



An Economist's Guide to Visualizing Data

Jonathan A.
Schwabish

Data Visualization: An Emerging Field

- As analysts and economists, we are used to graphical representations of our work
- People tend to spend a lot of time on the analysis and the words, but less time on thinking about the best presentation of their work

Three basic principles:

● Show the data:

- People read graphs in a research report, article, or blog to understand the **story being told**.
- The data are the most important part of the graph and should be presented in the **clearest way possible**.
- But that **does not mean that all of the data must be shown**—indeed, many graphs show too much.

Three basic principles:

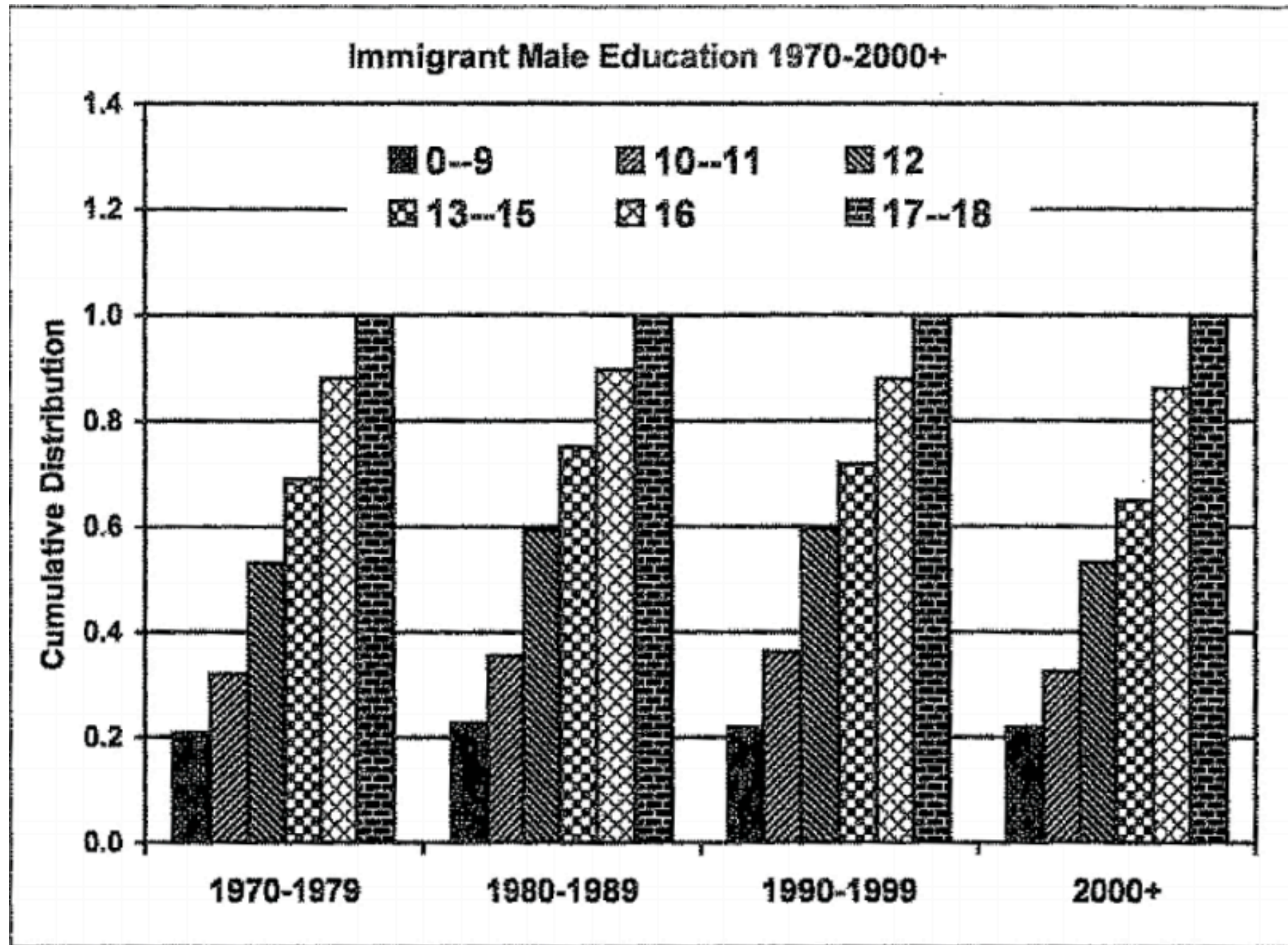
● **Reduce the clutter:**

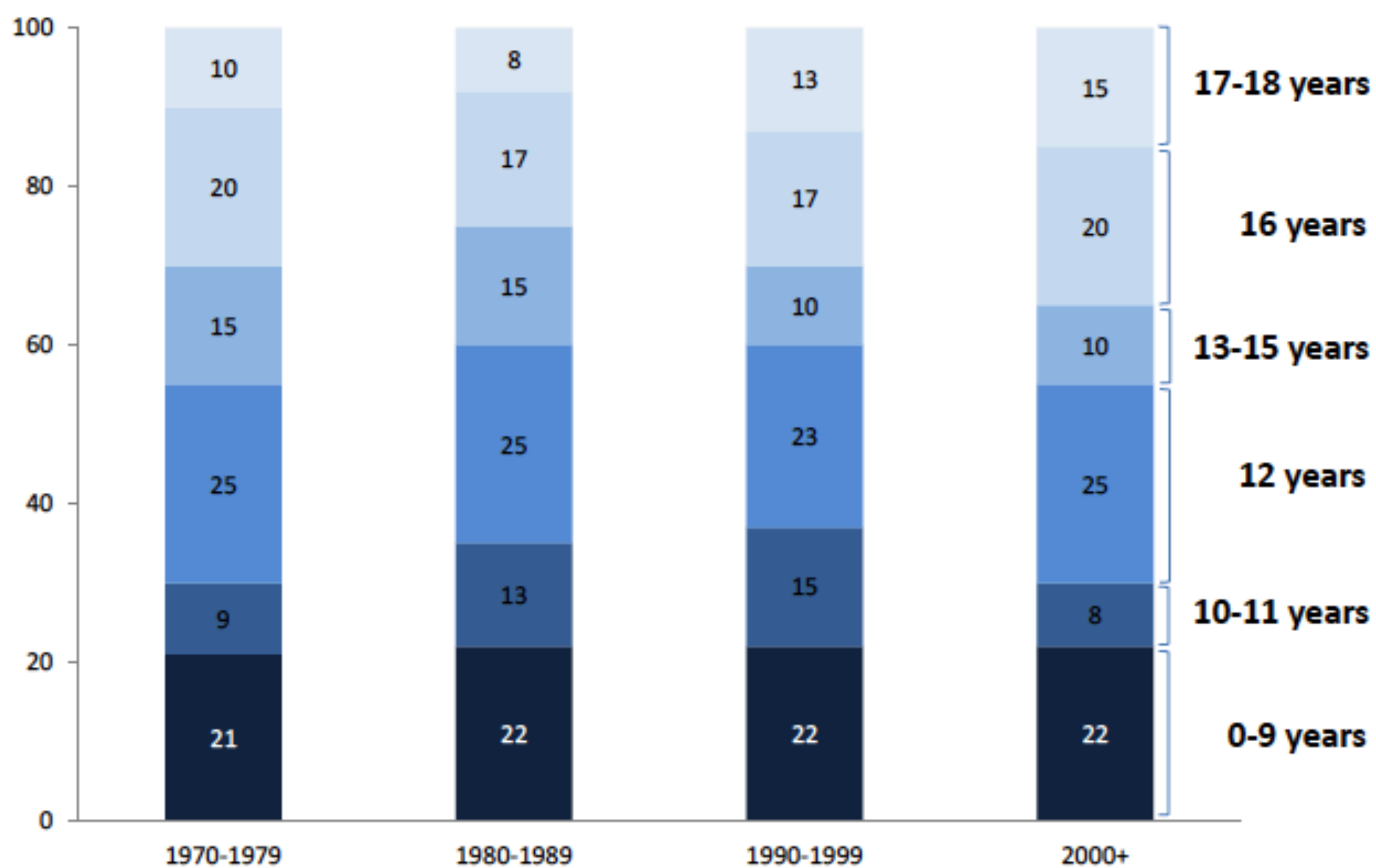
- The use of **unnecessary or distracting visual elements**, will tend to reduce effectiveness.
- Clutter comes in dark or heavy gridlines; unnecessary tick marks, labels, or text; unnecessary icons or pictures; ornamental shading and gradients; and unnecessary dimensions.

