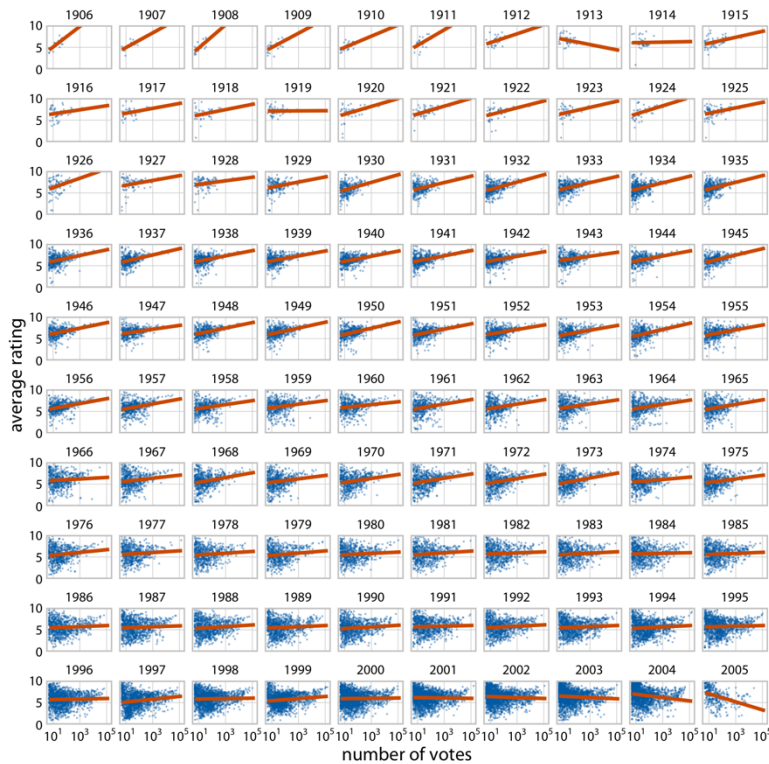
- One dimension: year.
- More votes more ratings?

Faceting-example 1I

- Dataset is sliced by only one dimension, the year, and panels for each year are arranged in rows from top left to bottom right. This visualization shows that there is an overall relationship between average ranking and number of votes, such that movies with more votes tend to have higher rankings.

Multipanel Remarks

- It is important that each panel uses the same axis ranges and scaling, which the human mind expects.

- Otherwise, there is a good chance that a reader will misinterpret what the figure shows.

- You can add a note to the caption.
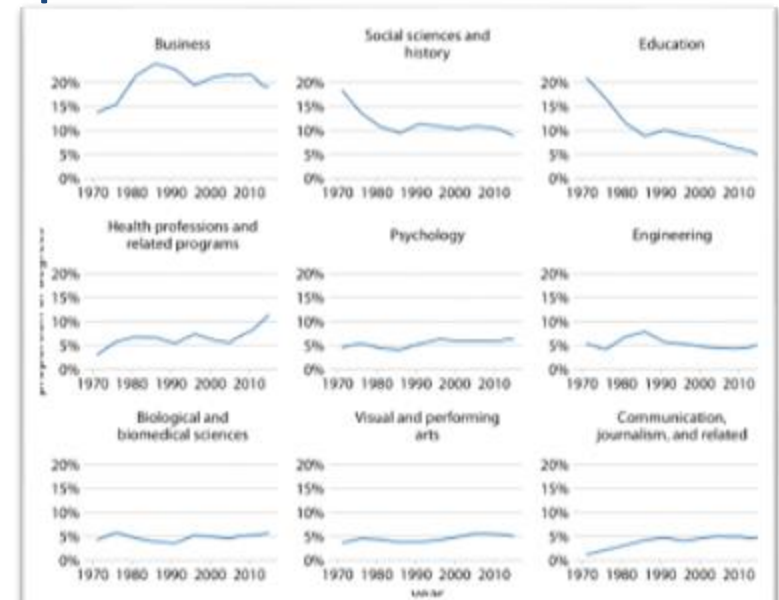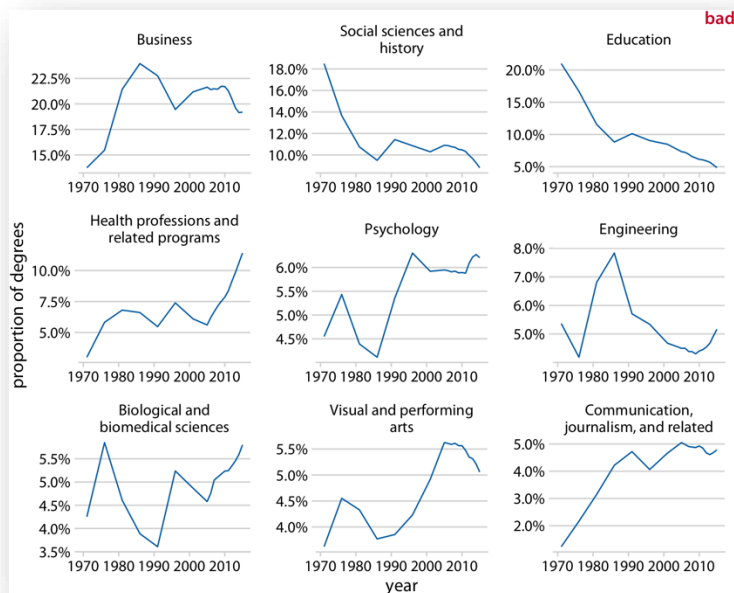
Panels in a meaningful and logical order

