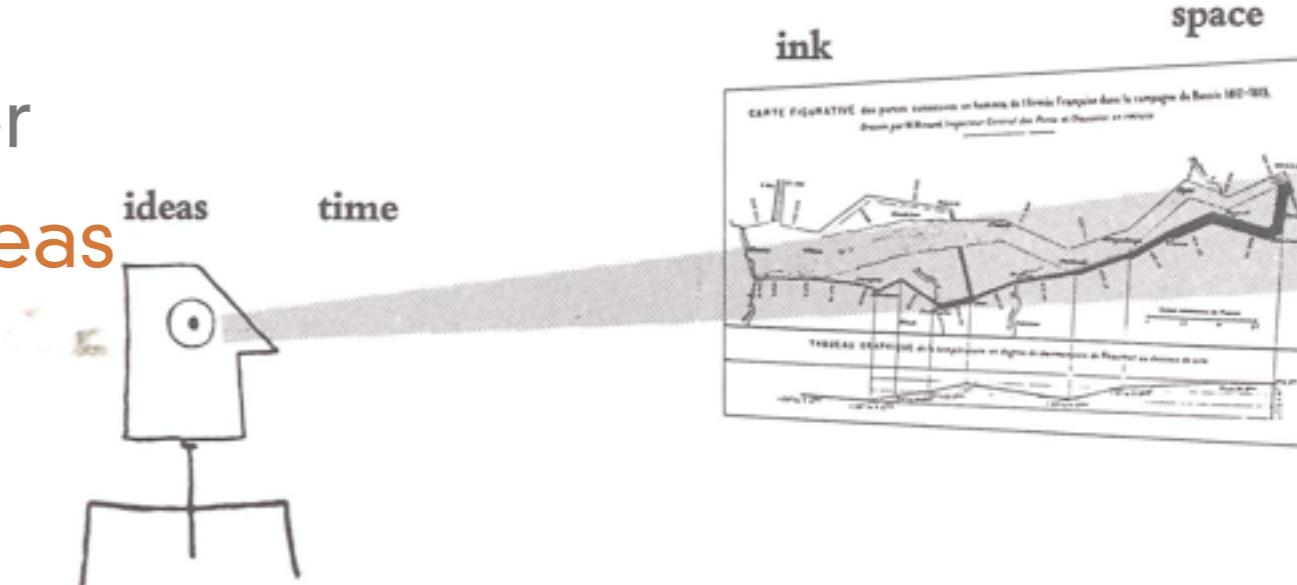


The Visual Display of Quantitative Information

- Graphical Excellence
 - is the well-designed presentation of interesting data
 - substance
 - statistics
 - design
 - consists of complex ideas communicated with
 - clarity
 - precision
 - efficiency
 - is that which gives the viewer
 - the greatest number of ideas
 - in the shortest time
 - with the least ink



The Visual Display of Quantitative Information

Graphical Excellence begins with Graphical Integrity



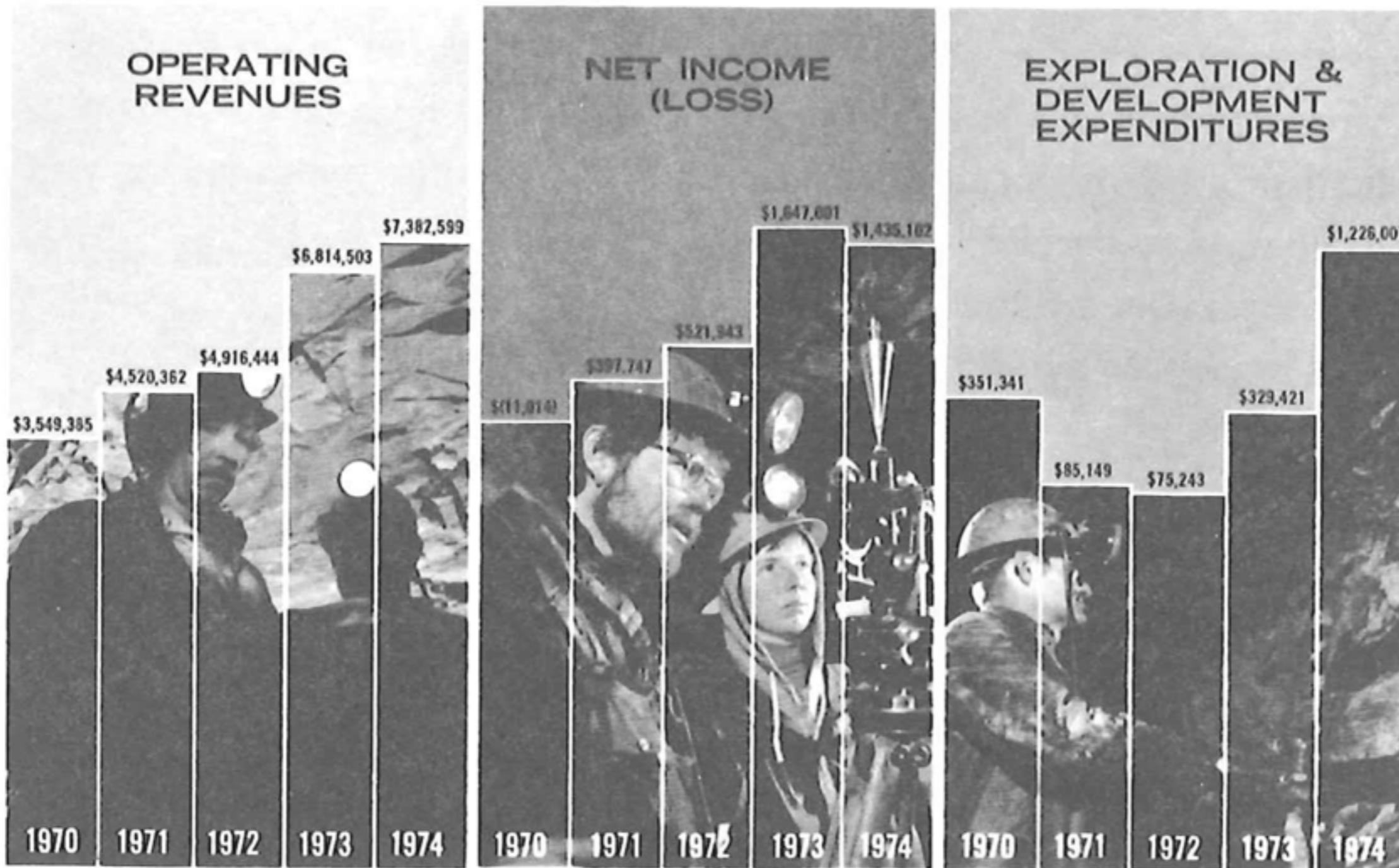
The Visual Display of Quantitative Information

- Graphical Integrity
 - “not lying with statistics”
 - tell the truth about data



The Visual Display of Quantitative Information

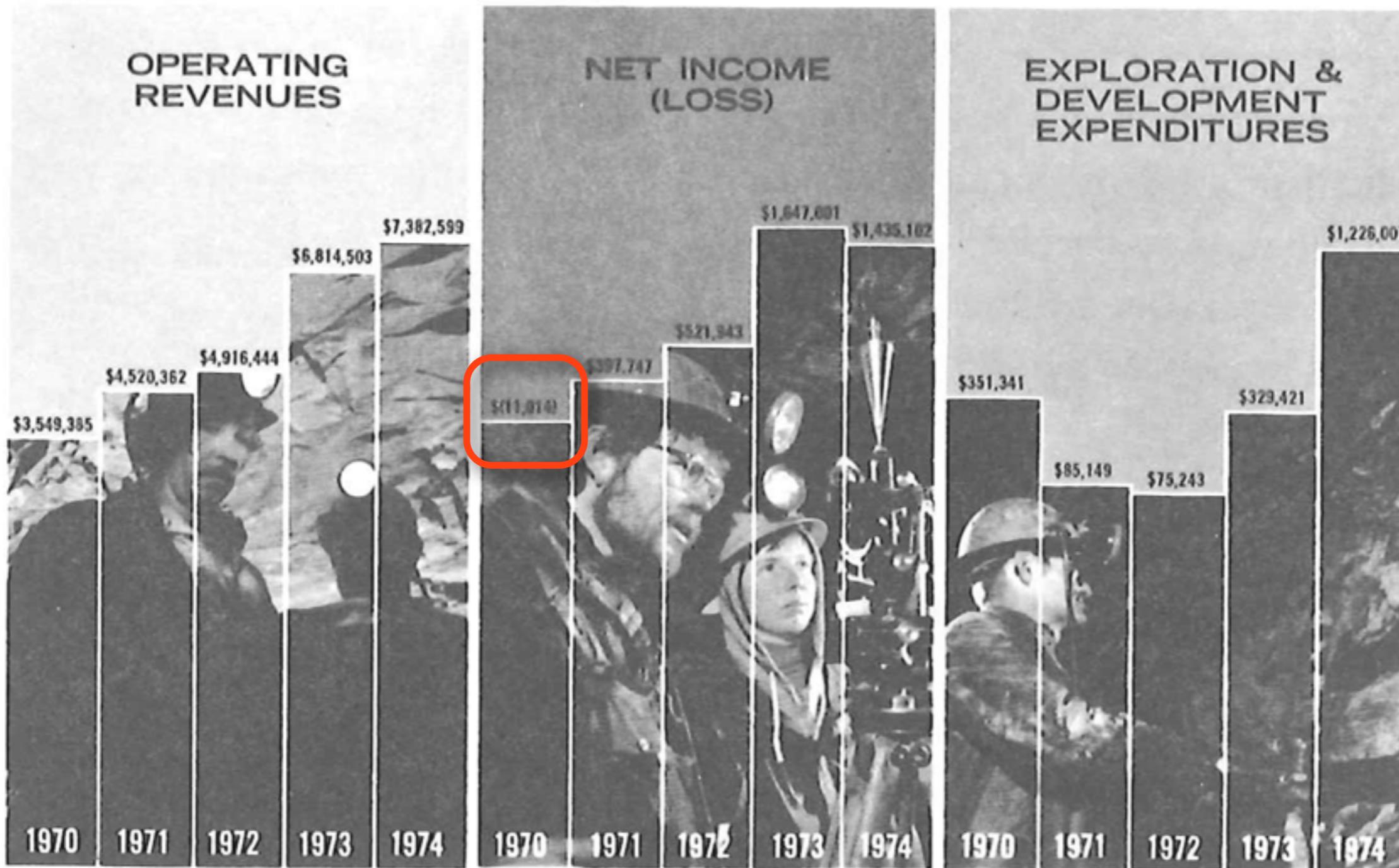
Examples of Infographics lacking integrity



Day Mines, Inc., 1974 Annual Report

The Visual Display of Quantitative Information

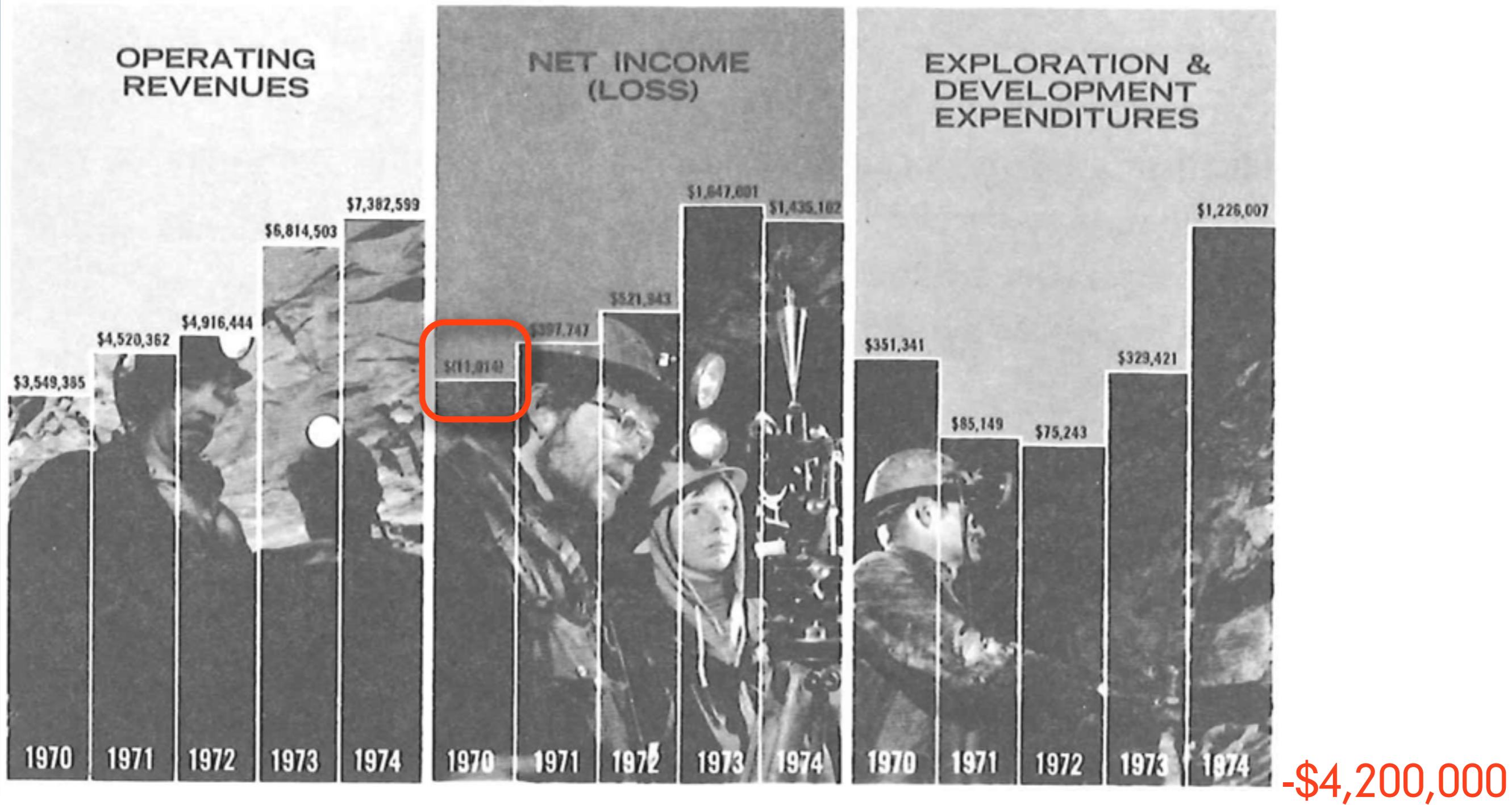
Examples of **Infographics** lacking integrity