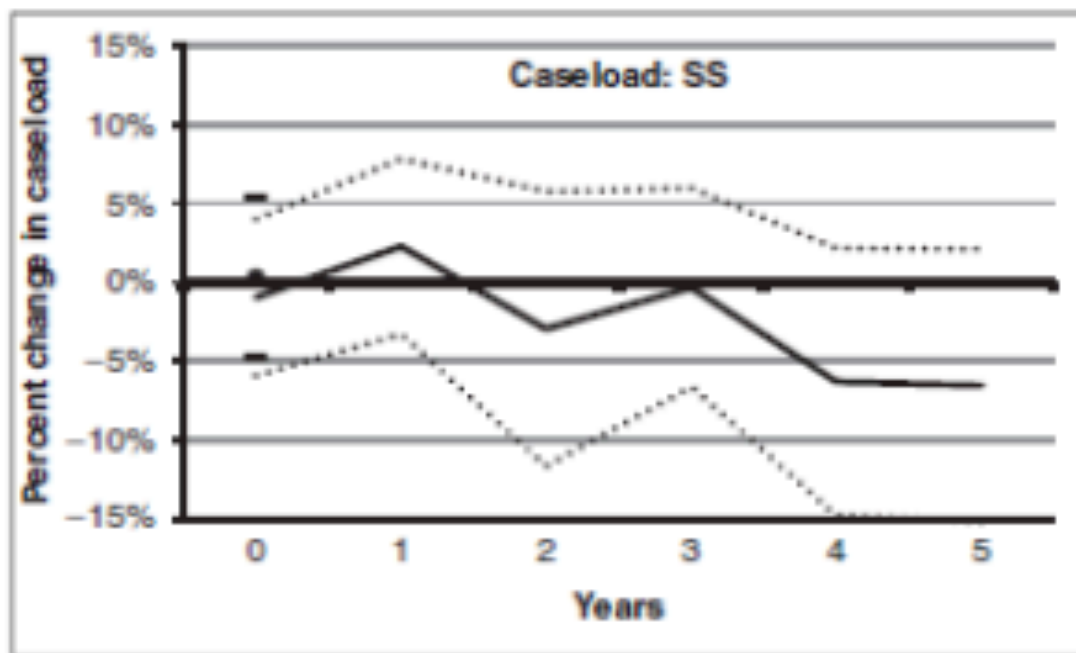
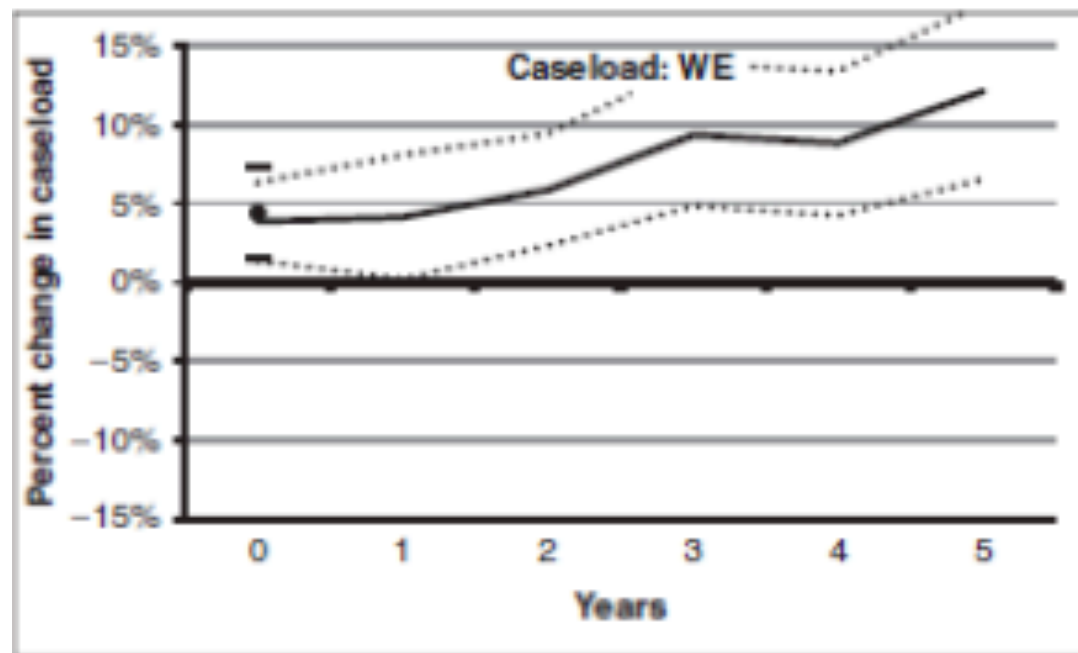