- It is also important to think about the ordering of the individual panels in a small multiples plot.

- The plot will be easier to interpret if the ordering follows some logical principle.

  - *Titanic: rows from the highest class (1st) to the lowest class (3rd).*

  - *IMDB: years increasing from the top left to the bottom right.*

  - *BA Degrees: arranged the panels by decreasing average degree popularity, such that the most popular degrees are in the top row and/or to the left and the least popular degrees are in the bottom row and/or to the right.*
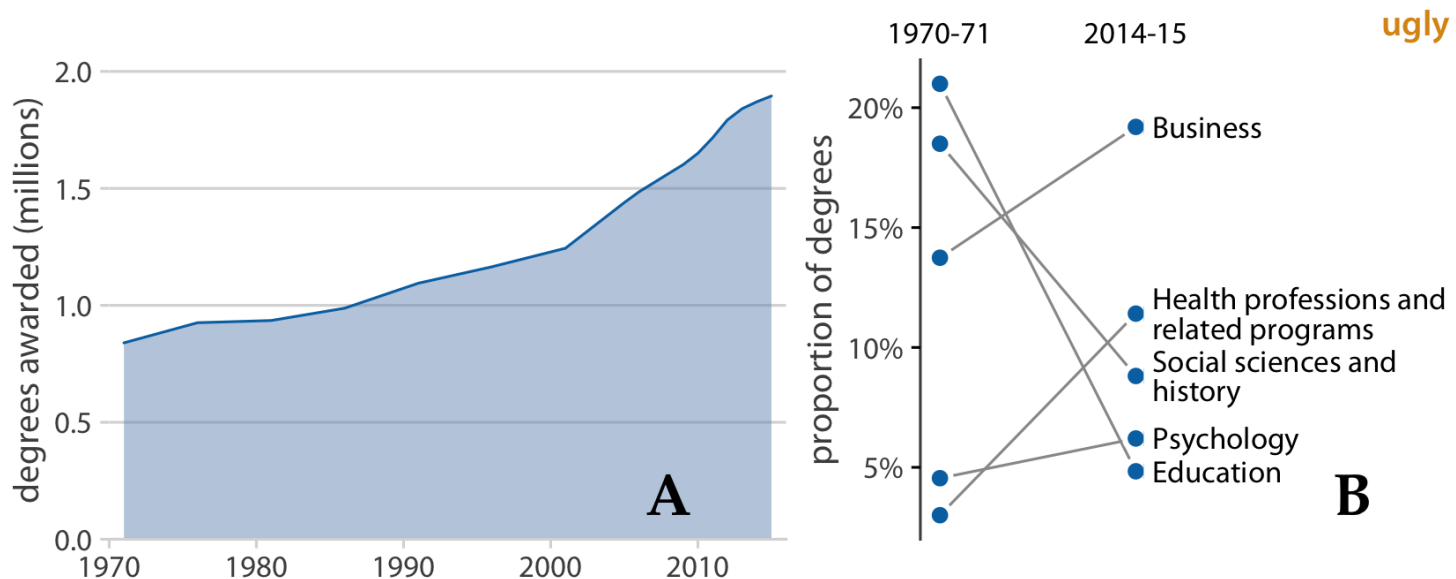
Compound Figures

