How to Display Data Badly

Howard Wainer's Dirty Dozen

The plots and the list of dozen items presented here are from "How to Display Data Badly", Howard Wainer, *" The American Statistician*, May 1984.

1. Show as little data as possible

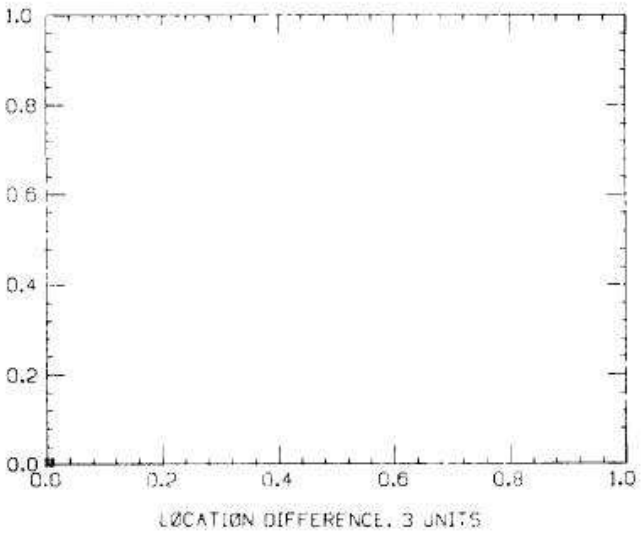


Figure 2. A low density graph (from Friedman and Rafsky 1981 [ddı = .5]).

2. Hide the data you do show

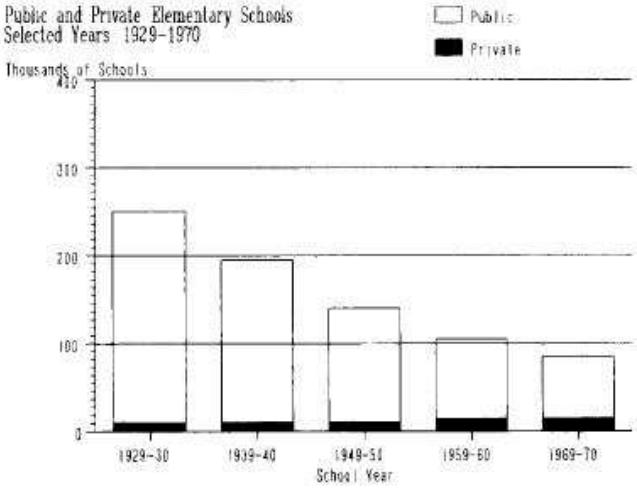


Figure 4. Hiding the data in the scale (from SI3).

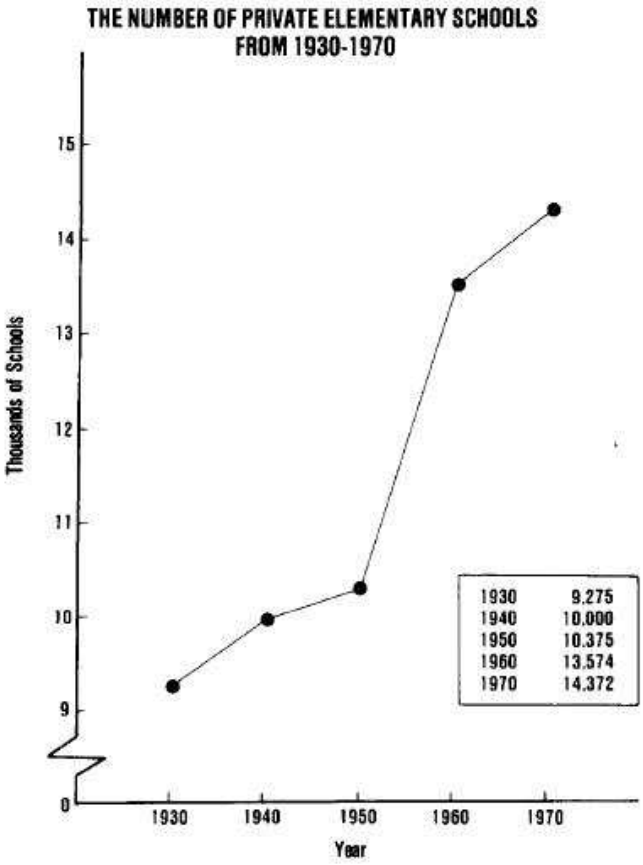


Figure 5. Expanding the scale and showing the data in Figure 4 (from SI3)

