Economics 201
Tufte's *The Visual Display of Quantitative Information*:
A Reader's Guide with Questions

HOPEFULLY, you will quickly see that this is both a beautiful and an intelligent book, not to be discarded at the end of the semester but rather taken home and shared with parents, siblings or friends.

These notes provide a short reader's guide, along with some questions you should think about as you're reading—some of which you will likely be quizzed on in class.

CHAPTER 1, GRAPHICAL EXCELLENCE

Tufte begins by stating what he believes data graphics ought to accomplish. He continues by asserting (with the help of "Anscombe's quartet") that graphics can *reveal* data in a way that tabulation and the calculation of standard statistics may not.

Question: Give a brief but precise verbal description of what is shown (what sort of relationship between x and y) in each of the four Anscombe plots.

In this chapter Tufte makes the case that data graphics emerged via a process of abstraction from geographical maps. In an ordinary map, the x and y coordinates represent longitude and latitude. The idea eventually emerges that other magnitudes can be substituted on the axes, for example time or money. He points out that the first economic time-series plot was produced in 1786. (Note: 10 years after Adam Smith's *Wealth of Nations*. One wonders what else might Smith have spotted with the help of some good data graphics.)

Tufte shows some good examples of "data maps" which retain a geographical basis but show additional, non-spatial magnitudes.

Question: Examine the U.S. cancer maps. Note down something that strikes you as surprising or interesting—something that is not mentioned in Tufte's accompanying text.

Question: Look carefully at Playfair's double time-series (price of wheat and wages) on page 34. How could the graph be modified to show Playfair's point more clearly?

Tufte also discusses "relational graphics" in this chapter—graphics that bring to the fore questions of *connection*, of cause and effect.

Question: Look at the "Phillips Curve" plots on page 48. Select one of the plots and construct a brief narrative account of what it shows. If you can't see how to do this don't worry, we'll talk about it in class.

CHAPTER 2, GRAPHICAL INTEGRITY

Here Tufte is concerned with data graphics that "lie"—that systemically mislead the reader.

Question: Look at the graphic at the top of page 55. Explain exactly what is wrong with it.

Compare the horrid graphic on page 57 with Tufte's version on p. 58, for an object lesson in obfuscation versus clarity. (We will give you a handout showing an even more striking case taken from one of Tufte's later books.)

On pages 62–3 he gets into the "real" versus "nominal" distinction, something we will come back to later.

Question: What exactly does it mean, to "adjust the price of oil for inflation"? Why is it sensible to do so?

Question: Look at the graph from the *Economist* at the top right of page 63. What, may we infer, happened in terms of general inflation between mid-1973 and 1977?

CHAPTER 3, SOURCES OF GRAPHICAL INTEGRITY AND SOPHISTICATION

Tufte diagnoses a problem whereby many publications hand off the task of preparing data graphics to artists who are not necessarily very numerate, who don't really understand the data themselves, and who labor under the notion that statistics are boring (and so have to be dressed up).

Question: Page 81, the two graphics at the foot of the page: How *should* these data have been presented? Be brief but precise.

CHAPTER 4, DATA-INK AND GRAPHICAL REDESIGN

Note Tufte's account of William Playfair's rapid improvement: the reduction of redundant and distracting grid lines. Tufte's motto: "Maximize the data–ink, within reason."

Note the prescriptions he offers in conclusion (p. 105). Unfortunately, it can be difficult to implement these prescriptions when using standard software to generate data graphics.

CHAPTER 5, CHARTJUNK: VIBRATIONS, GRIDS AND DUCKS

Tufte's main points:

§ Avoid Moiré vibration

§ Calm the grid

§ Eschew the production of "ducks"

Even when using standard software, one has some control over the issues he's talking about here.

One example that springs to mind relates to pie charts. Tufte, it seems, is not very impressed by pie charts: they don't really do anything that an ordered data table couldn't do. But anyway, pie charts are quite popular. A relatively recent computer-inspired development is the pie chart where the "pie" takes the form of a 3-D disk, viewed at an angle.

Question: Why is such a pie chart arguably inferior to the more traditional sort, where the "pie" is a circle viewed from directly above, so to speak?

CHAPTER 6, DATA-INK MAXIMIZATION AND GRAPHICAL DESIGN

Excellent ideas here. I have the same comment as for Chapter 4: unfortunately, the "ordinary" producer of data graphics has little opportunity to implement Tufte's suggestions unless he/she is willing to invest the time to learn a sophisticated custom graphics program or language.

Tufte's book was first published (1983) before the "PC revolution," at a time when data graphics were generally produced either by specialist designers of widely varying talents, or, if they were computer-generated, with the help of rather primitive graphics programs (for an example of which see page 120). Since then we have seen the rise of ubiquitous programs with a data graphics capability, such as Microsoft Excel. On the upside, this means that we are less likely to see such idiosyncratically nasty designs as those deprecated by Tufte on pages 108 and 120. On the downside, "non-standard" but elegant graphics (such as those produced by William Playfair at his best) have become rarer too.

CHAPTER 7, MULTIFUNCTIONING GRAPHICAL ELEMENTS

Again, very good ideas, but not something you can put into practice via casual use of standard computer software.

CHAPTER 8, DATA DENSITY AND SMALL MULTIPLES

OK, here we have an important idea that *can* be implemented even by a non-specialist. Excel (for instance) may not give you fine control over the appearance of a plot, but generally you can *size it* at will. Tufte's point here is that where comparison across multiple units is required we can sometimes do much better by putting a lot of small graphics on one page rather than taking many pages and forcing the reader to turn back and forth to make the relevant comparisons.

"Graphics can be shrunk way down"

There's nothing sacrosanct about the default size with which a data graphic happens to be dumped into your document when you do a "Paste."

CHAPTER 9, AESTHETICS AND TECHNIQUE

Tufte is obviously an advocate of good data graphics, but notice one point he argues in this chapter: In some cases a well-designed table is better than a picture.

Question: In what sort of cases is a table preferable to a graphical chart, and why?

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Question: By way of rounding off on Tufte: Take a look at some recent issues of publications carrying data graphics—for example, the *Wall Street Journal*, the *New York Times*, *Business Week*, *Time*, *US News and World Report*, *Scientific American* .... Select from these one data graphic that strikes you as particularly good and one that seems particularly bad. (You should make this selection in the light of Tufte's arguments, although you don't have to agree with everything he says. Note that a poor graphic does not have to be as grotesque as Tufte's set-piece horrors—it may simply represent a missed opportunity to help the reader make sense of the data.) Make photocopies of the graphics and bring them to class. Be prepared to defend your judgments.