- Not every figure with multiple panels fits the pattern of small multiples
- We can take the individual plots and arrange them in rows, columns, or other ways, and call the entire arrangement one figure.
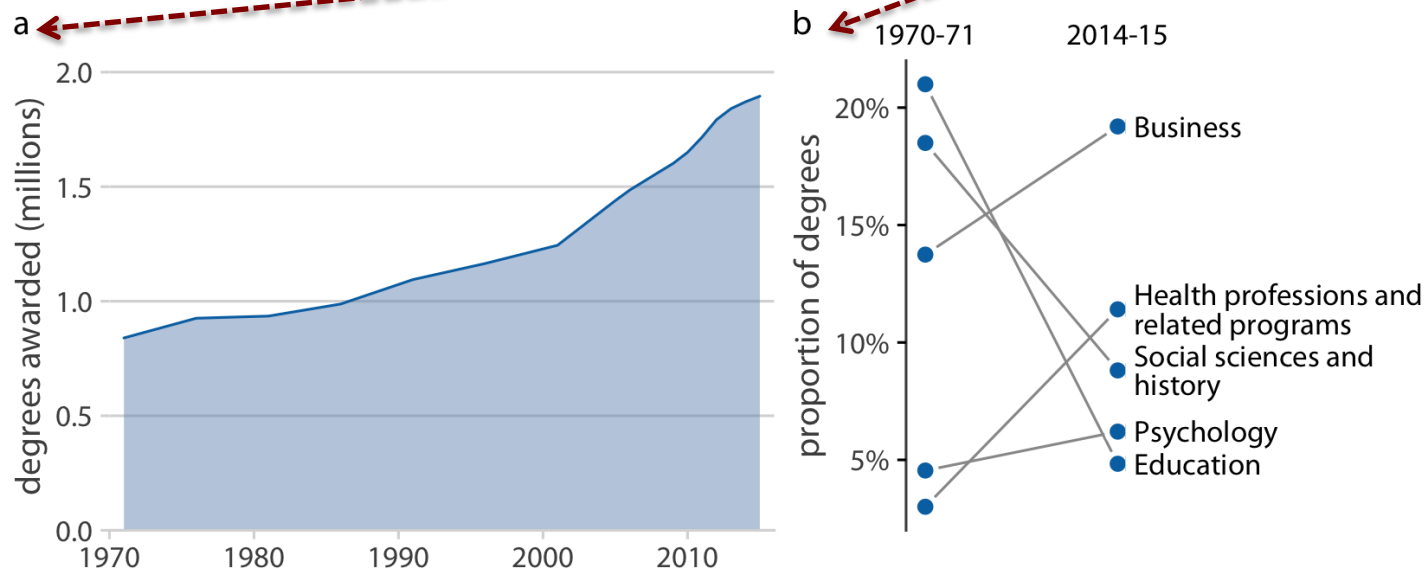
Figure labels

Compound figures-Remarks

- The labels should not be the first thing you see when you look at a compound figure.