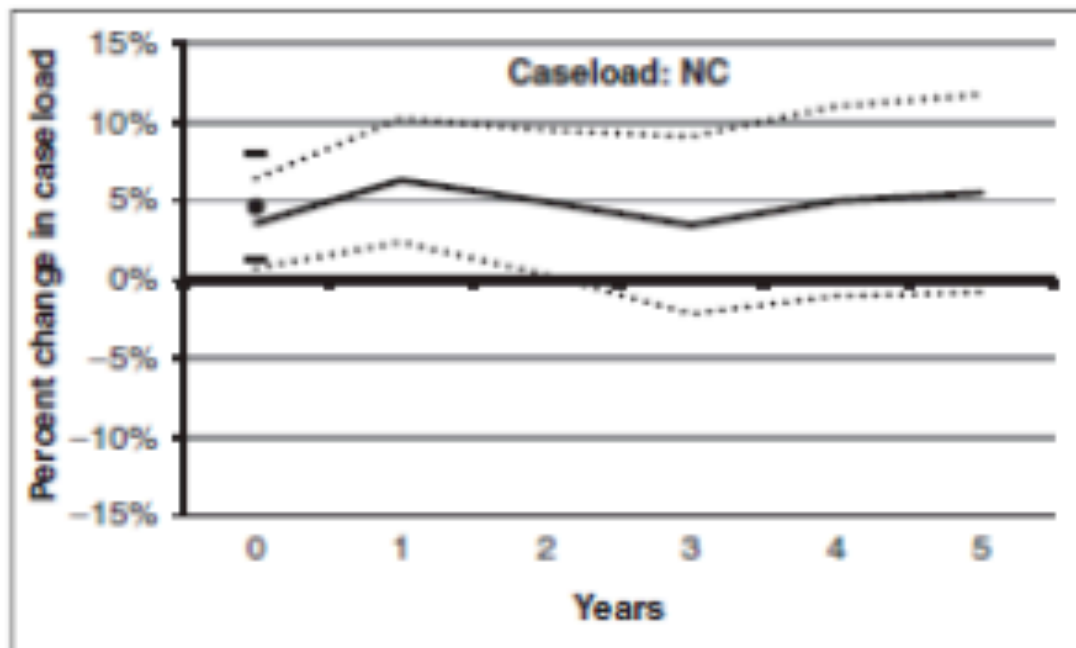
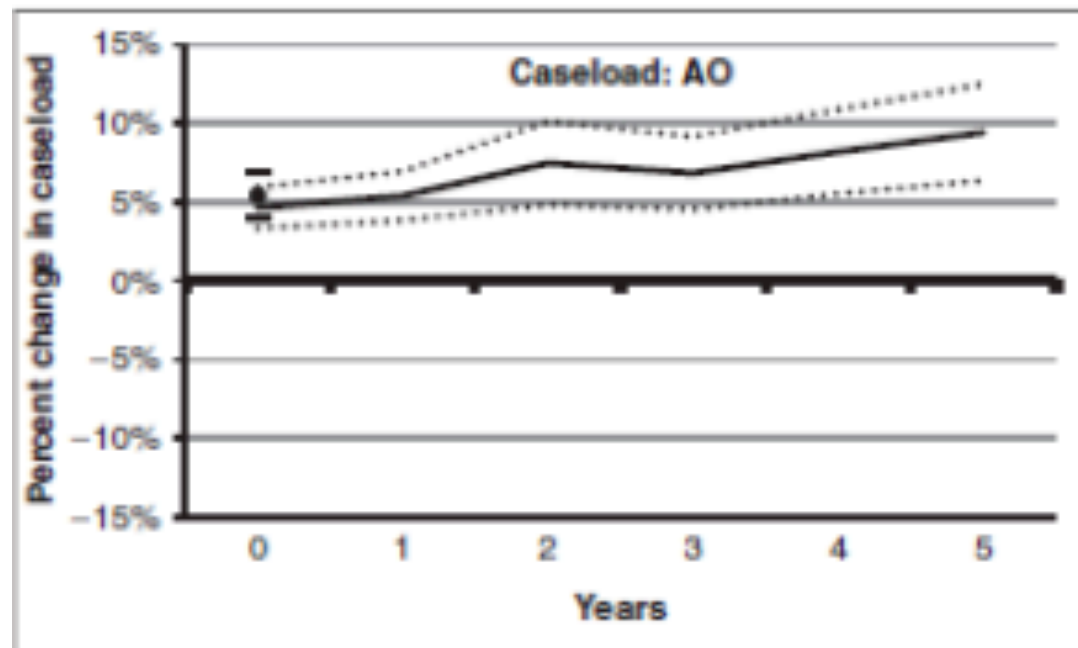
Three basic principles:

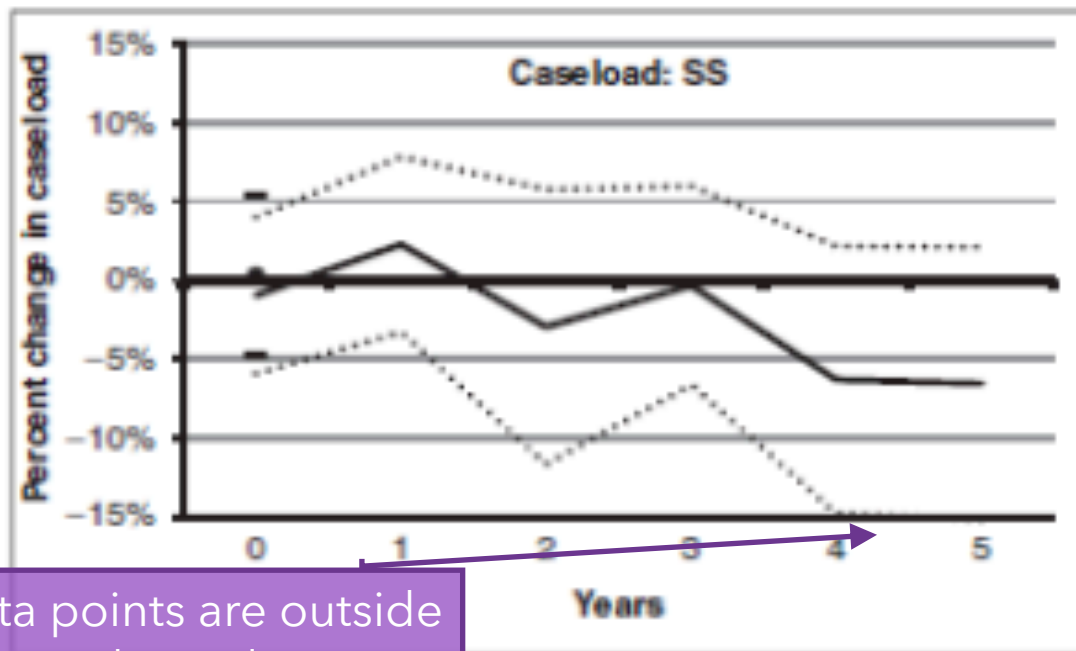
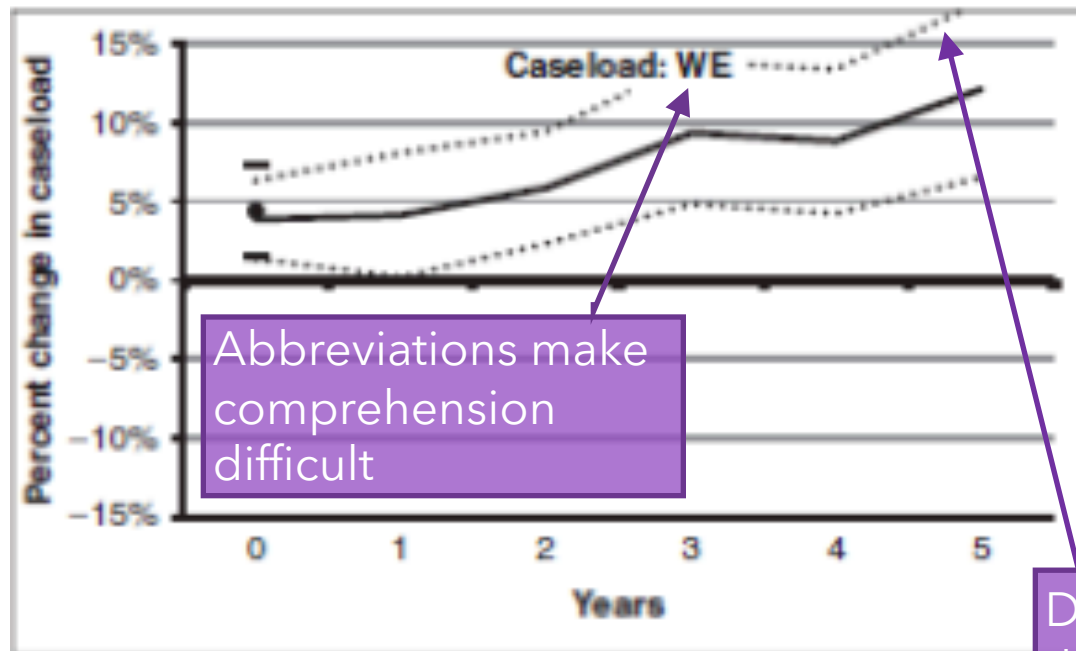