3. Ignore the visual metaphor

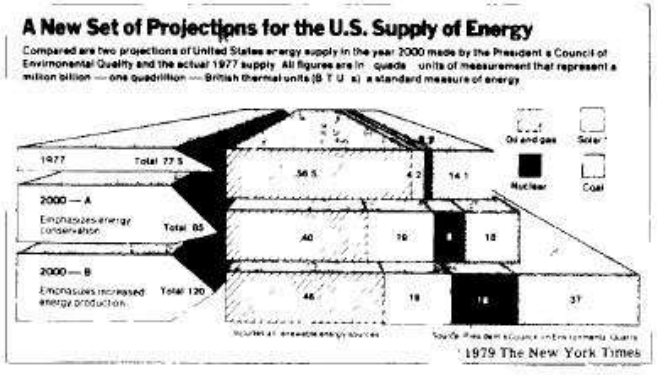


Figure 6 Ignoring the visual metaphor (© 1978, The New York Times)

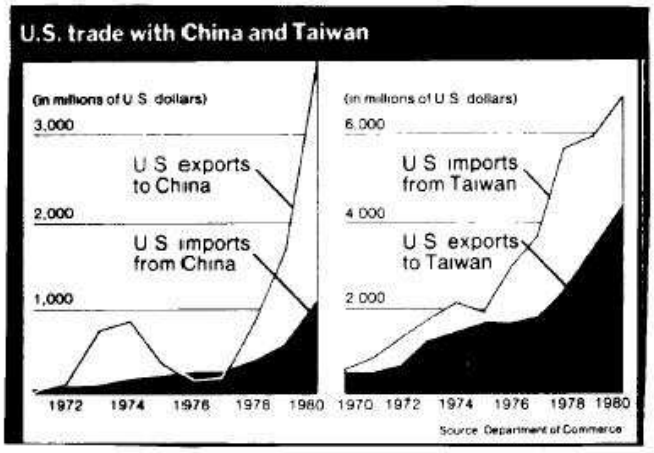
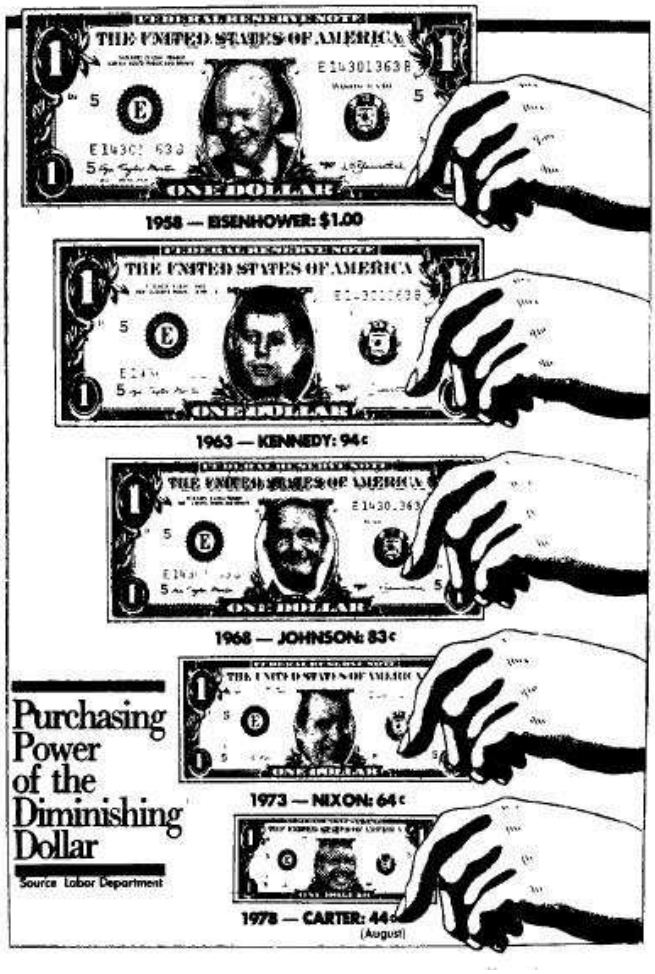