Day Mines, Inc., 1974 Annual Report

The Visual Display of Quantitative Information

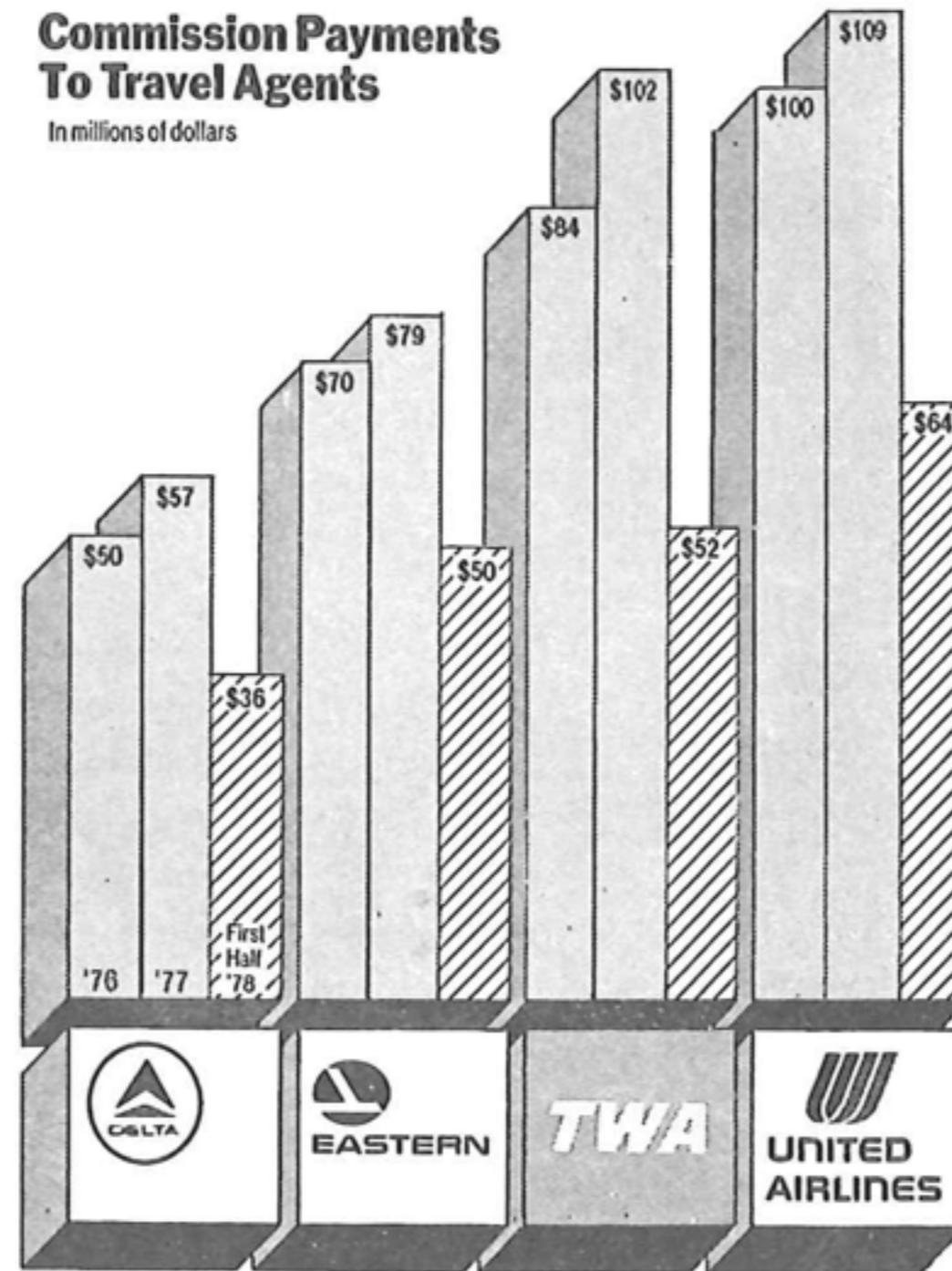
Examples of Infographics lacking integrity



Day Mines, Inc., 1974 Annual Report

The Visual Display of Quantitative Information

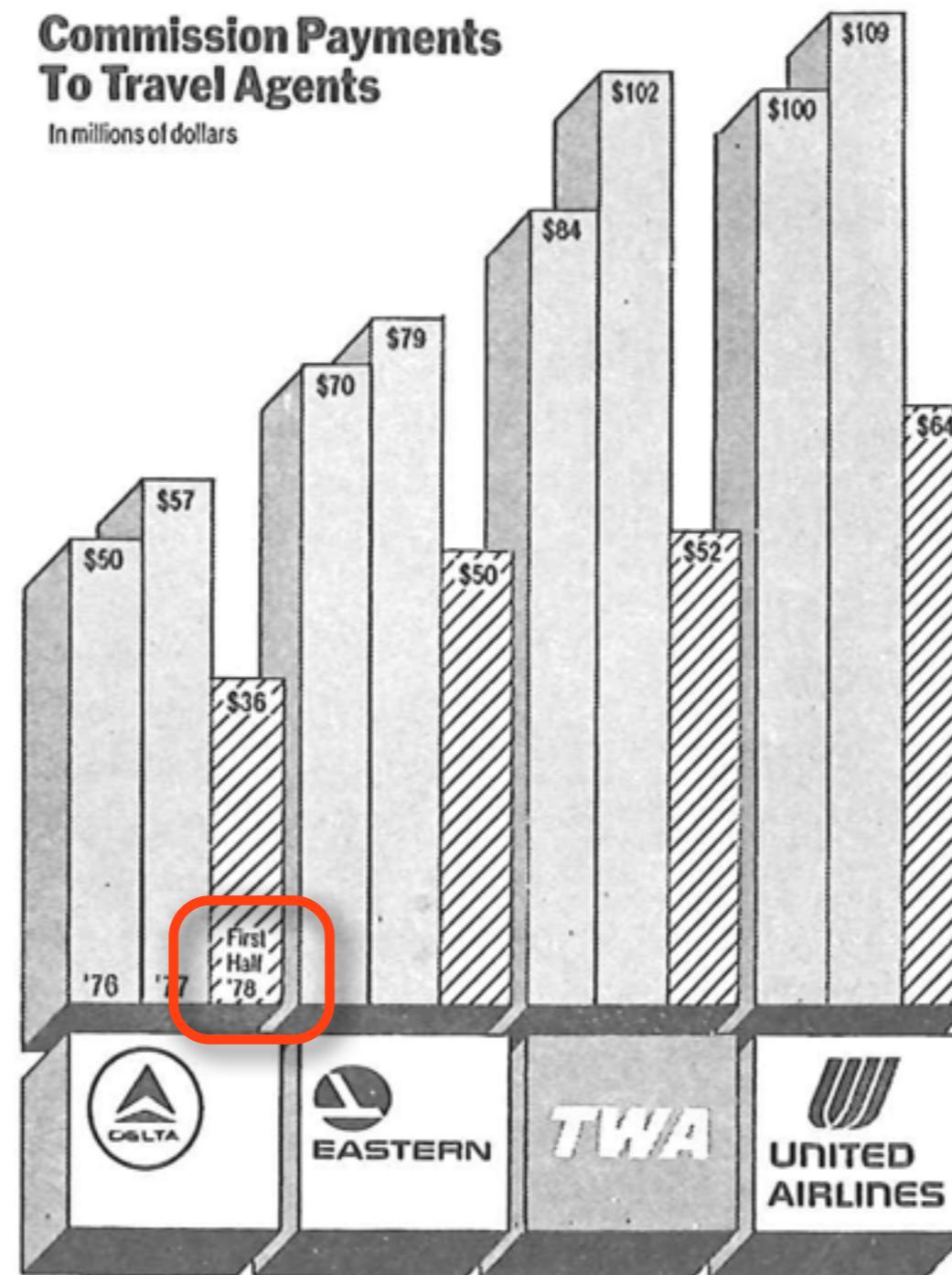
Examples of Infographics lacking integrity



New York Times, 8/8/78

The Visual Display of Quantitative Information

Examples of Infographics lacking integrity

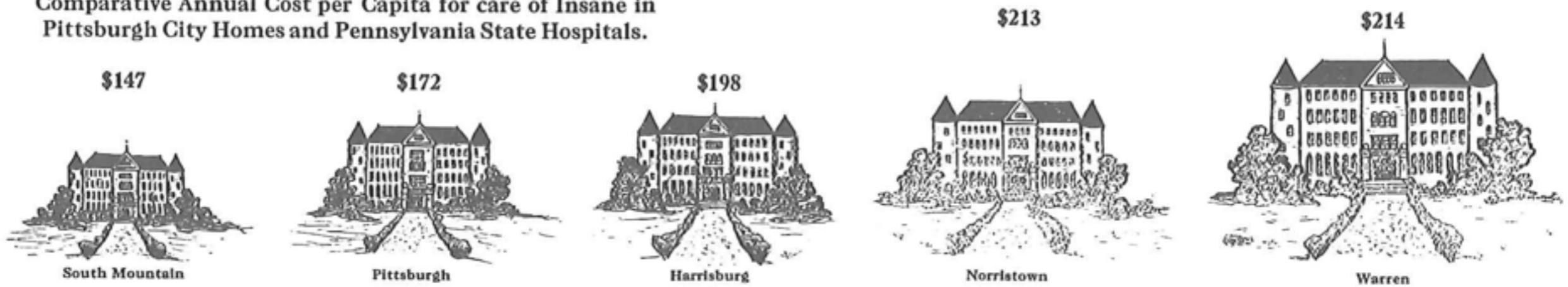


New York Times, 8/8/78

The Visual Display of Quantitative Information

Examples of Infographics lacking integrity

Comparative Annual Cost per Capita for care of Insane in Pittsburgh City Homes and Pennsylvania State Hospitals.



Pittsburgh Civic Commission, *Report on Expenditures of the Department of Charities* (Pittsburgh, 1911), p. 7.

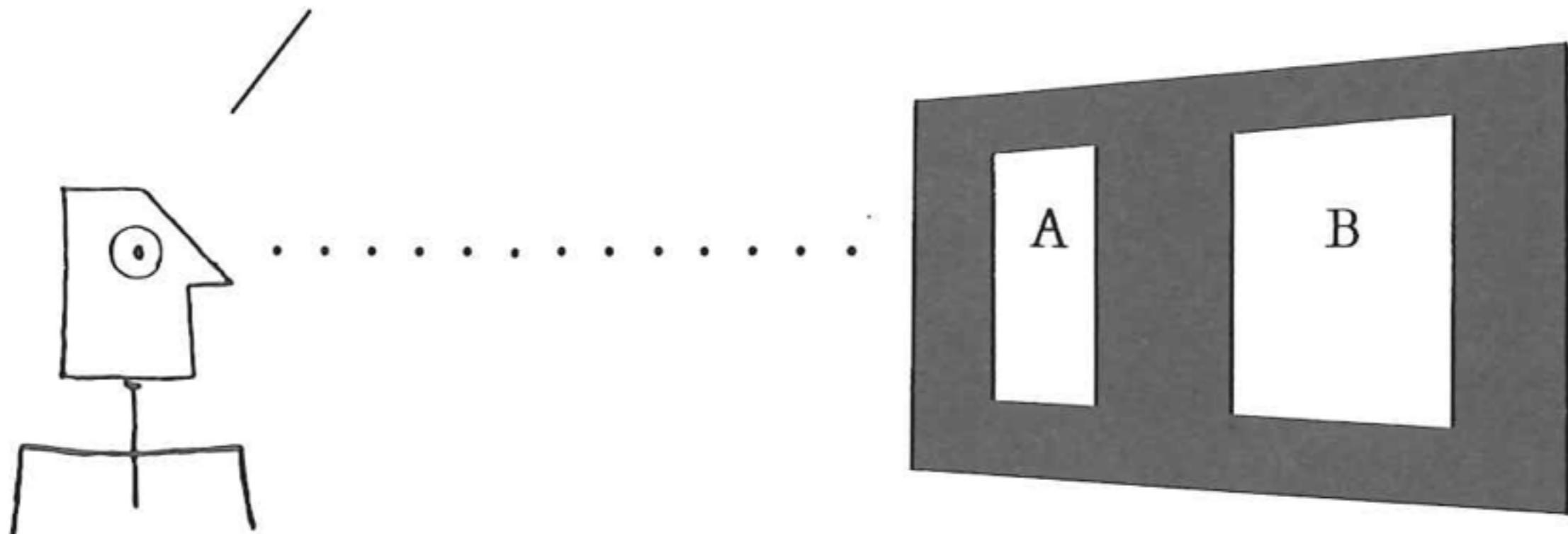
The Visual Display of Quantitative Information

Let's formalize **Distortion** in Infographics

The Visual Display of Quantitative Information

Let's formalize **Distortion** in Infographics

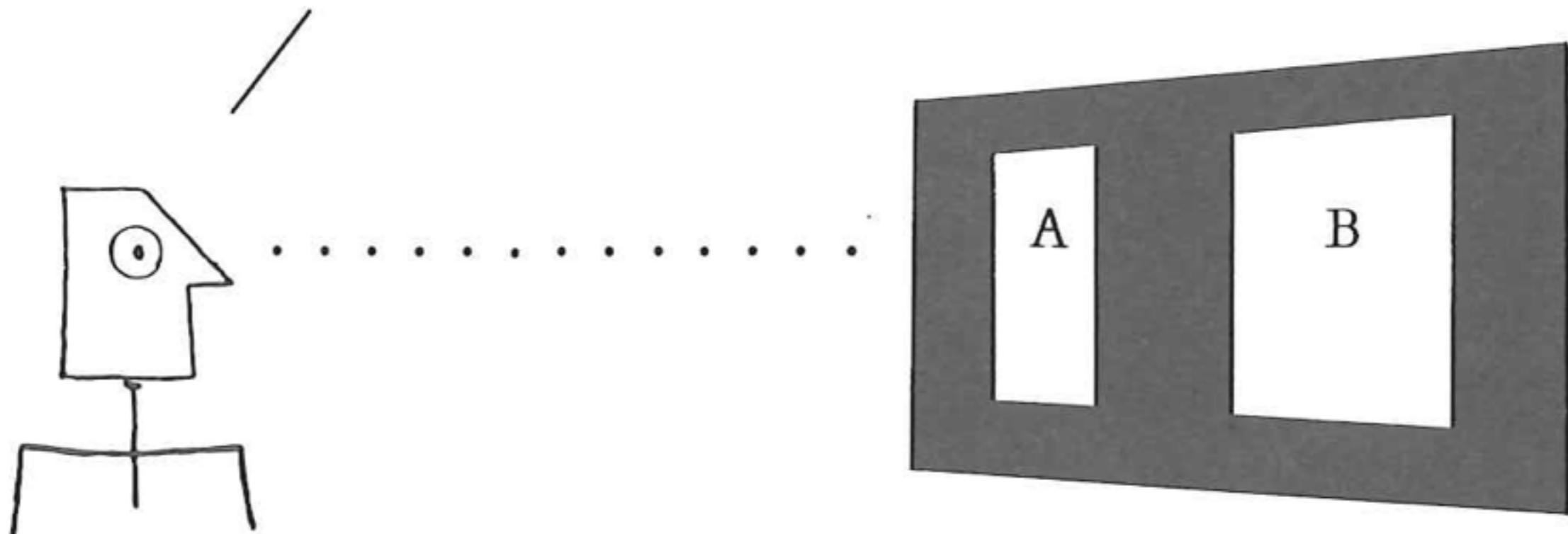
I think I see that area B
is 3.14 times bigger than
area A. Is that correct?