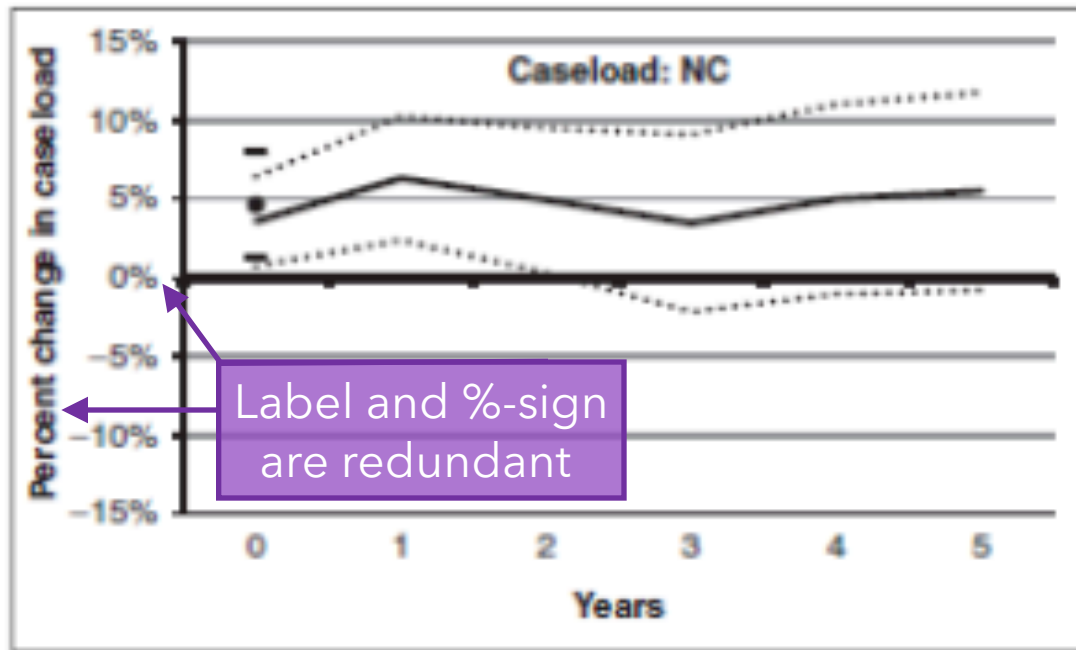
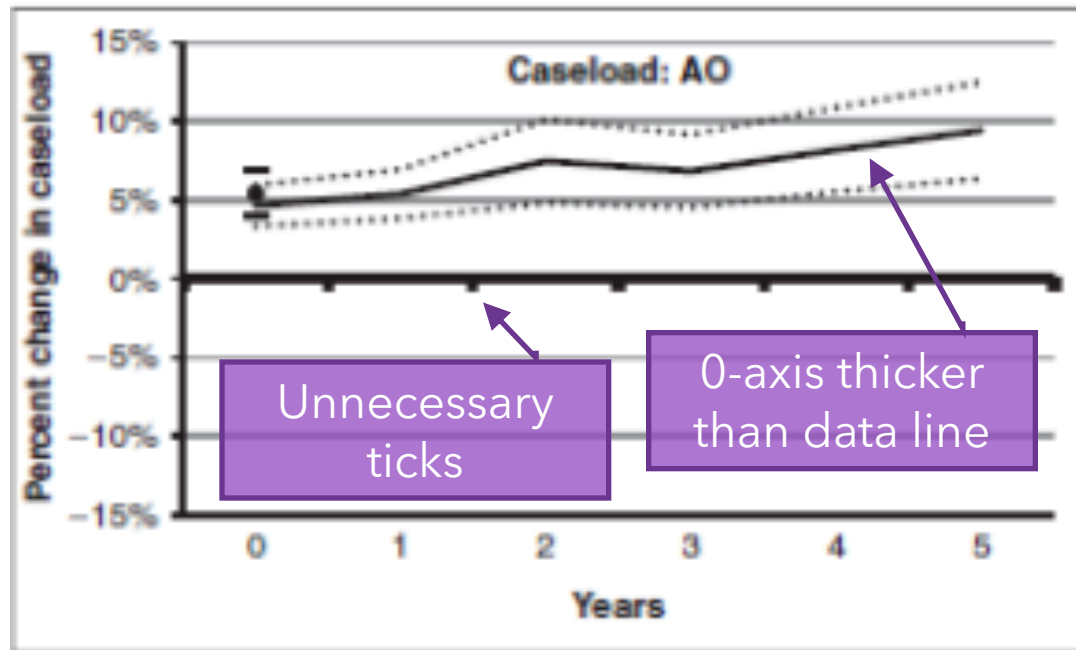
● **Integrate the text and the graph:**