Figure 7 Reversing the metaphor in mid-graph while changing scales on both axes (© June 14, 1981, The New York Times)

4. Only order matters



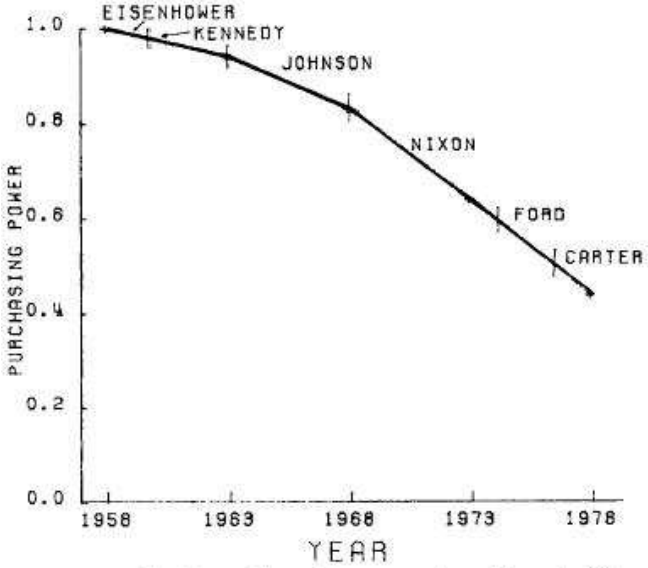


Figure 10. The data in Figure 9 as an unadorned line chart (from

5. Graph Data out of context

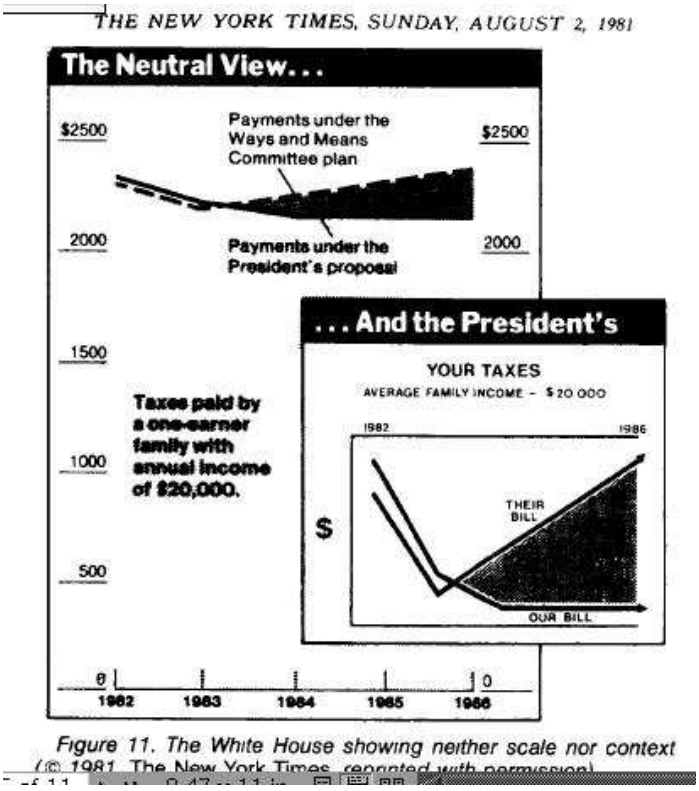


Figure 11. The White House showing neither scale nor context
(© 1981 The New York Times, reprinted with permission)