The Visual Display of Quantitative Information

Let's formalize **Distortion** in Infographics

I think I see that area B
is 3.14 times bigger than
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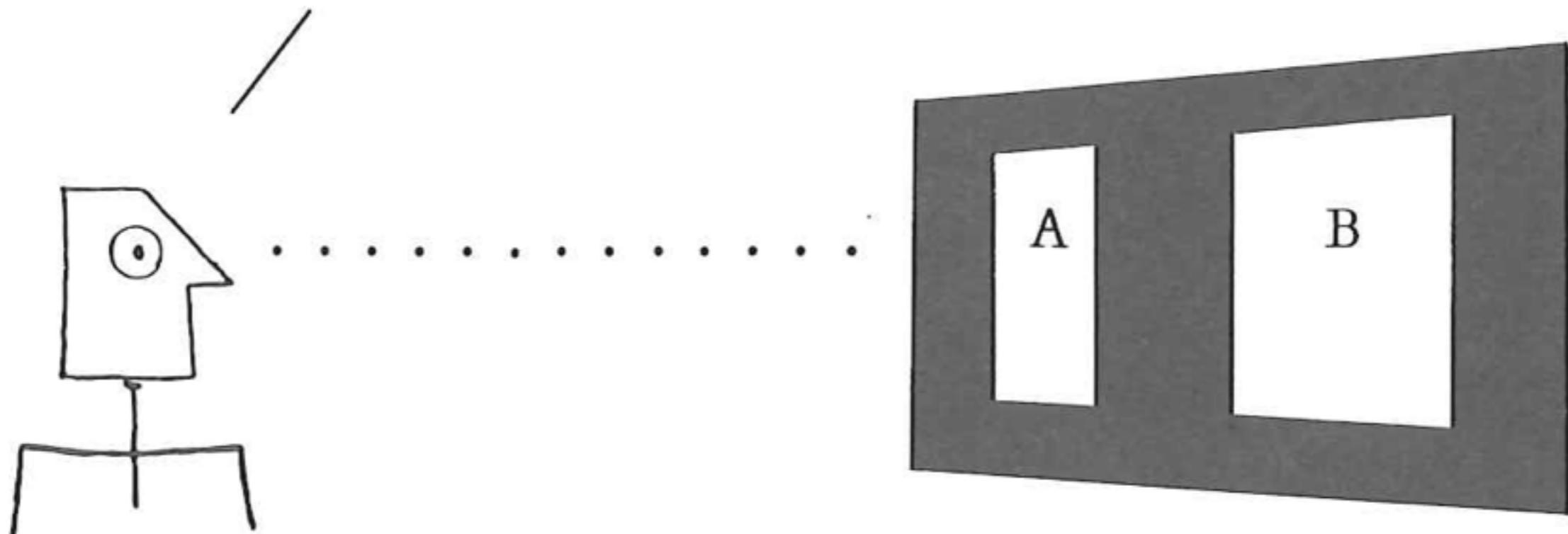


$$Perceived = Actual^x$$

The Visual Display of Quantitative Information

Let's formalize **Distortion** in Infographics

I think I see that area B
is 3.14 times bigger than
area A. Is that correct?



$$Perceived = Actual^x \quad x = .8 \pm .3$$

The Visual Display of Quantitative Information

- Perceived Area
 - grows more slowly than measured area
 - varies between people
 - changes with experience
 - changes with context
 - changes with loading

The Visual Display of Quantitative Information

- Guidelines

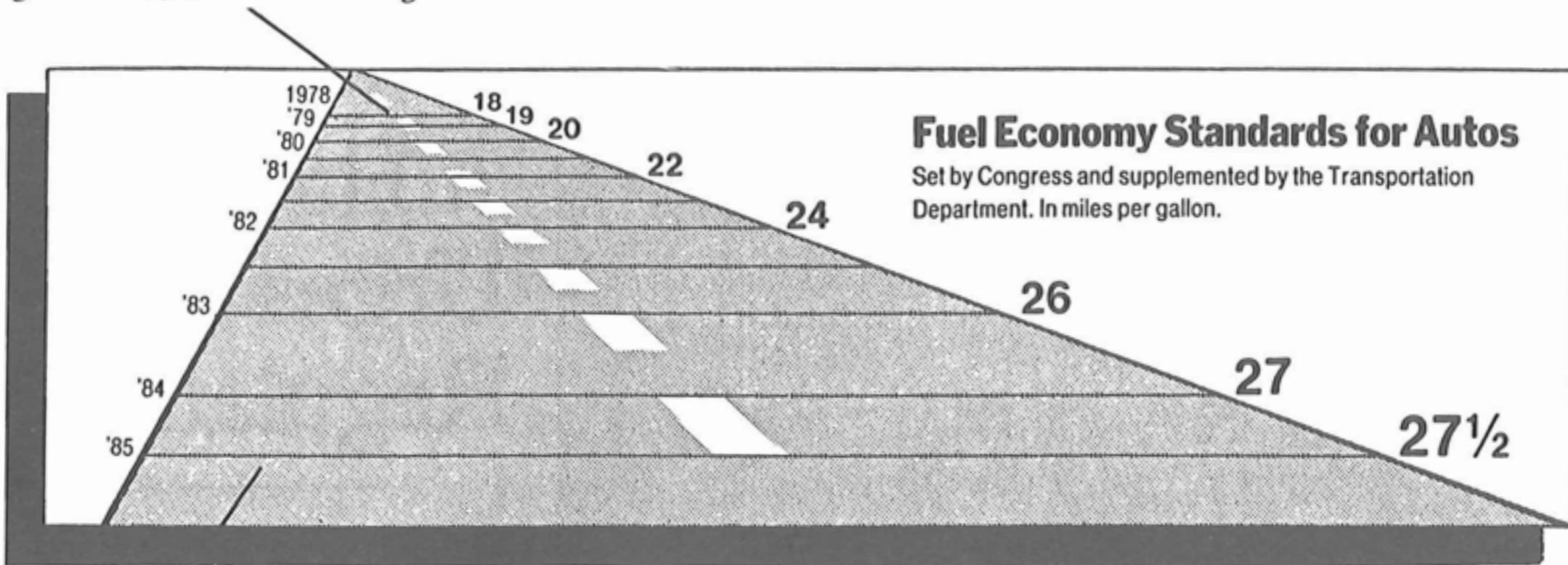
- The measurement of the graphic should be in proportion to the quantity
- Clear, detailed labels should explain distortion and events, on the graphic.

$$LieFactor = \frac{\text{size of effect shown in graphic}}{\text{size of effect in data}}$$

The Visual Display of Quantitative Information

$$LieFactor = 14.8$$

This line, representing 18 miles per gallon in 1978, is 0.6 inches long.

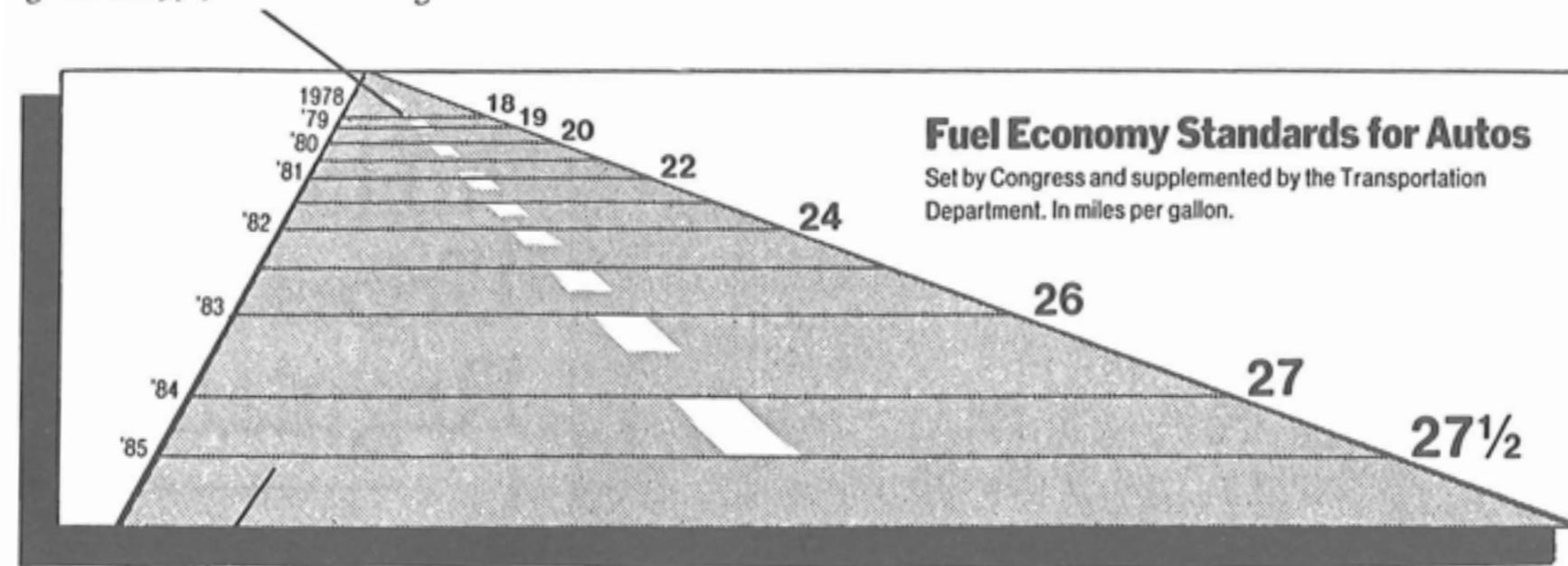


This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.

New York Times, 8/9/78

The Visual Display of Quantitative Information

This line, representing 18 miles per gallon in 1978, is 0.6 inches long.

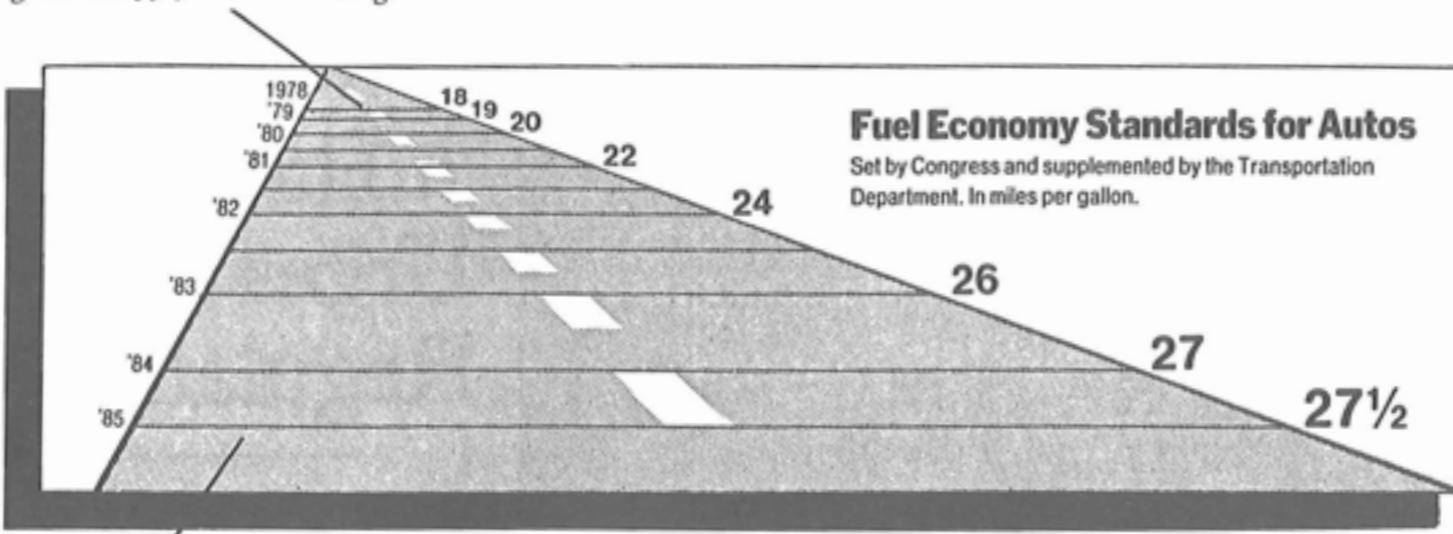


This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.

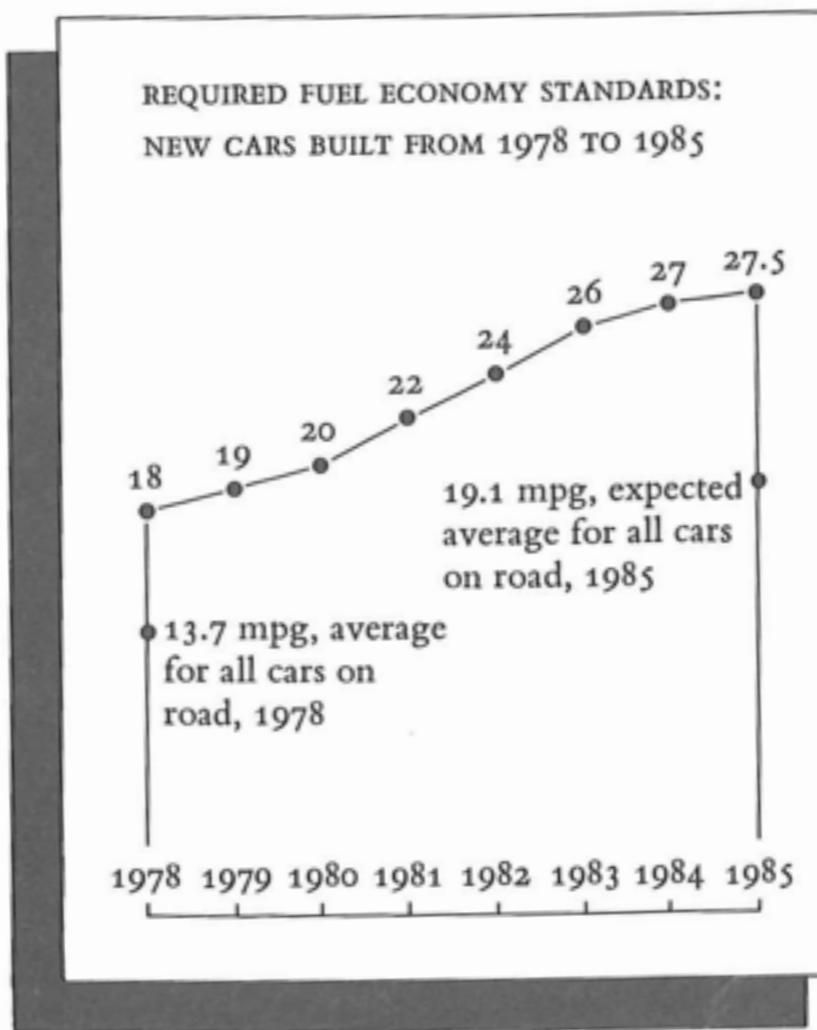
- Past and Future are reversed
- Foreshortening is confusing two issues
- Y-Scale is crazy

The Visual Display of Quantitative Information

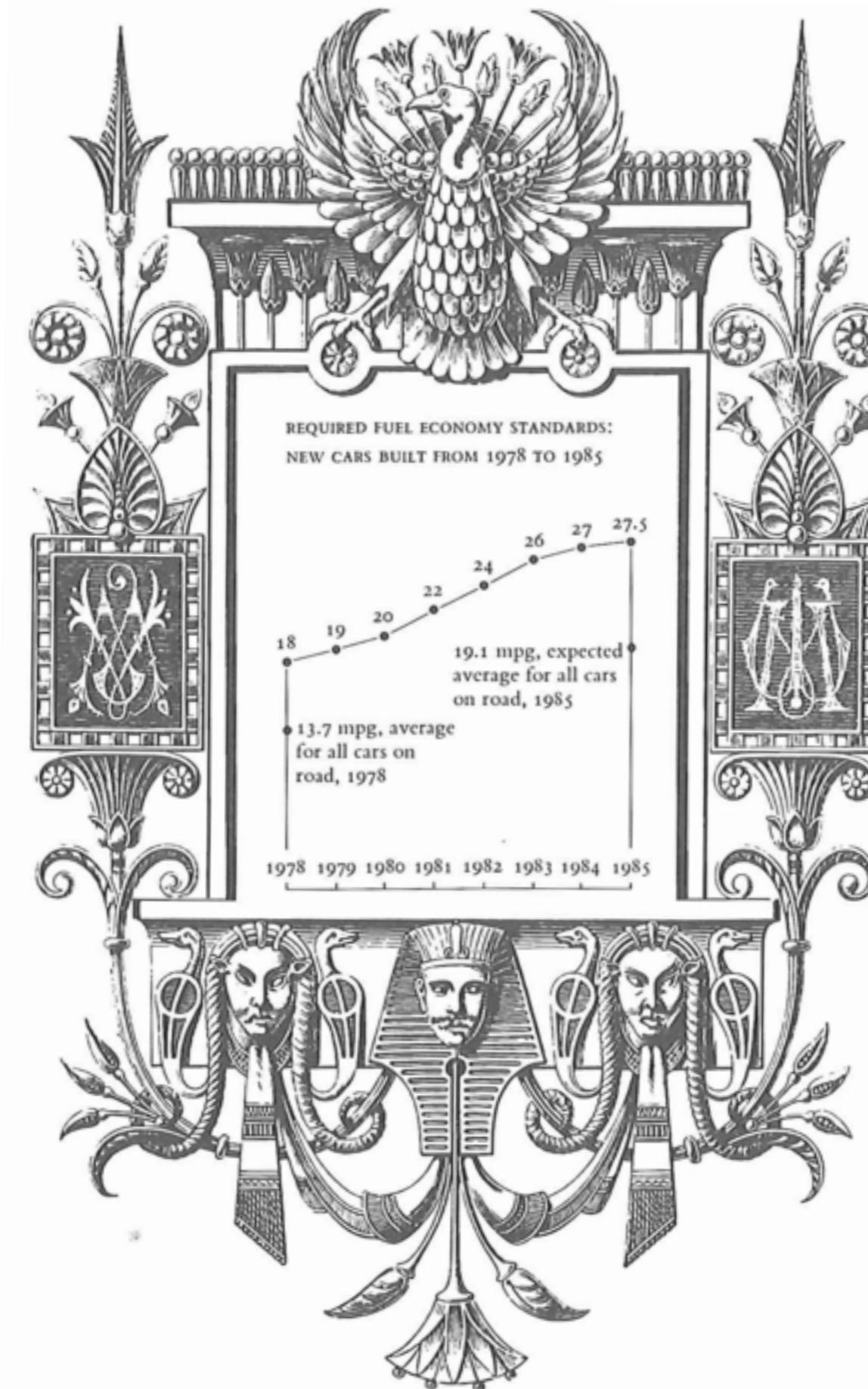
This line, representing 18 miles per gallon in 1978, is 0.6 inches long.