- The convention is to start in the top-left corner with "a" and label consecutively from left to right and top to bottom.
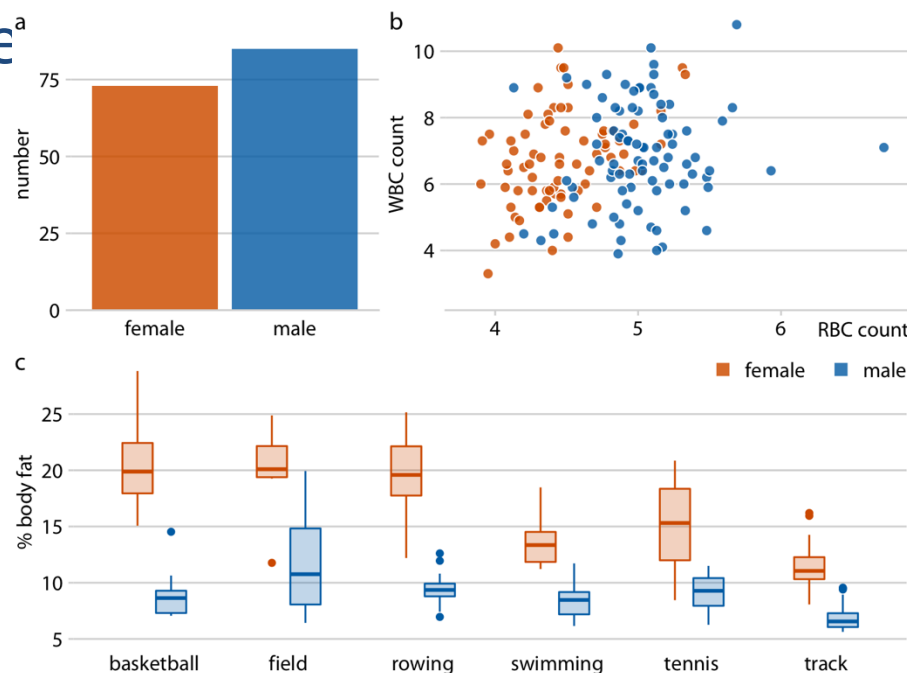
Compound figures-Remarks

- How do the individual panels fit together?

- They may be individually fine but jointly don't work.

- We need to employ a consistent visual language.
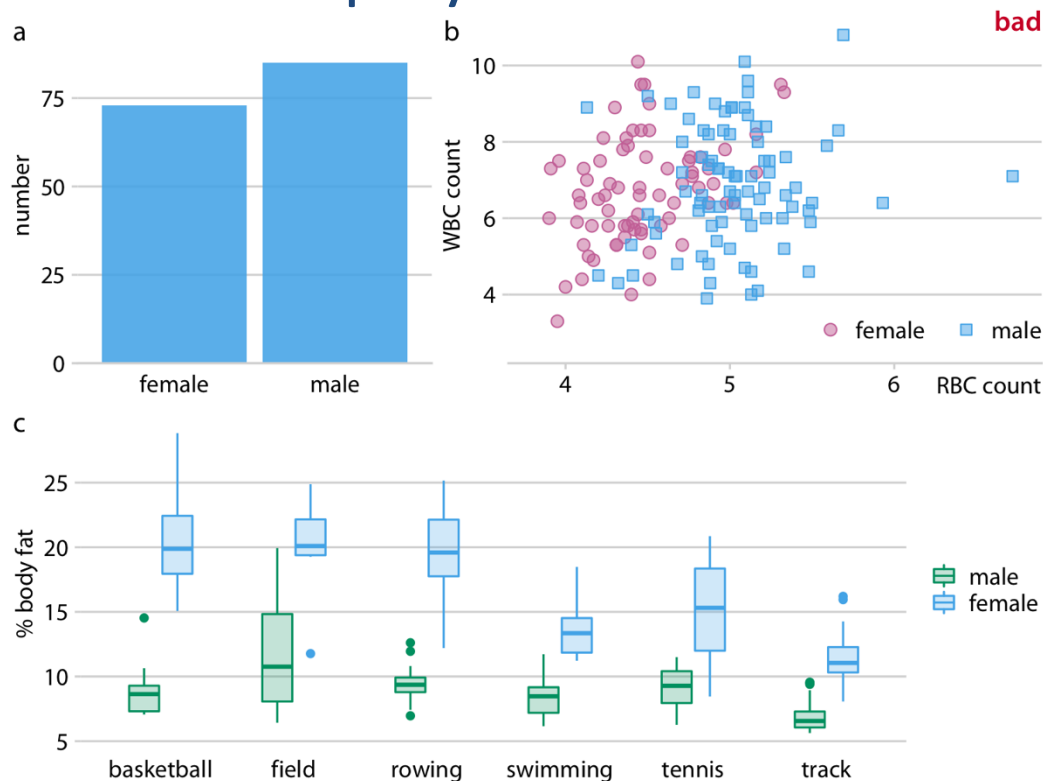
What inconsistencies you can see?

Compound figures-Remarks

- Female athletes are consistently shown in orange and to the left of male athletes, who are shown in blue.

- It doesn't take much mental effort to determine.

- Single le

Compound figures-Remarks

- We need to pay attention to the alignment of individual figure panels in a compound figure.

- The axes and other graphical elements of the individual panels should all be aligned to each other.