6. Change the scales in mid-axis

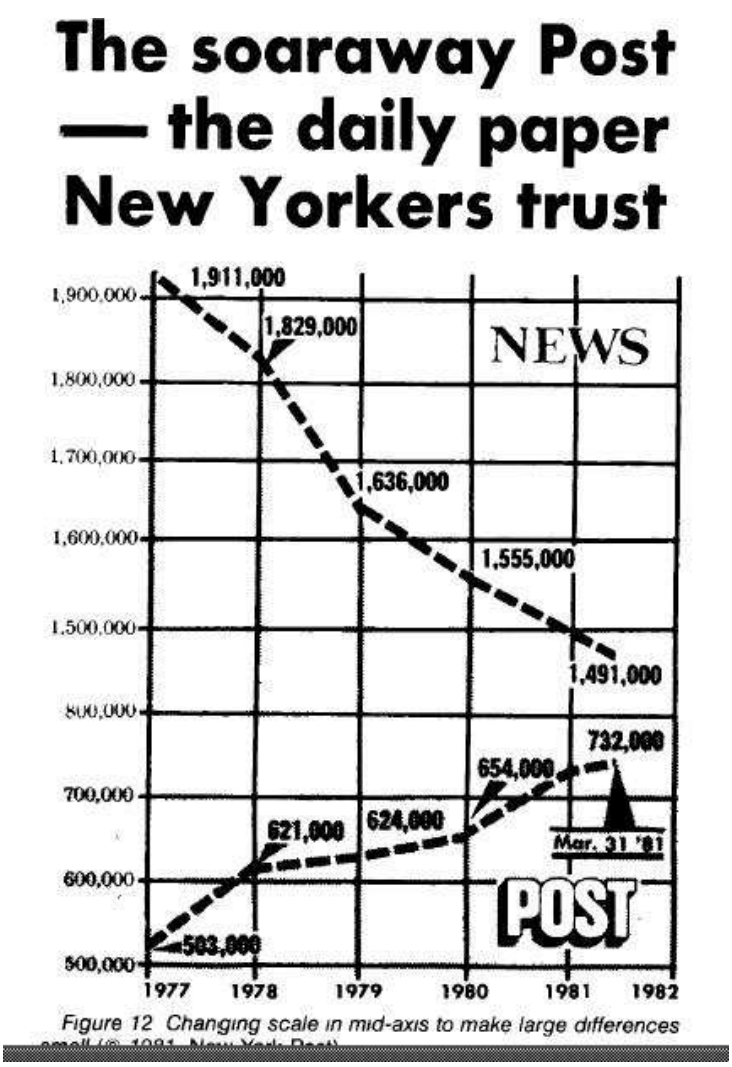


Figure 12 Changing scale in mid-axis to make large differences

7. Emphasize the trivial

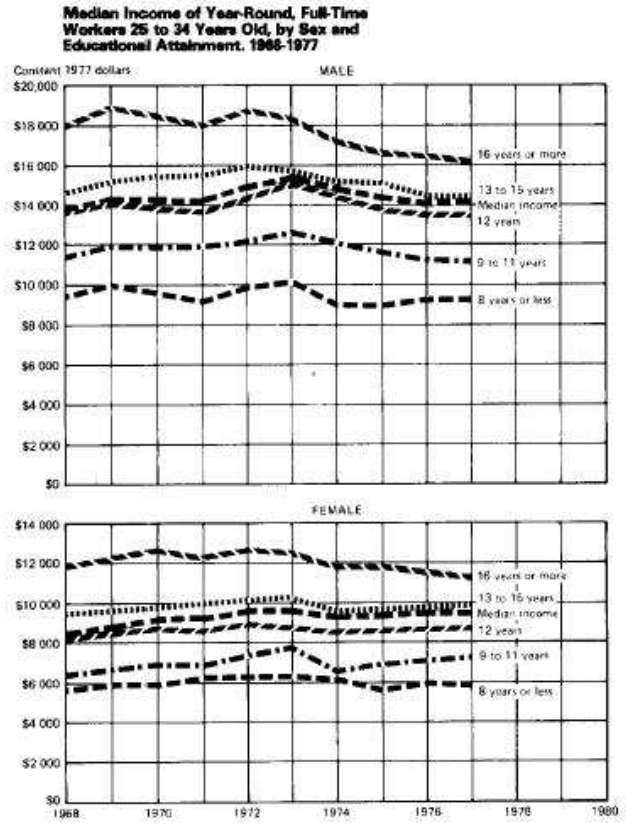


Figure 15. Emphasizing the trivial: Hiding the main effect of sex differences in income through the vertical placement of plots (from SI3)