This line, representing 27.5 miles per gallon in 1985, is 5.3 inches long.



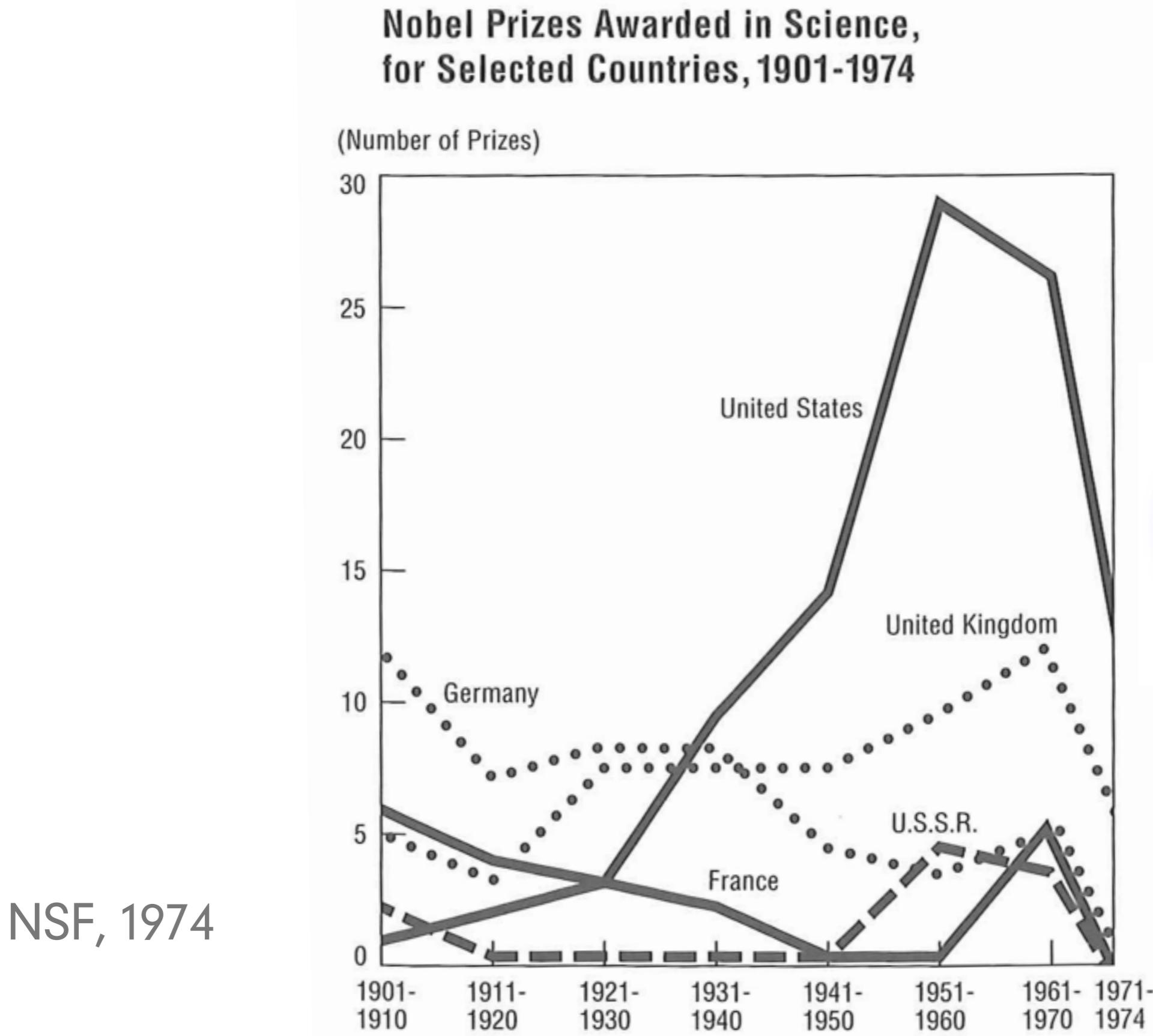
The Visual Display of Quantitative Information



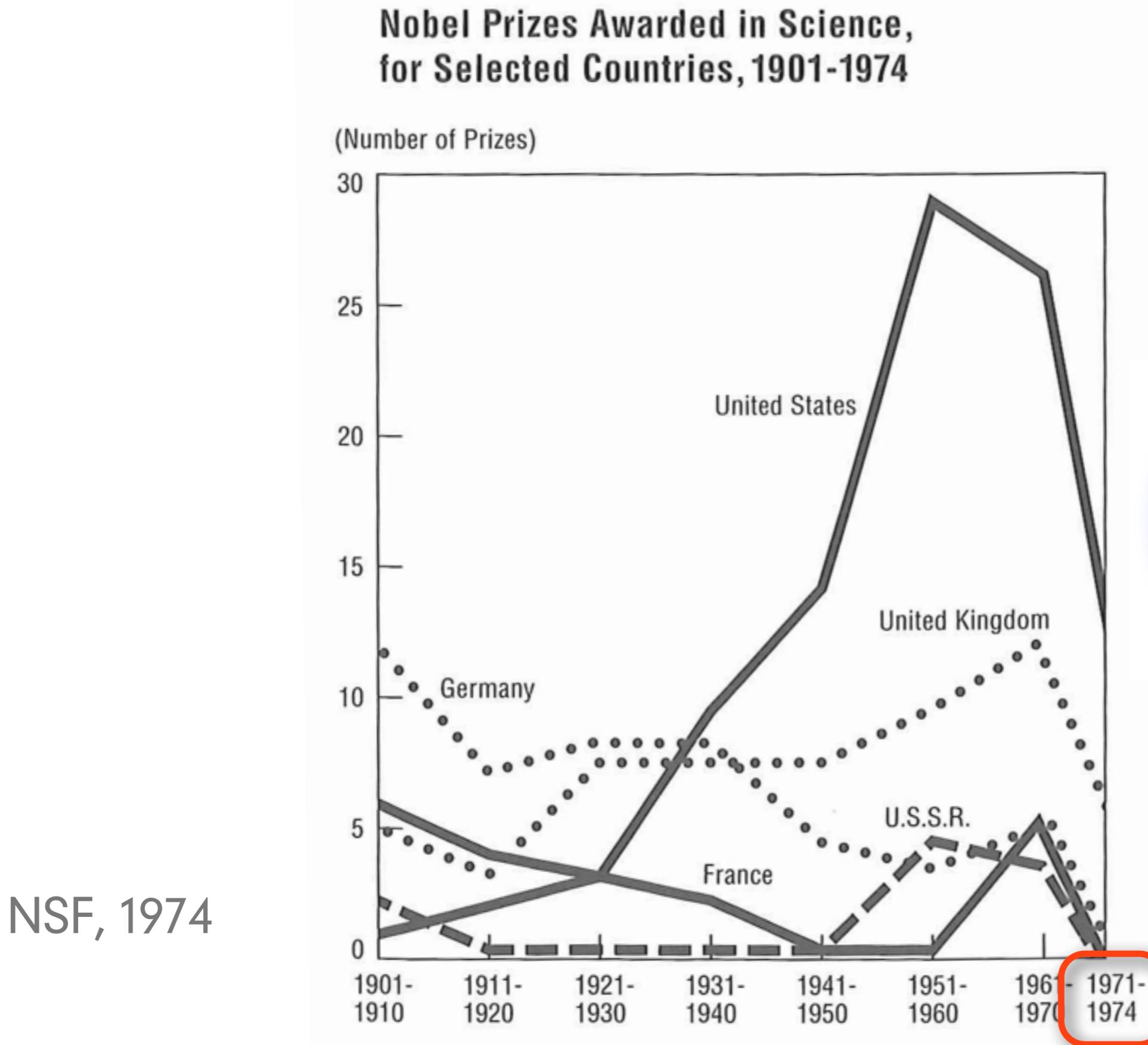
The Visual Display of Quantitative Information

- Design vs Data Variation
 - We expect that patterns will continue
 - Don't confuse **design variation** and **data variation**

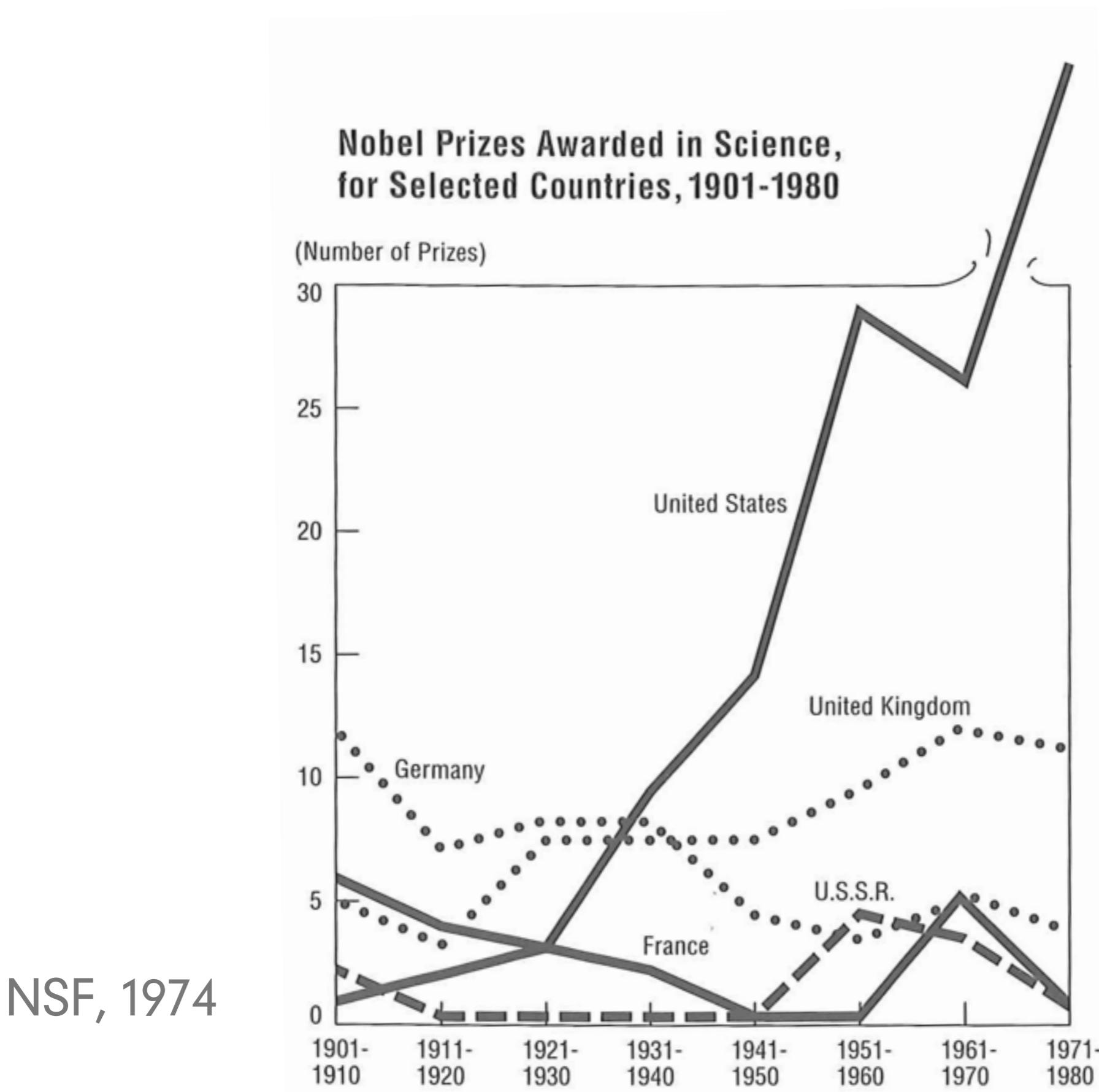
The Visual Display of Quantitative Information



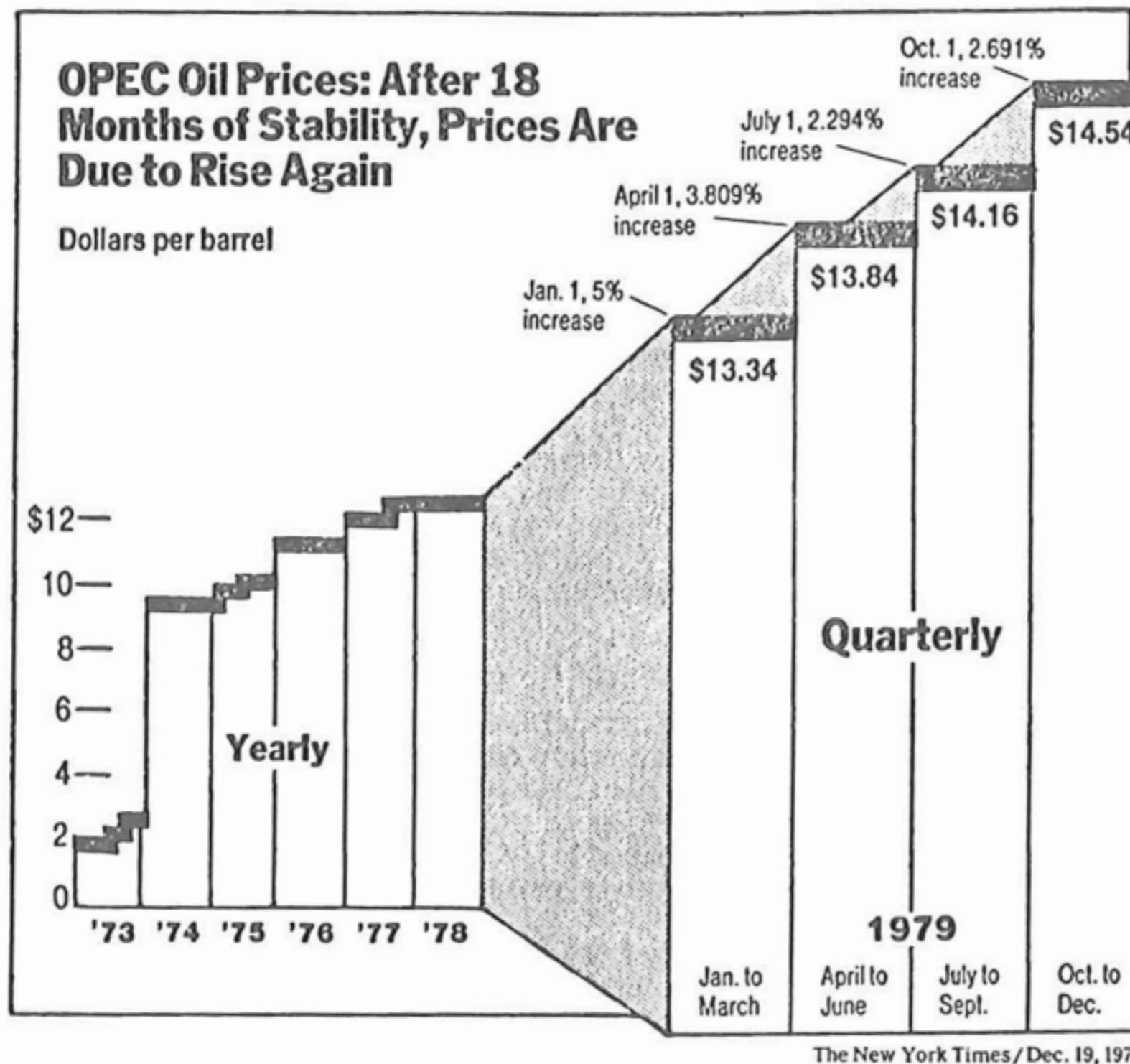
The Visual Display of Quantitative Information



