1 a) A boxplot explicitly shows the median an quartiles of a set of values and the Interquartile range can be seen as the distance between the quartiles. In addition observations which lie more than 1.5 times the interquartile range are visible. It is also possible to detect skewness in a boxplot.

b) Boxplots are good plots for comparing several samples. They represent the median and quartiles for each sample by points along a common scale, and the interquartile ranges by lengths. Judging locations along a common scale and judging lengths are both perceptual tasks which humans are good at.

c) Comparing spreads using boxplots requires that we compare the lengths of the boxes on the plot. Although we are good a judging lengths, we are better at judging position along a common scale. For this reason, if we are truly interested in whether there is a spread/location dependency, then it would be better to plot the interquartile ranges against the medians for each sample.

2 a) Histograms and density plots both show the local density of points as a function of location. This kind of plot makes it easy to see things like skewness of the distribution of points (as opposed to symmetry) and the presence of clustering.

b) The shape of histograms is very sensitive to the choice of cells used to construct the plot. Moving the cells slightly to the left or right can change the shape of the histogram. This is not true for density plots, the shape of the plot is completely determined by the bandwidth.

The pictures produced by histograms are also noisier because of the vertical lines drawn in the plot. The lines also make it hard to superimpose several histograms on the same plot.

Finally, density plots can be superimposed, whic is useful for comparing distributions.

c) Histograms might be preferable when a presentation is being made to a group (e.g. “the boss”) familiar with histograms, but not density plots.

They might also be useful if there is a particularly important reason for using a particular set of cells.

3) Stevens' law states that if A is the actual value of some attribute of a graph (e.g. length, area or volume) and P is the perceived value, then

$$P \propto A^{\beta}$$

where β is a constant which depends on the individual and type of attribute in question.

Any plot which uses areas or volumes is likely to result in distorted perceptions because for these attributes (and most individuals) $\beta < 1$. Examples include; pie charts, maps, 3d bar charts and plots which use areas (such as circles) to represent values.

3) The plots suffer from several deficiencies

- The horizontal scales are not comparable - the distance between 1972 and 1980 differs in the two plots.
- The vertical scales on the plots are different, even though the plots are juxtaposed. The China plot is twice as high as it should be.
- The shading used to encode imports and exports is switched between the plots (very confusing).
- The shading produces a strong horizon effect.