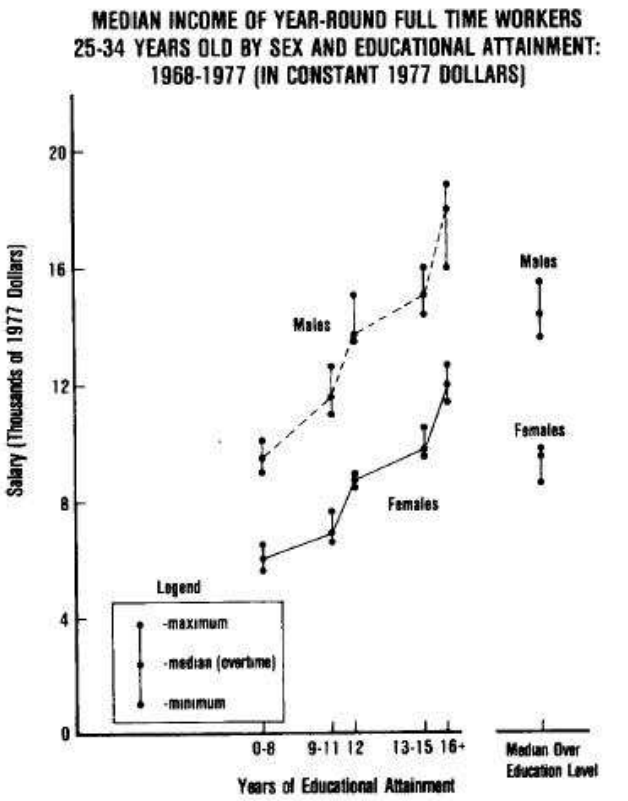


Figure 16. Figure 15 redone with the large main effects emphasized and the small one (time trends) suppressed.

8. Jiggle the baseline

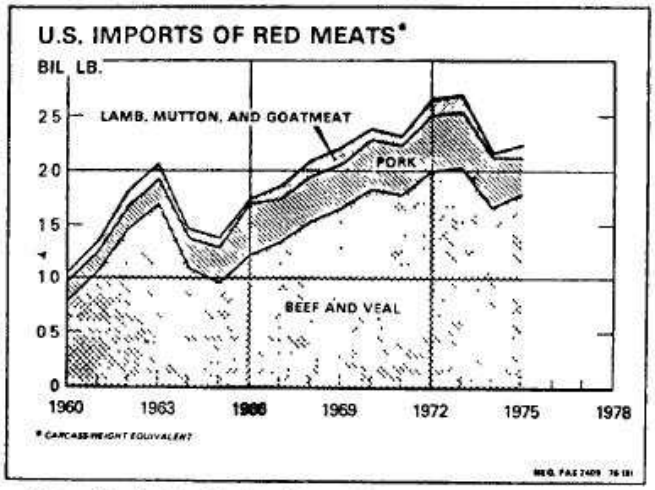
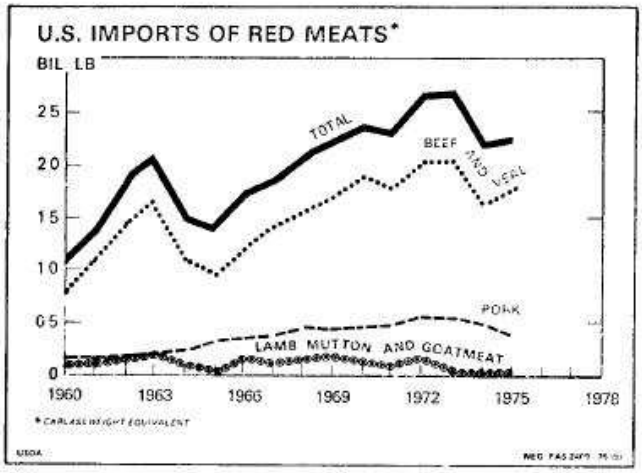