The Visual Display of Quantitative Information



The Visual Display of Quantitative Information



During this time

1973–1978
January–March 1979
April–June 1979
July–September 1979
October–December 1979

one vertical inch equals

\$8.00
\$4.73
\$4.37
\$4.16
\$3.92

During this time

1973–1978
1979

one horizontal inch equals

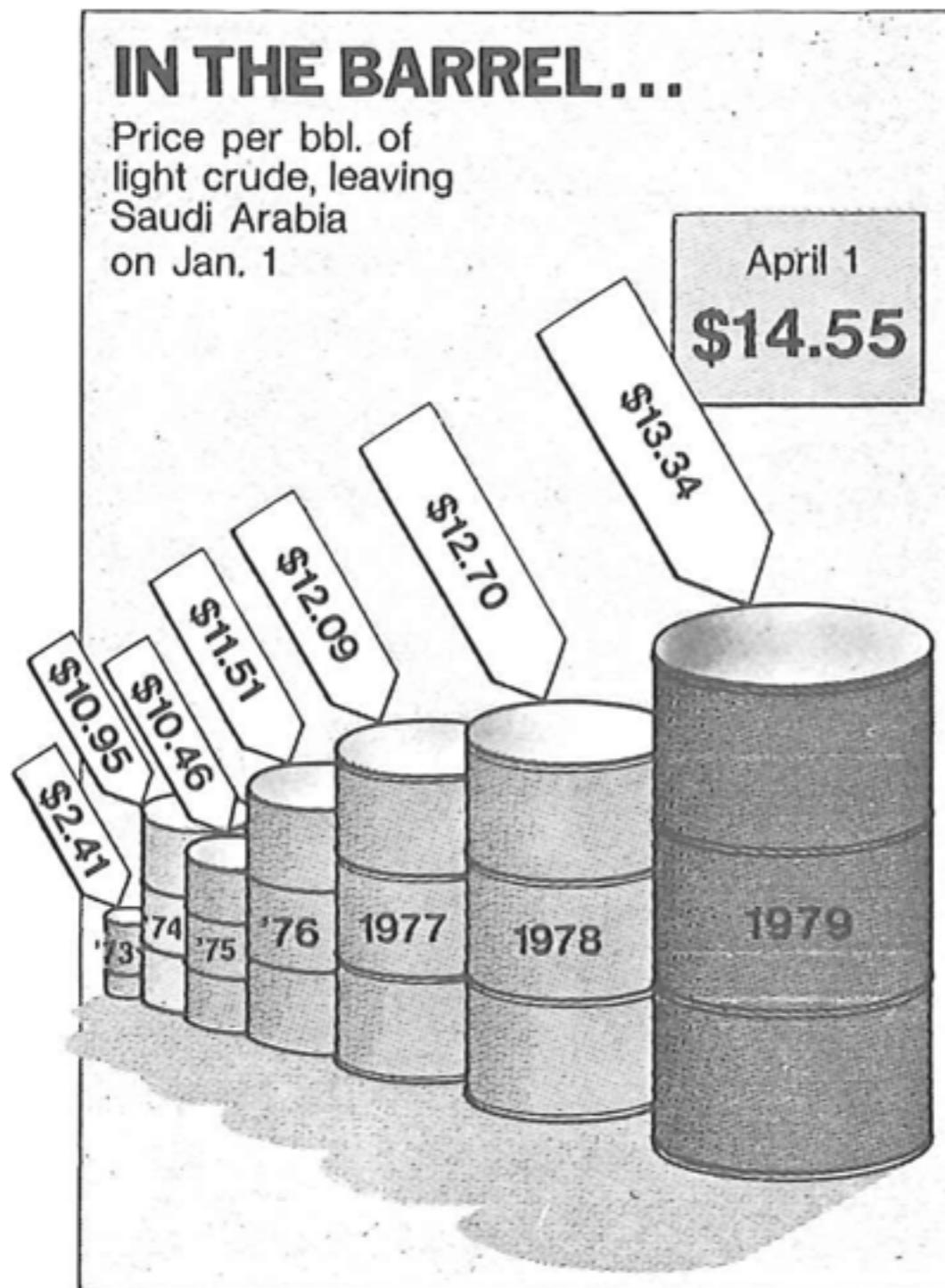
3.8 years
0.57 years

• design variation

LieFactor = 15.1

New York
Times,
12/19/78

The Visual Display of Quantitative Information



- 454% in data
- 4280% in graphic

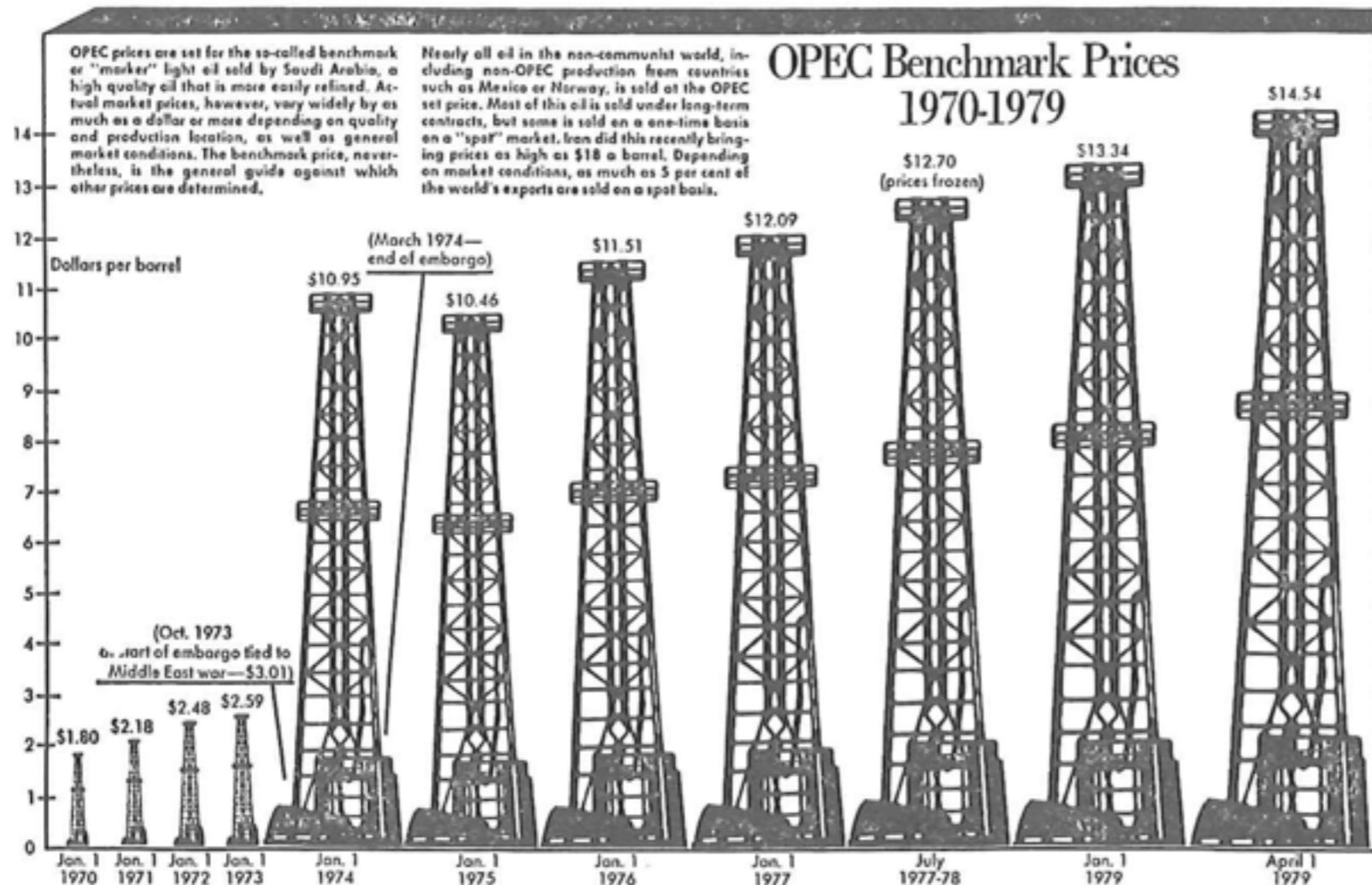
- design variation

$$LieFactor = 9.4$$

Time 4/9/79

The Visual Display of Quantitative Information

- 708% in data
- 6700% in graphic

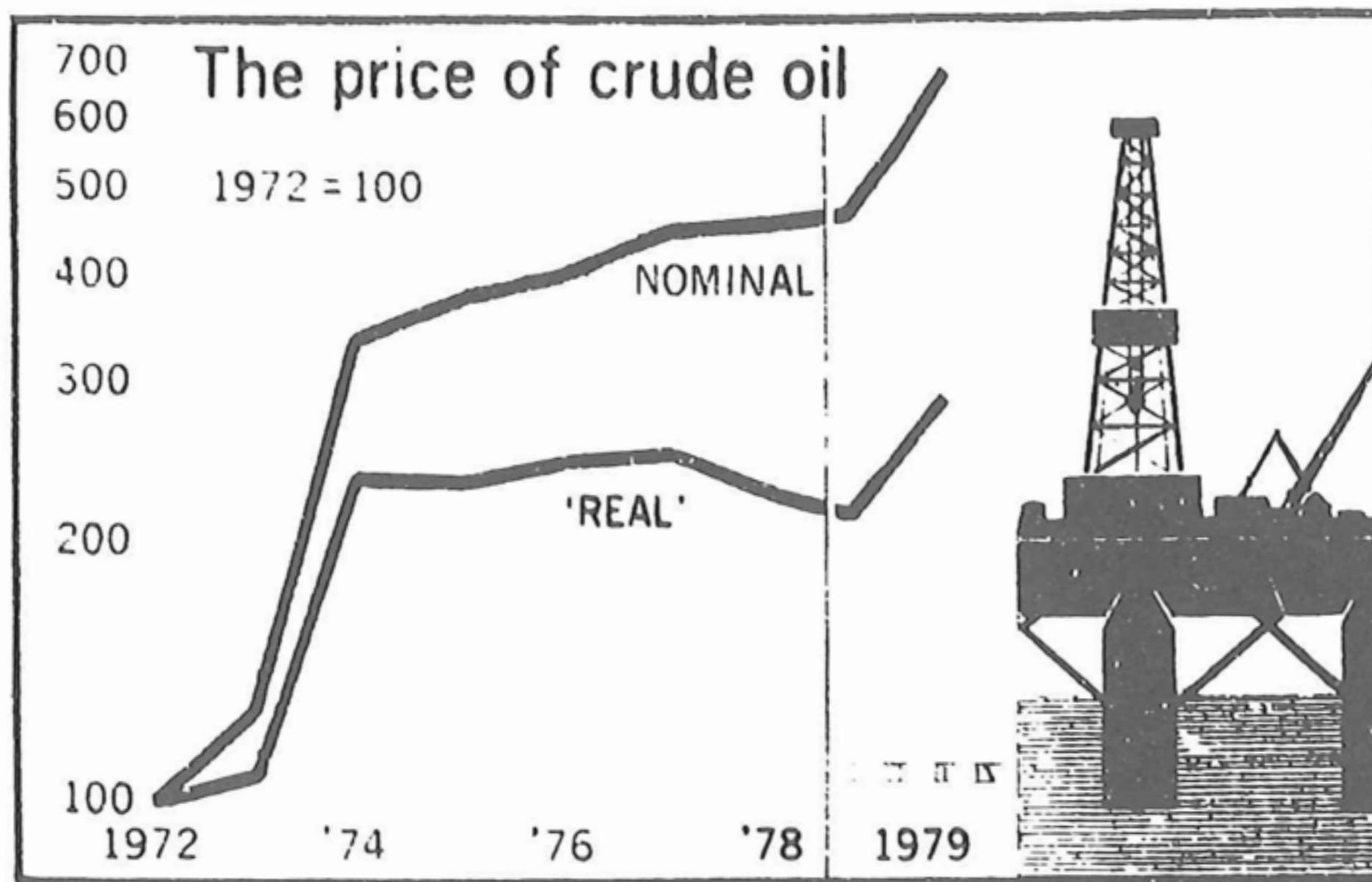


- design variation

LieFactor = 9.5

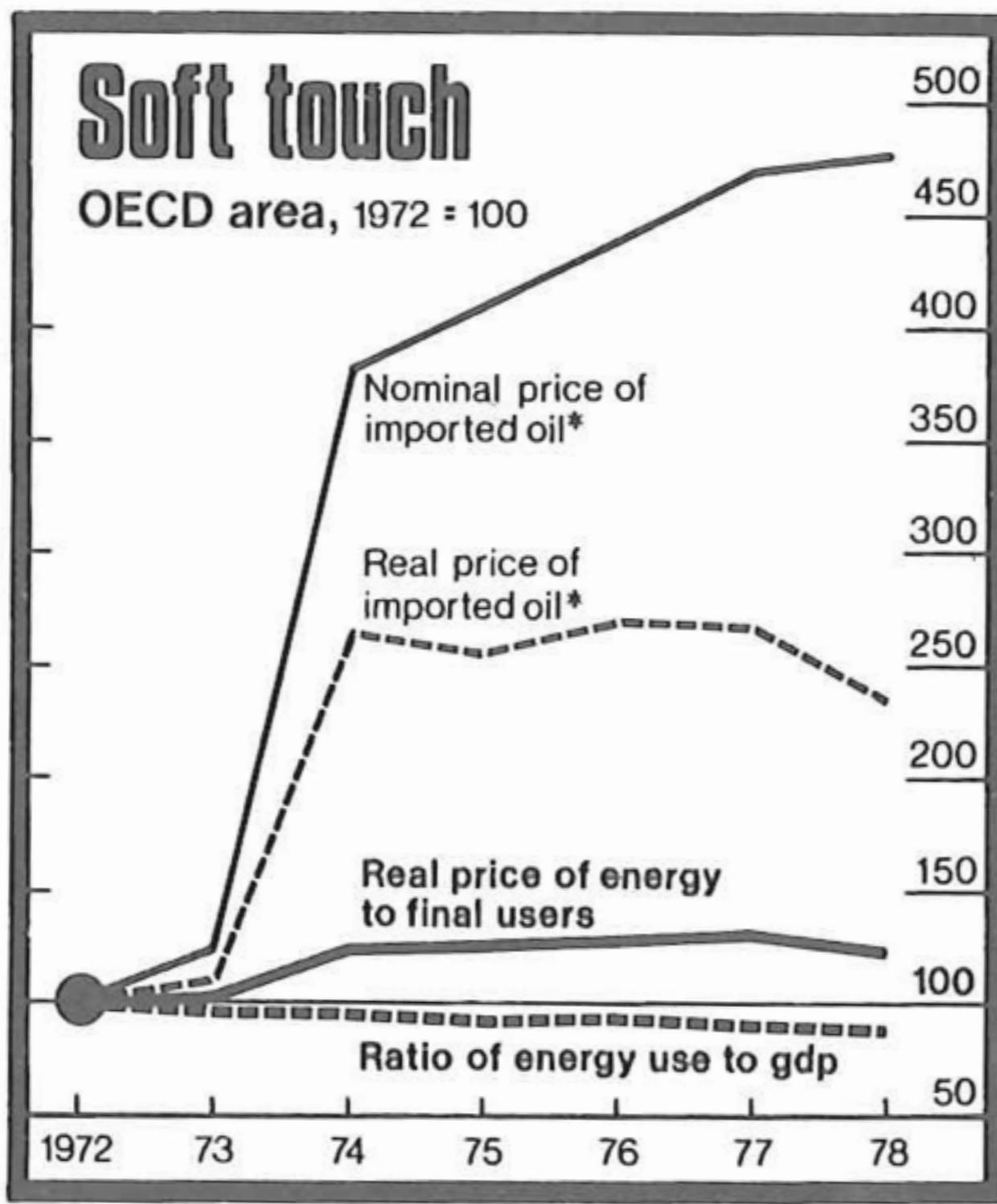
The Visual Display of Quantitative Information