- Visualizations are constructed to complement the text and to contain enough information to stand alone (Corum 2013).
- Integrated legends—right below the title, directly on the chart, or at the end of a line—are more accessible.



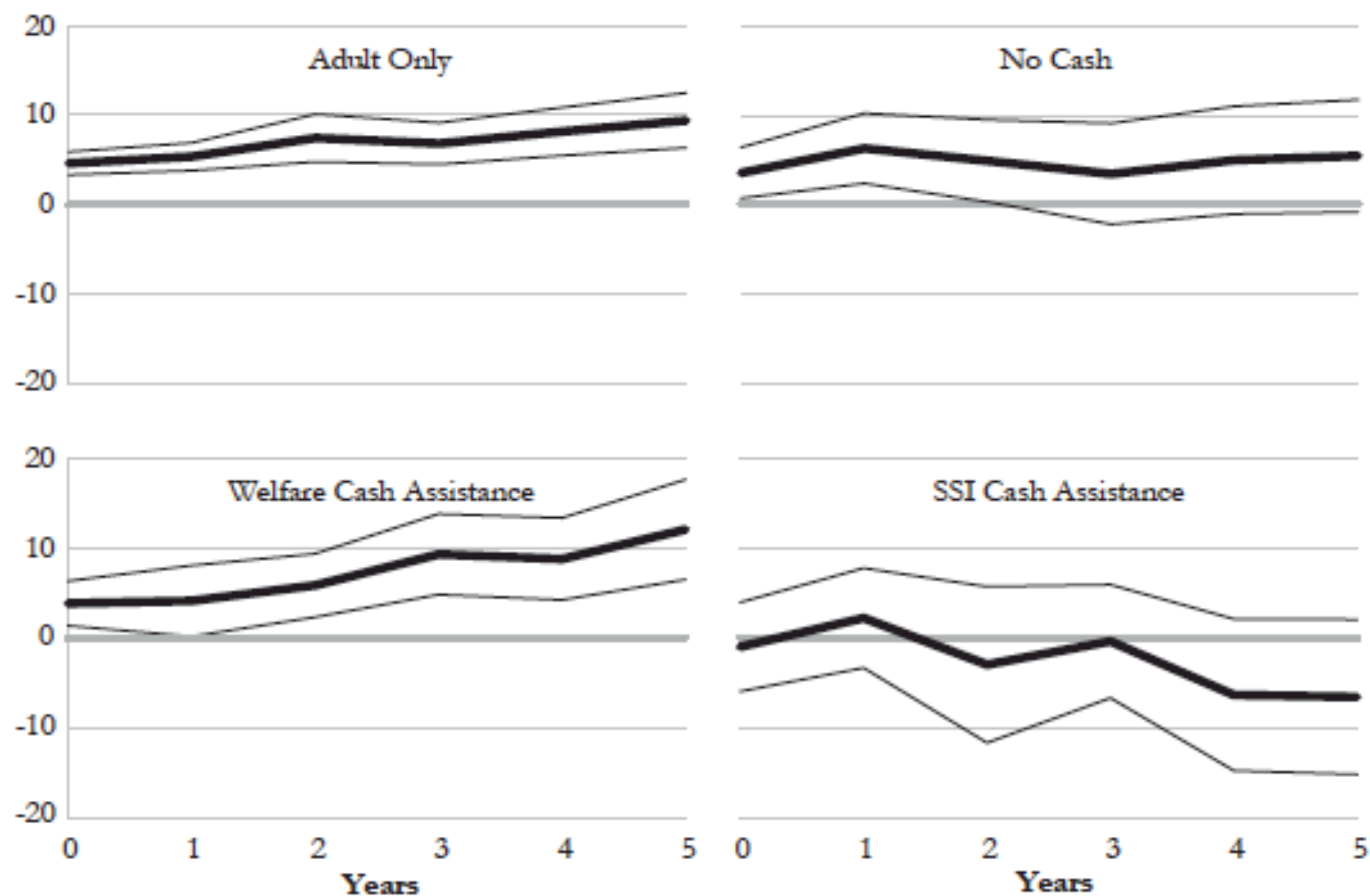




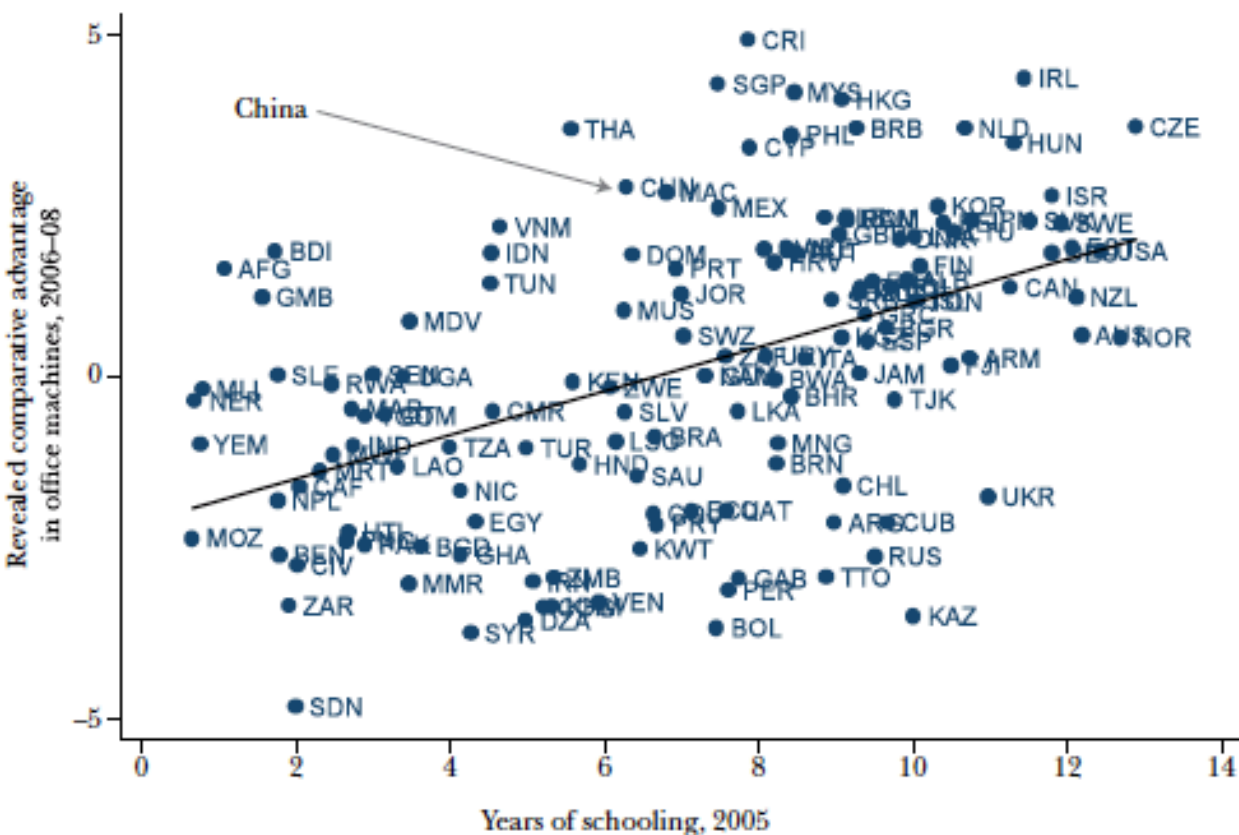


Implied Impulse Response Functions for Different Caseloads

(Percent change)