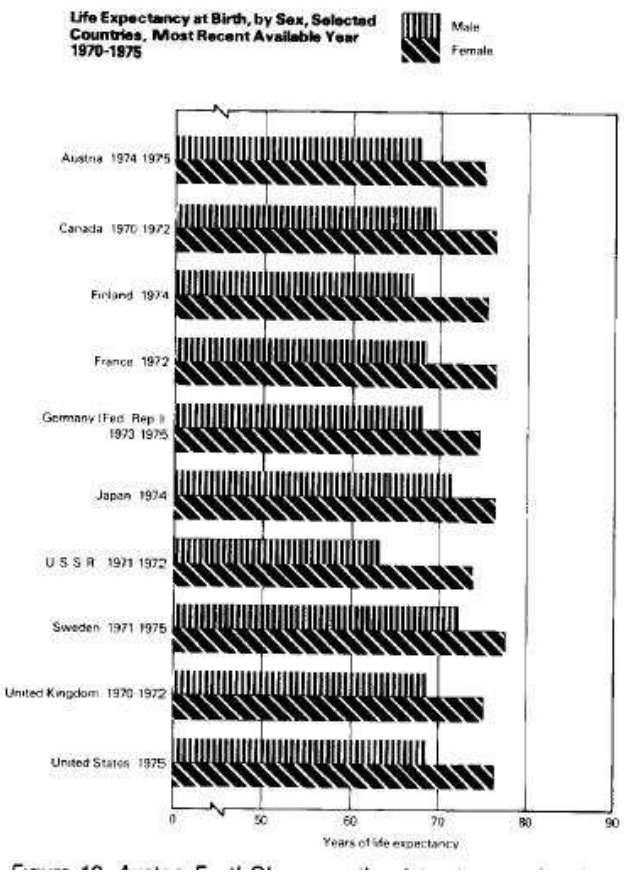
Figure 17 Jiggling the baseline makes comparisons more difficult (from Handbook of Agricultural Charts)



Source Handbook of Agricultural Charts, U S Department of Agriculture, 1976, p 93
Chart Source Original

Figure 18 An alternative version of Figure 17 with a straight line used as the basis of comparison