- Good examples
 - adjusted dollar amounts for inflation



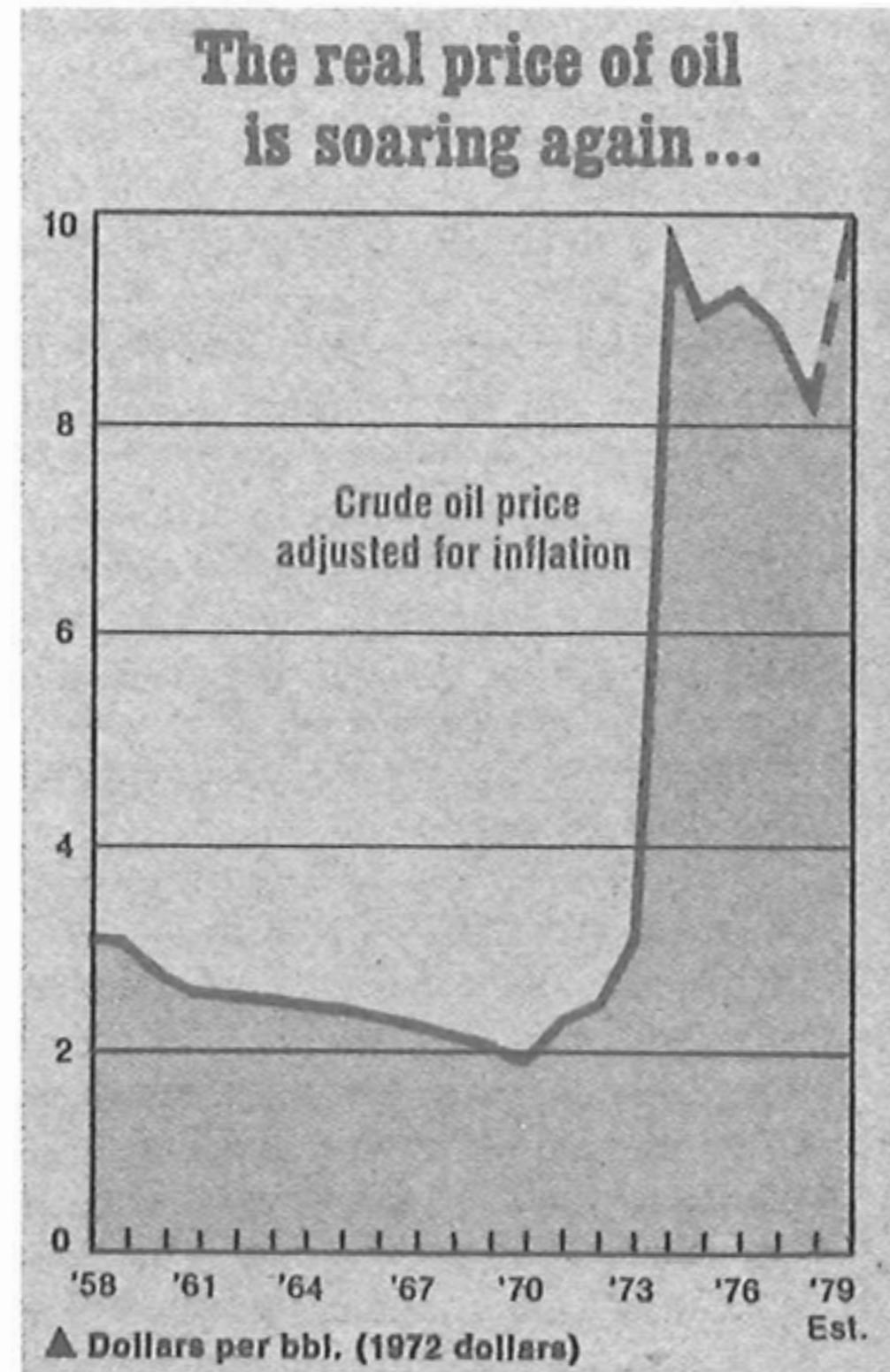
The Visual Display of Quantitative Information

- Good examples
 - adjusted dollar amounts for inflation



The Visual Display of Quantitative Information

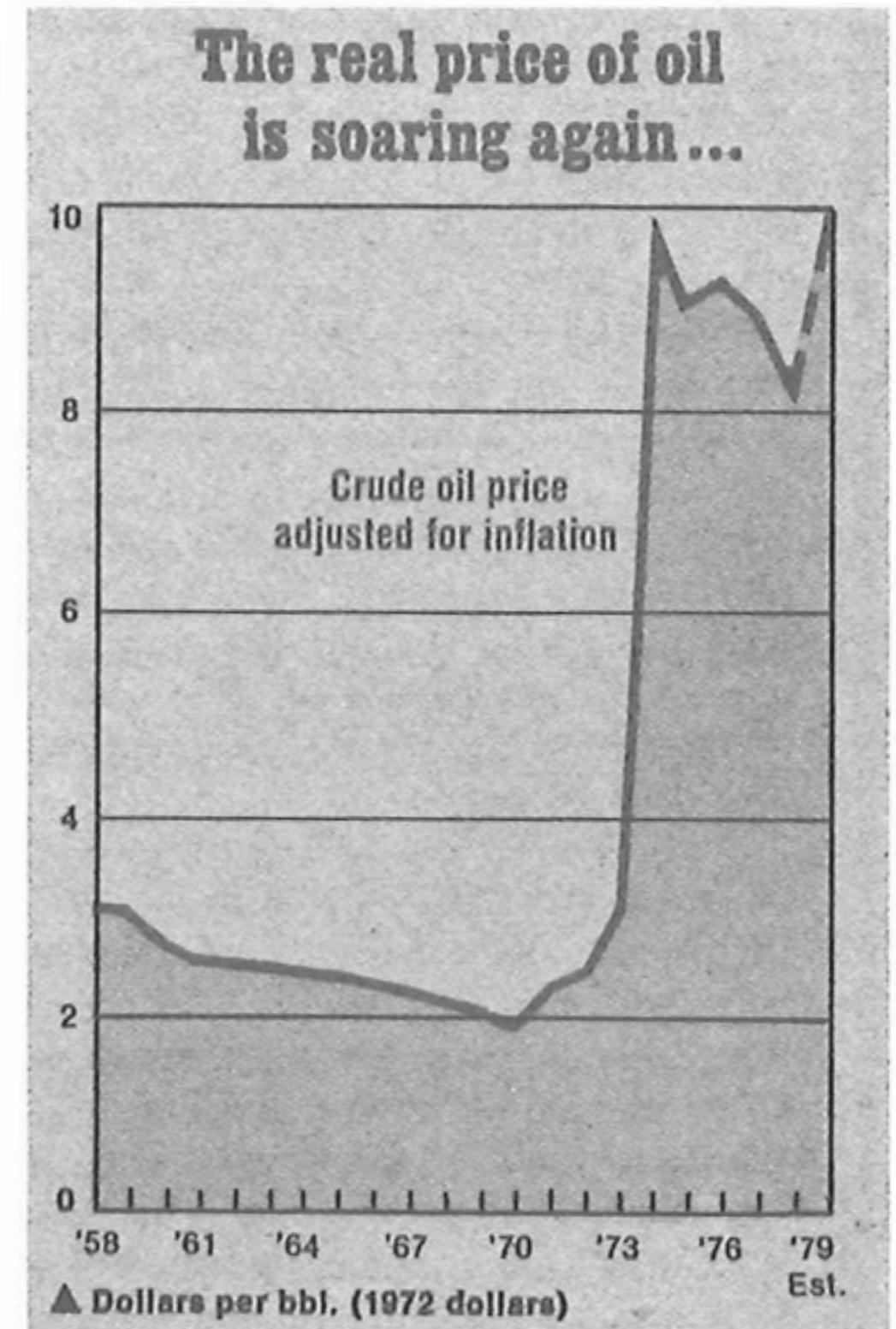
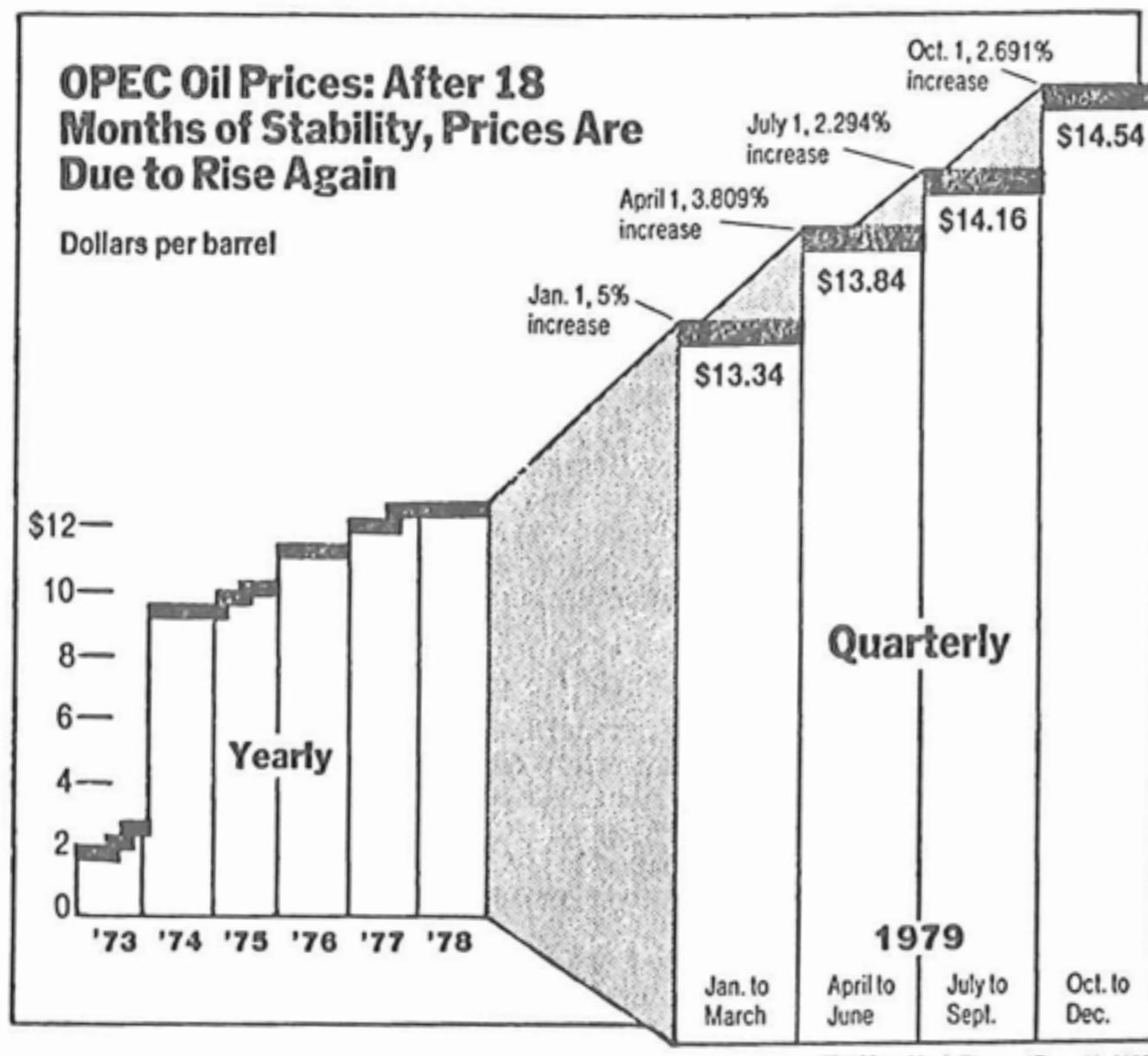
- Good examples
 - adjusted dollar amounts for inflation



Business
Week
4/9/1979

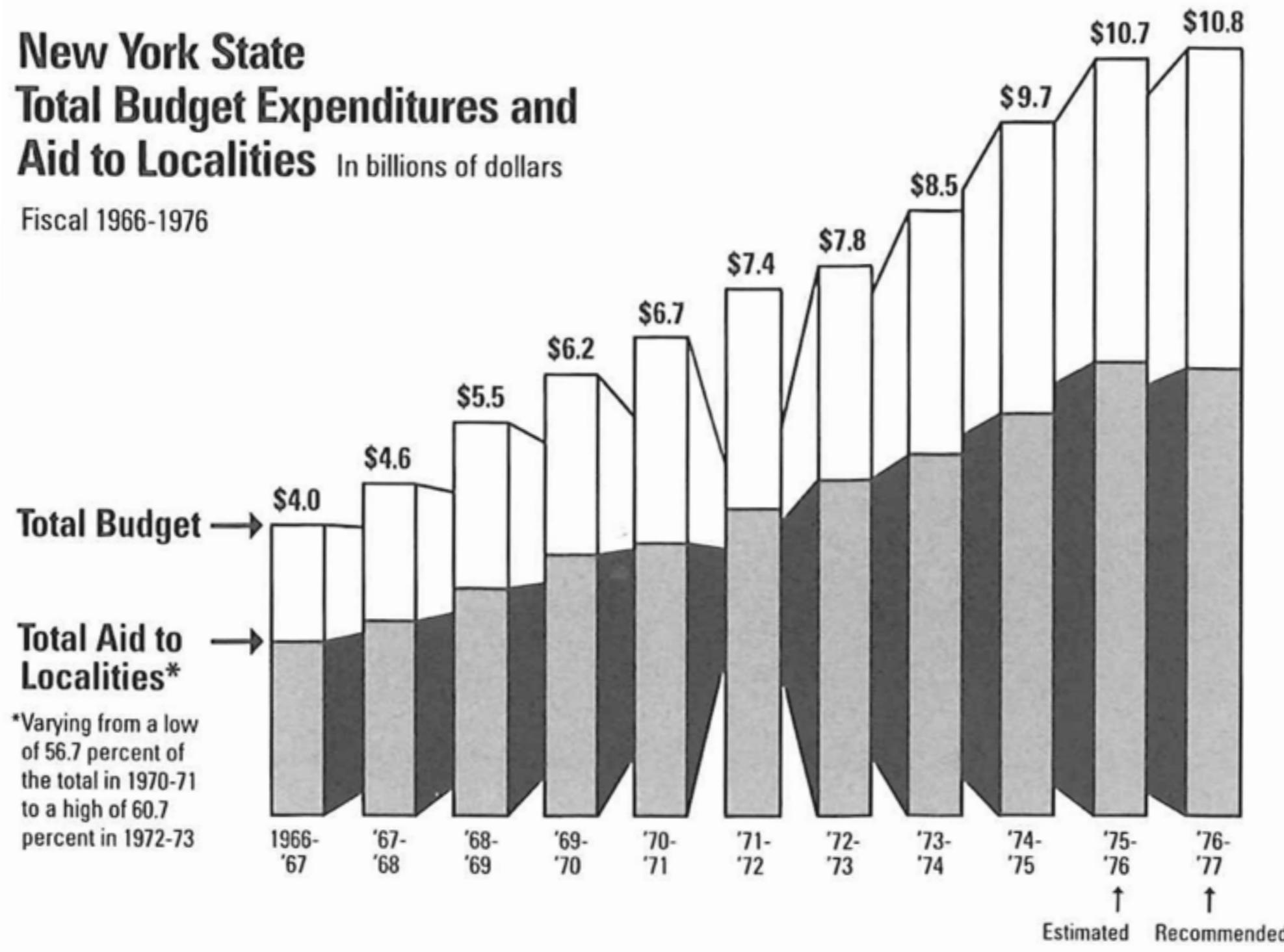
The Visual Display of Quantitative Information