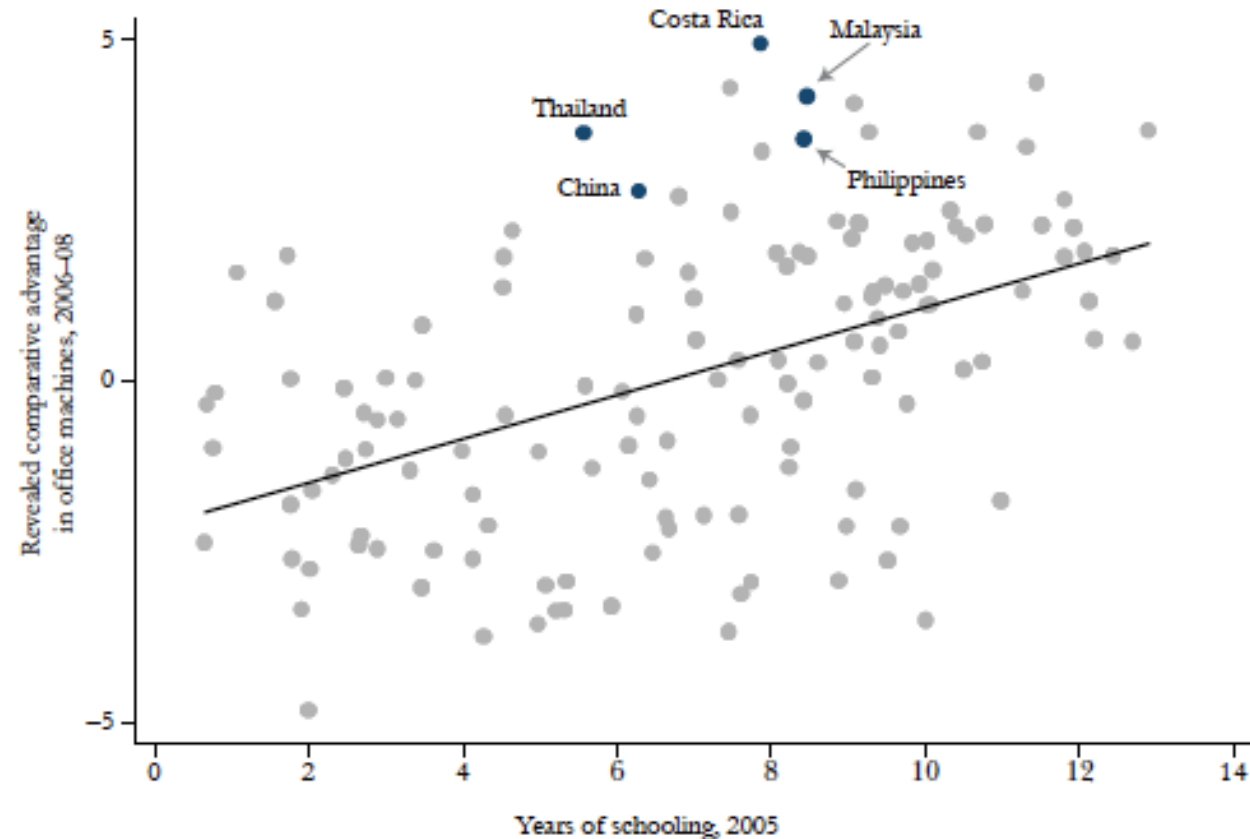


Education and Exports of Office Machines

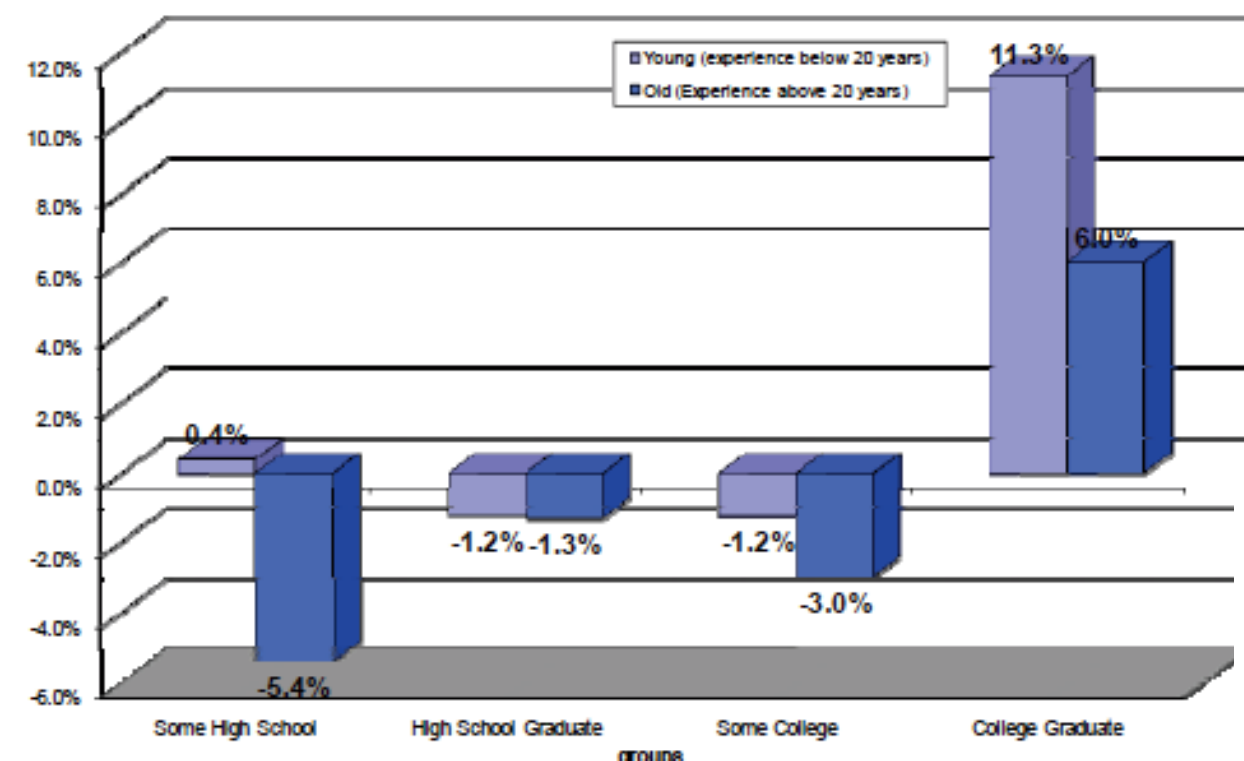


[The figure] plots countries' revealed comparative advantage in office machines... averaged over 2006 to 2008, against the average years of schooling of the adult population in 2005... *China* is above the regression line, indicating that its specialization in the