9. Austria First!

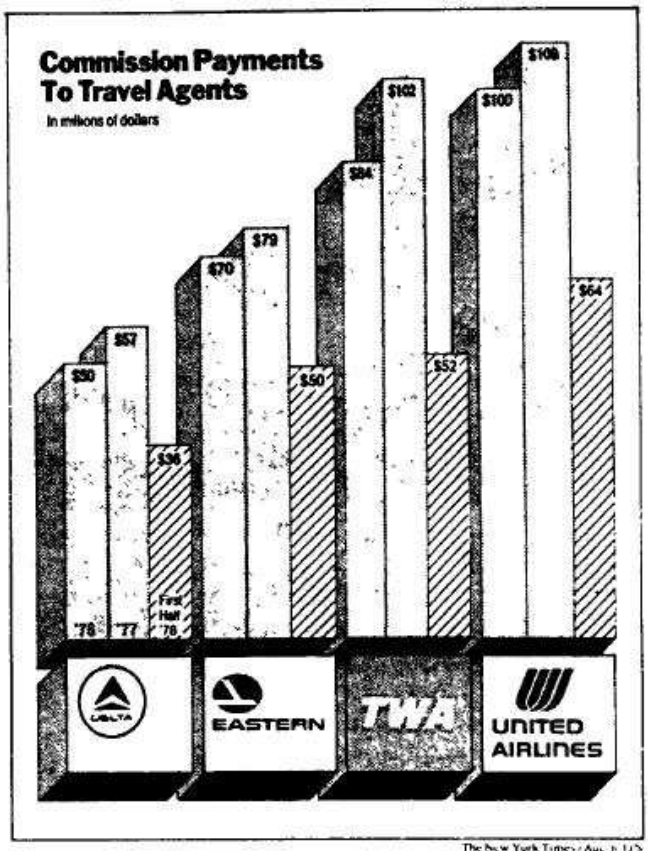


LIFE EXPECTANCY AT BIRTH, BY SEX,
MOST RECENT AVAILABLE YEAR

WOMEN	YEARS	MEN
SWEDEN	78	
	77	
FRANCE, US, JAPAN, CANADA	76	
FINLAND, AUSTRIA, UK	75	
USSR, GERMANY	74	
	73	
	72	SWEDEN
	71	JAPAN
	70	
	69	CANADA, UK, US, FRANCE
	68	GERMANY, AUSTRIA
	67	FINLAND
	66	
	65	
	64	
	63	USSR
	62	

Figure 20 Ordering and spacing the data from Figure 19 as a stem-and-leaf diagram provides insights previously difficult to extract (from SI3)

10. Label illegibly, incompletely, incorrectly, ambiguously



Complex web of discount fares and airlines' telephone delays are raising travel agents' overhead, offsetting revenue gains from higher volume.

Figure 21 Mixing a changed metaphor with a tiny label reverses the meaning of the data (© 1978, The New York Times)

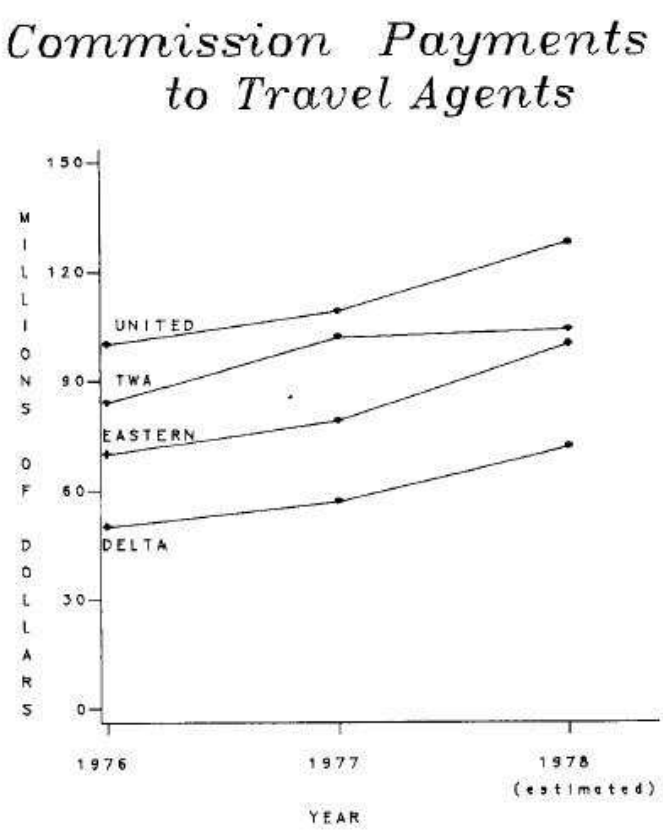


Figure 22 Figure 21 redrawn with 1978 data placed on a comparable basis (from Wainer 1980)

11. More is murkier: more decimal places, more dimensions, ...

Table 1. Optimal Selection From a Finite Sequence With Sampling Cost

	b/c = 10 0		100 0		1,000 0	
N	r*	$(G_N(r^*) - a)/c$	r*	$(G_N(r^*) - a)/c$	r*	$(G_N(r^*) - a)/c$
3	2	20000	2	2 22500	2	22 47499
4	2	26333	2	2 88833	2	29 13832
5	2	32333	3	3 54167	3	35 79166
6	3	38267	3	4 23767	3	42 78764
7	3	44600	3	4 90100	3	49 45097
8	3	50743	4	5 57650	4	56 33005
9	3	56743	4	6 26025	4	63 20129
10	4	62948	4	6 92358	4	69 86462

NOTE $g(Xs + r - 1) = bR(Xs + r - 1) + a$, if $S = s$, and $g(Xs + r - 1) = 0$, otherwise
Source Dhariyal and Ducewicz (1981)

12. If it has been done well in the past, think of another way to do it.