- Good examples
 - adjusted dollar amounts for inflation



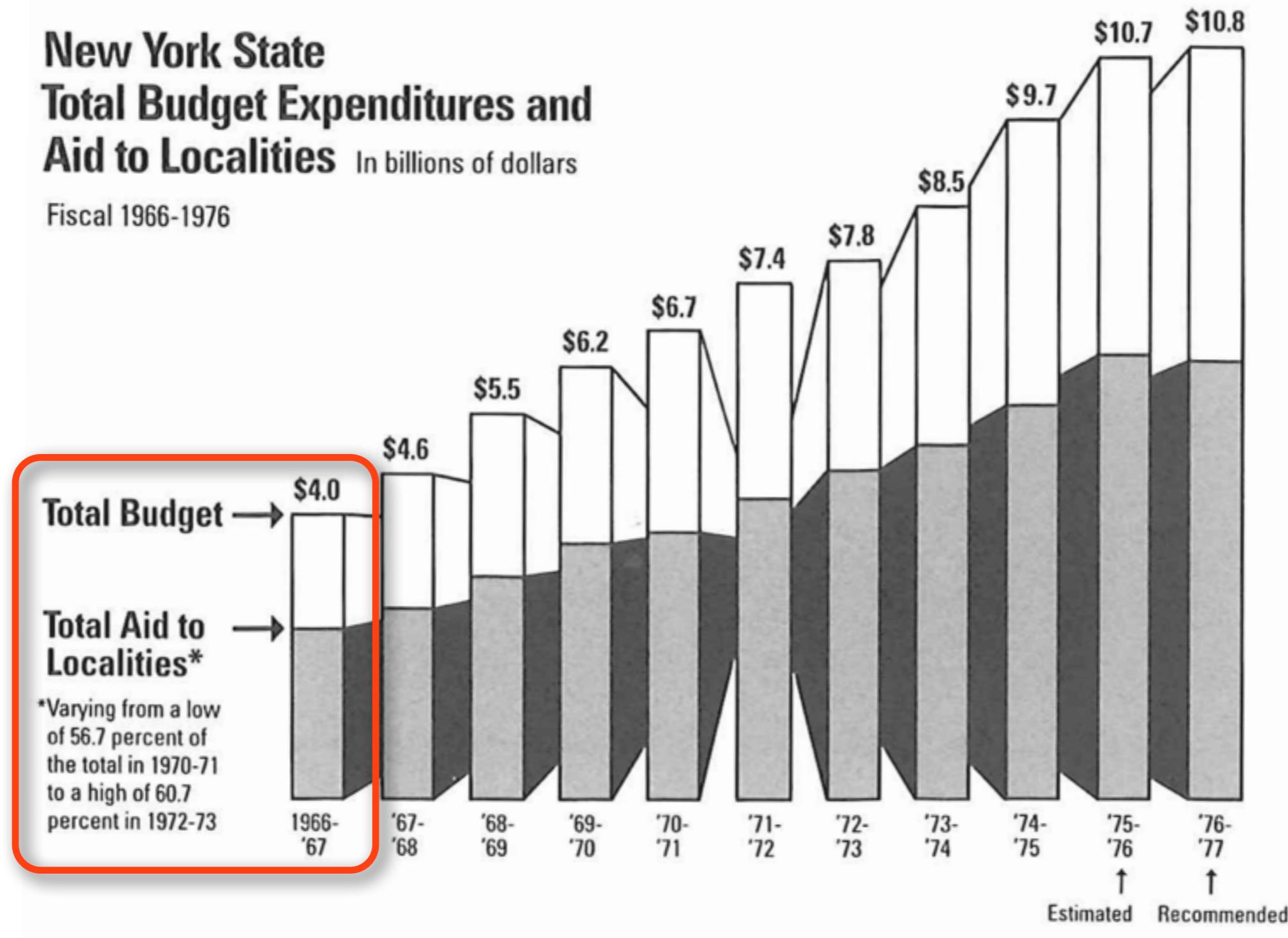
The Visual Display of Quantitative Information

- Bad example



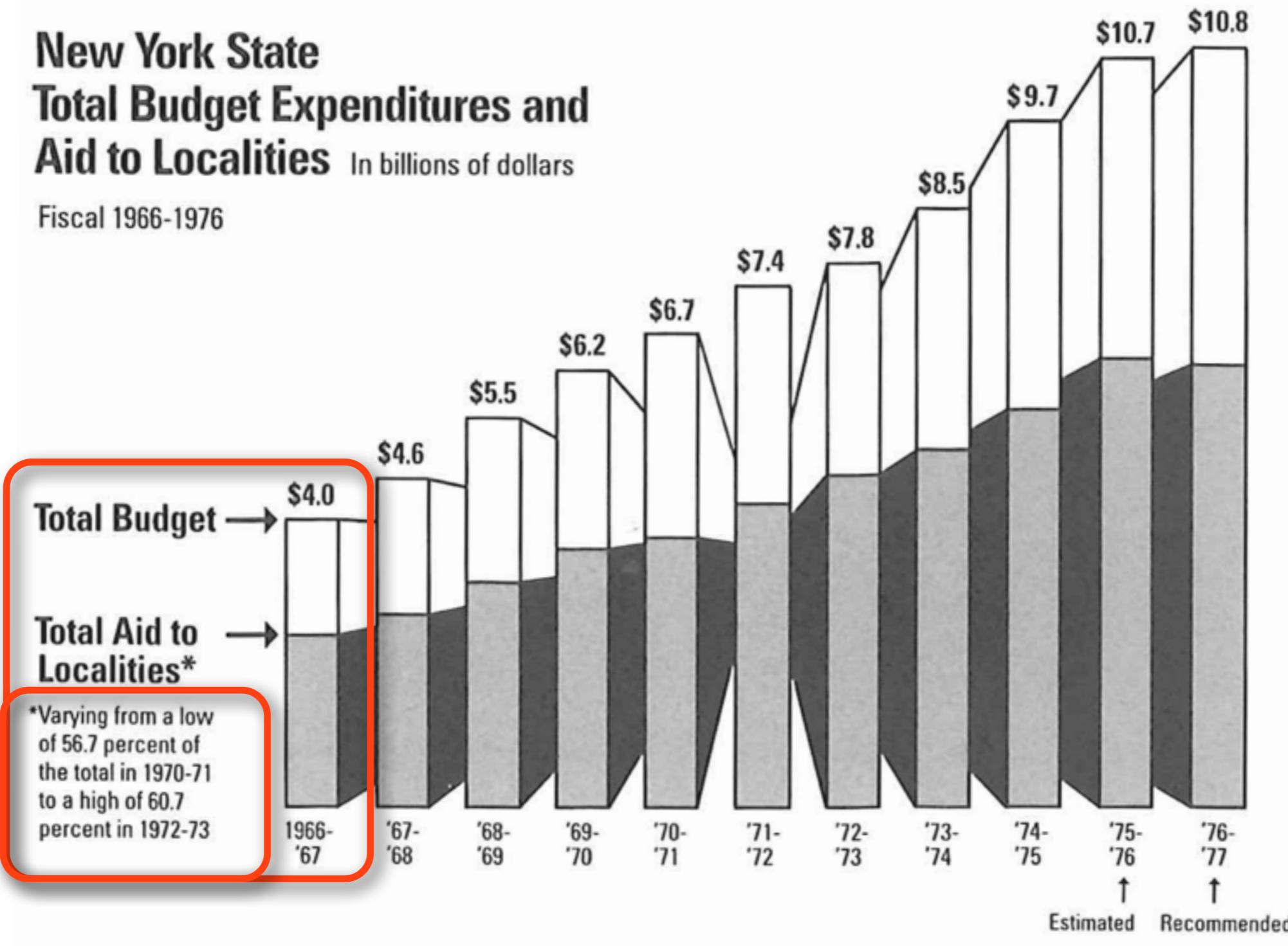
The Visual Display of Quantitative Information

- Bad example



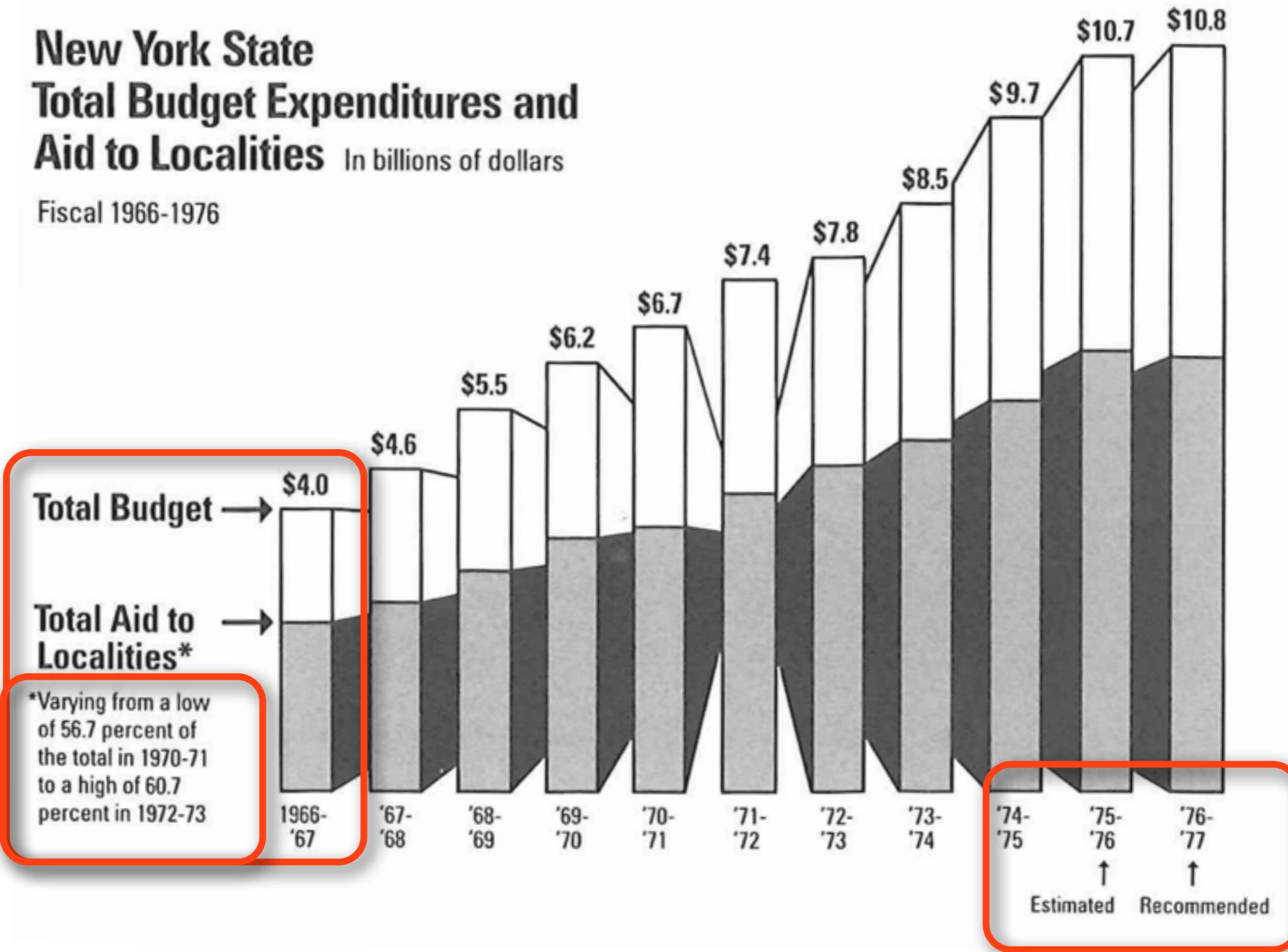
The Visual Display of Quantitative Information

- Bad example



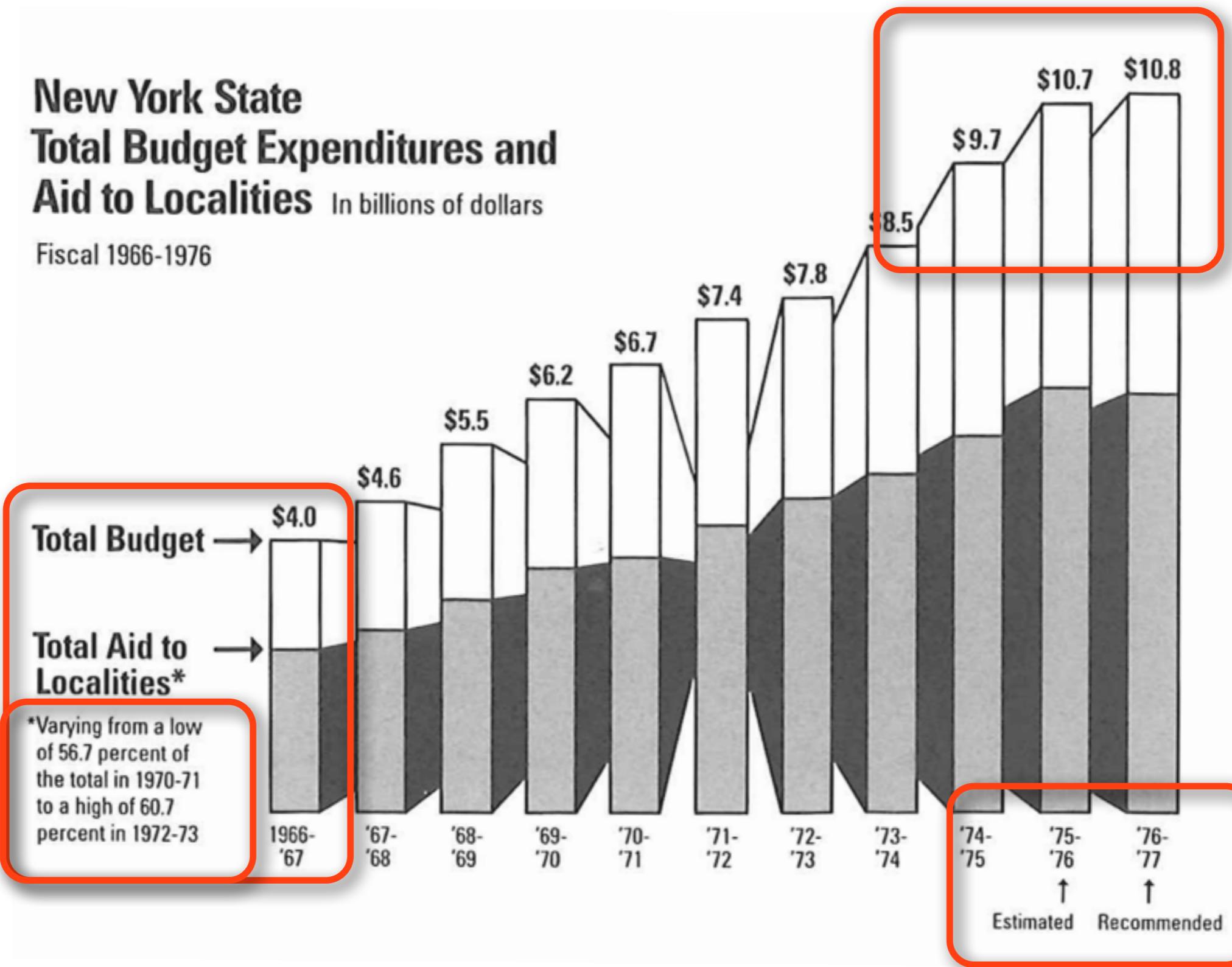
The Visual Display of Quantitative Information

- Bad example



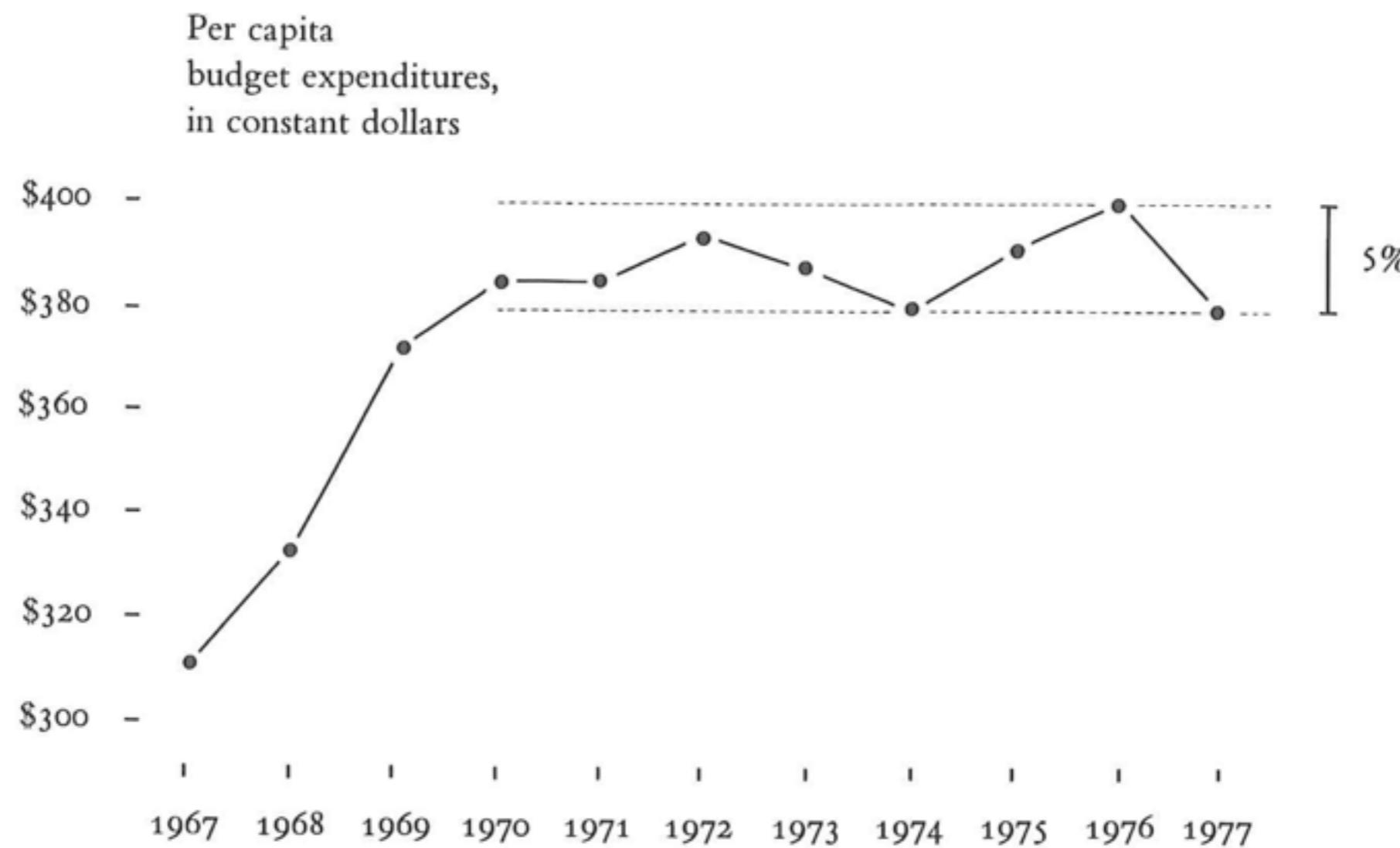
The Visual Display of Quantitative Information

- Bad example



The Visual Display of Quantitative Information

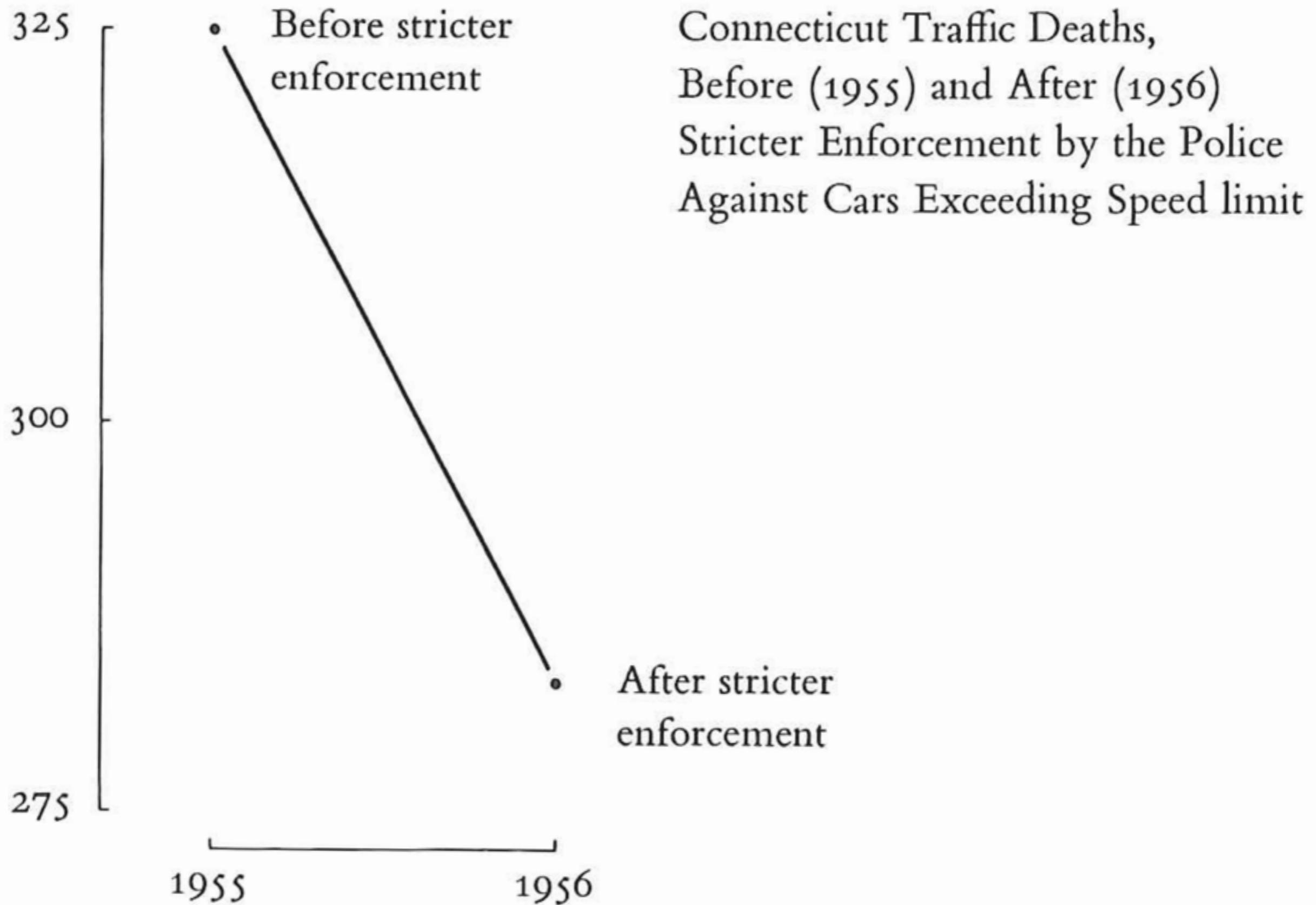
- Done well
 - Adjusted for inflation
 - Adjusted for population
 - No chart junk



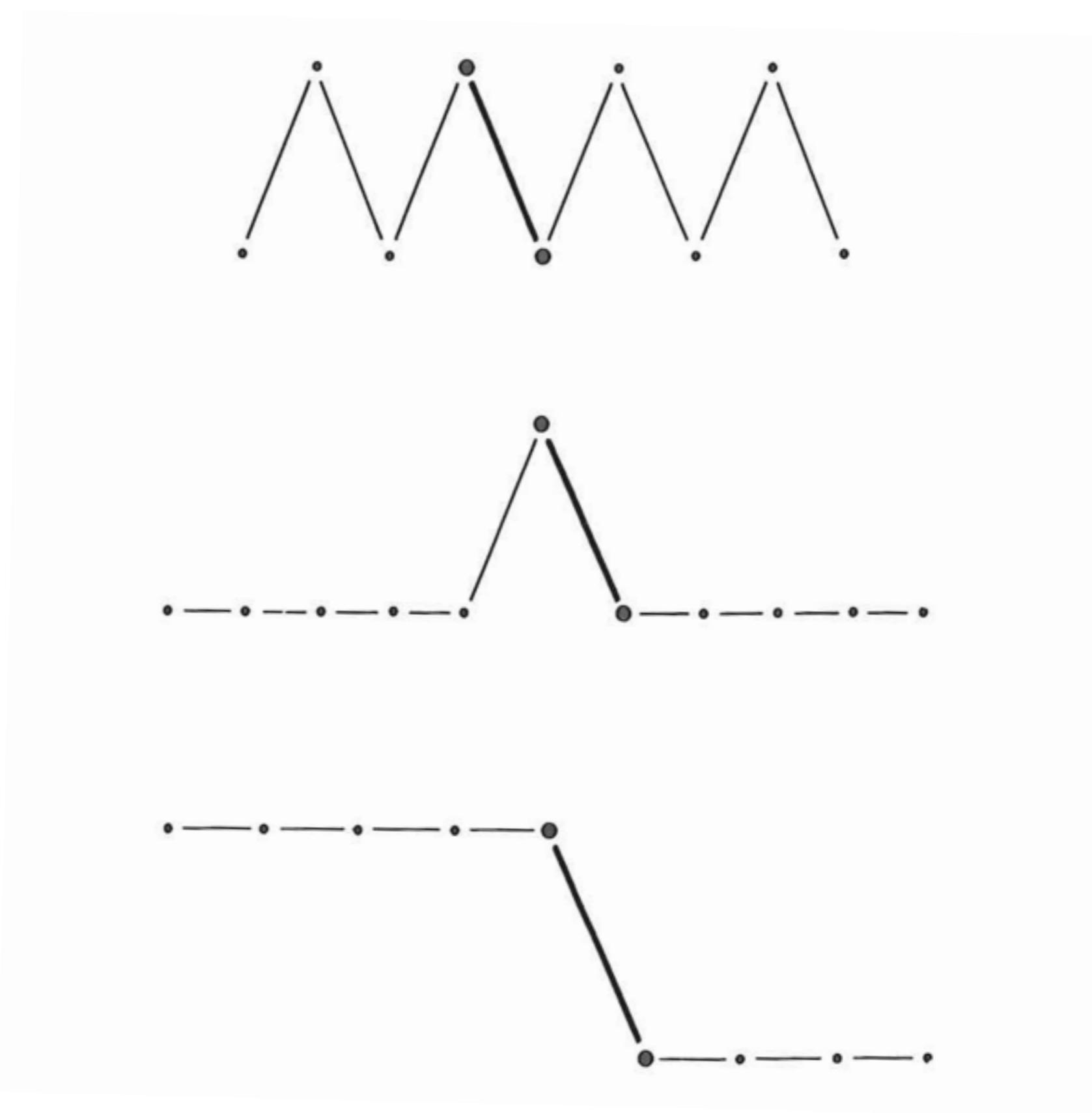
The Visual Display of Quantitative Information

- Context is essential for graphical integrity
 - Graphics must not quote data out of context

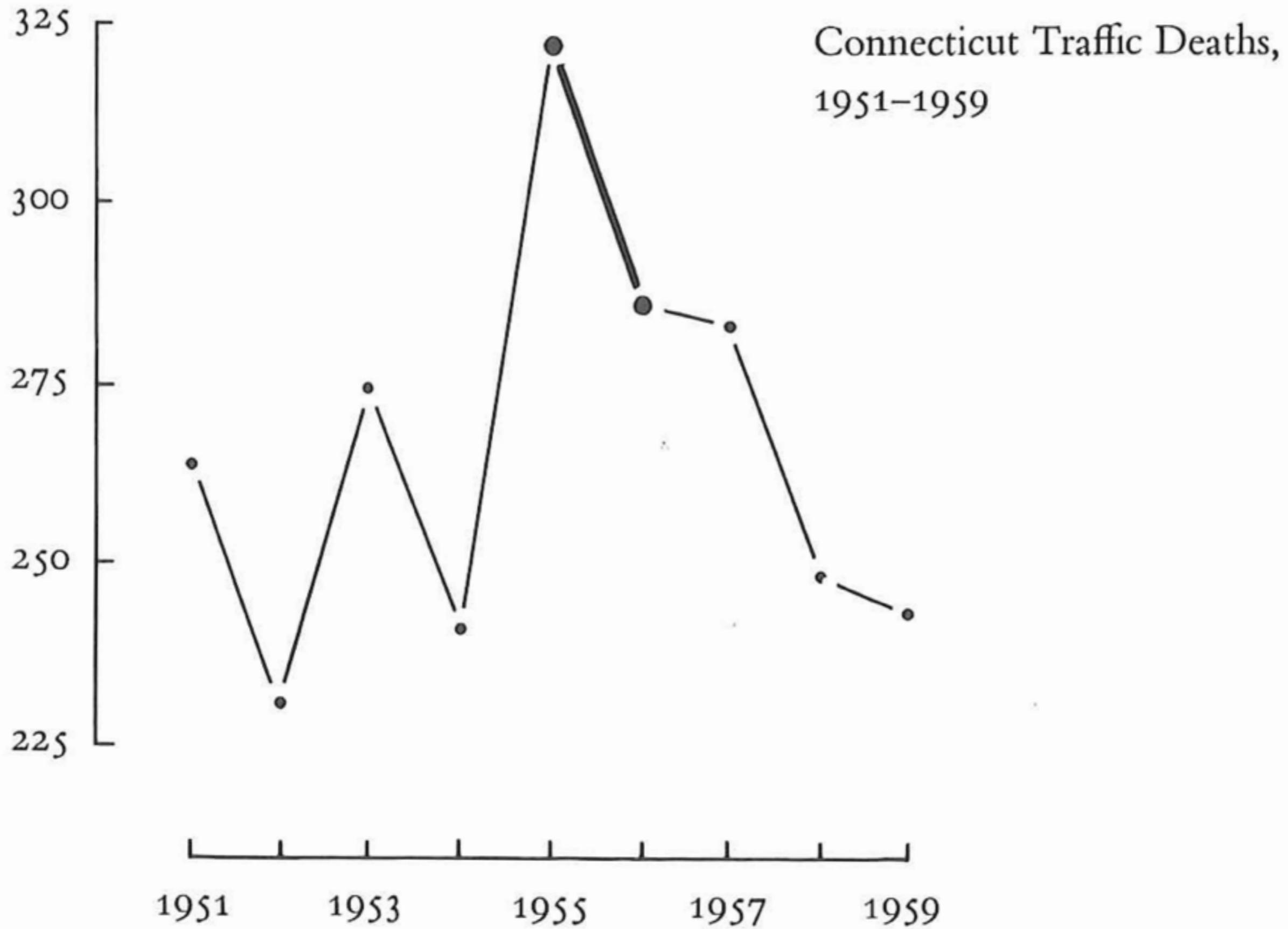
The Visual Display of Quantitative Information



The Visual Display of Quantitative Information



The Visual Display of Quantitative Information



The Visual Display of Quantitative Information

- Summary
 - The size of the graphic should match the size of the quantity $LieFactor = 1.0$
 - Labels, explanations and events should be on the graph
 - Data variation should dominate, not design variation
 - Time-series with money should be inflation adjusted and standardized
 - The number of dimensions of data should match the number of dimensions in the graphic
 - Graphics should be put in context

The Visual Display of Quantitative Information

Explore political ad spending through creative cartography. This animated map shows where superPACs and other outside groups spent their money — over a six-month period during the general election — to air political ads aimed at influencing the presidential race.



Credit: Adam Cole / NPR