sector is greater than one would expect given its level of education, but it is hardly an extreme outlier. Other middle-income countries—including *Costa Rica*, the *Philippines*, *Malaysia*, and *Thailand*—have larger positive residuals.

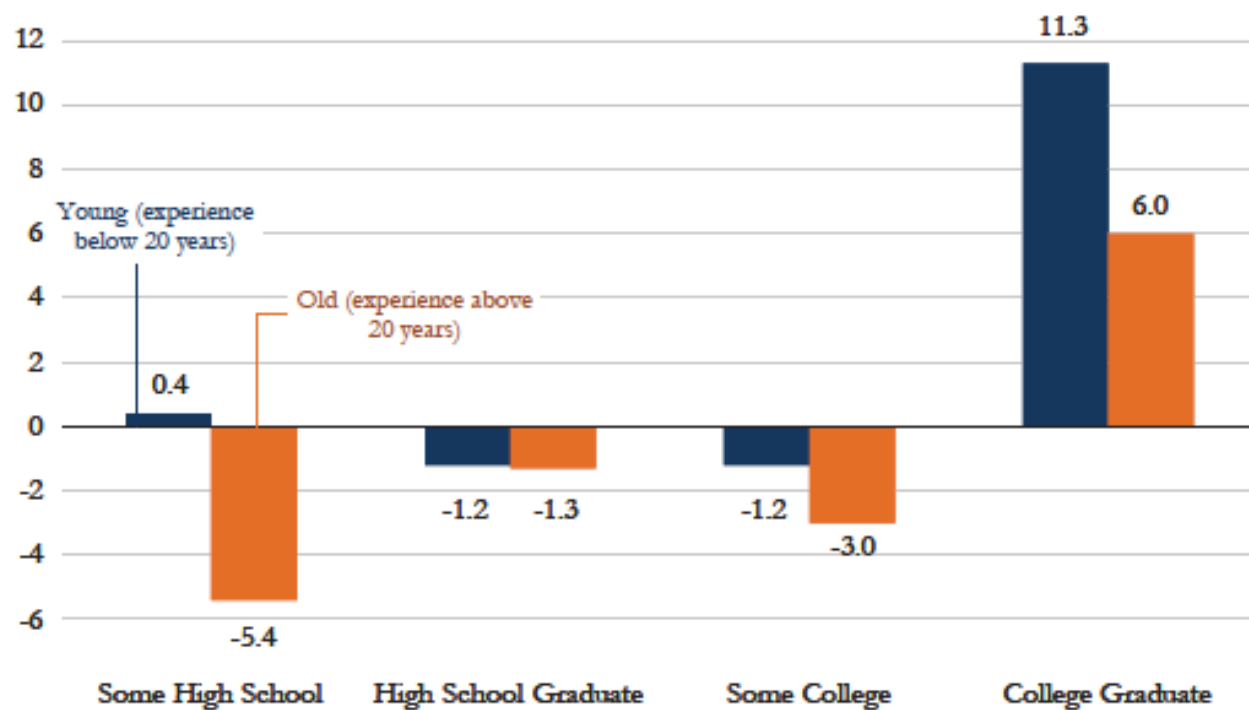
Education and Exports of Office Machines



Change in real weekly wages of US-born workers by group, 1990-2006

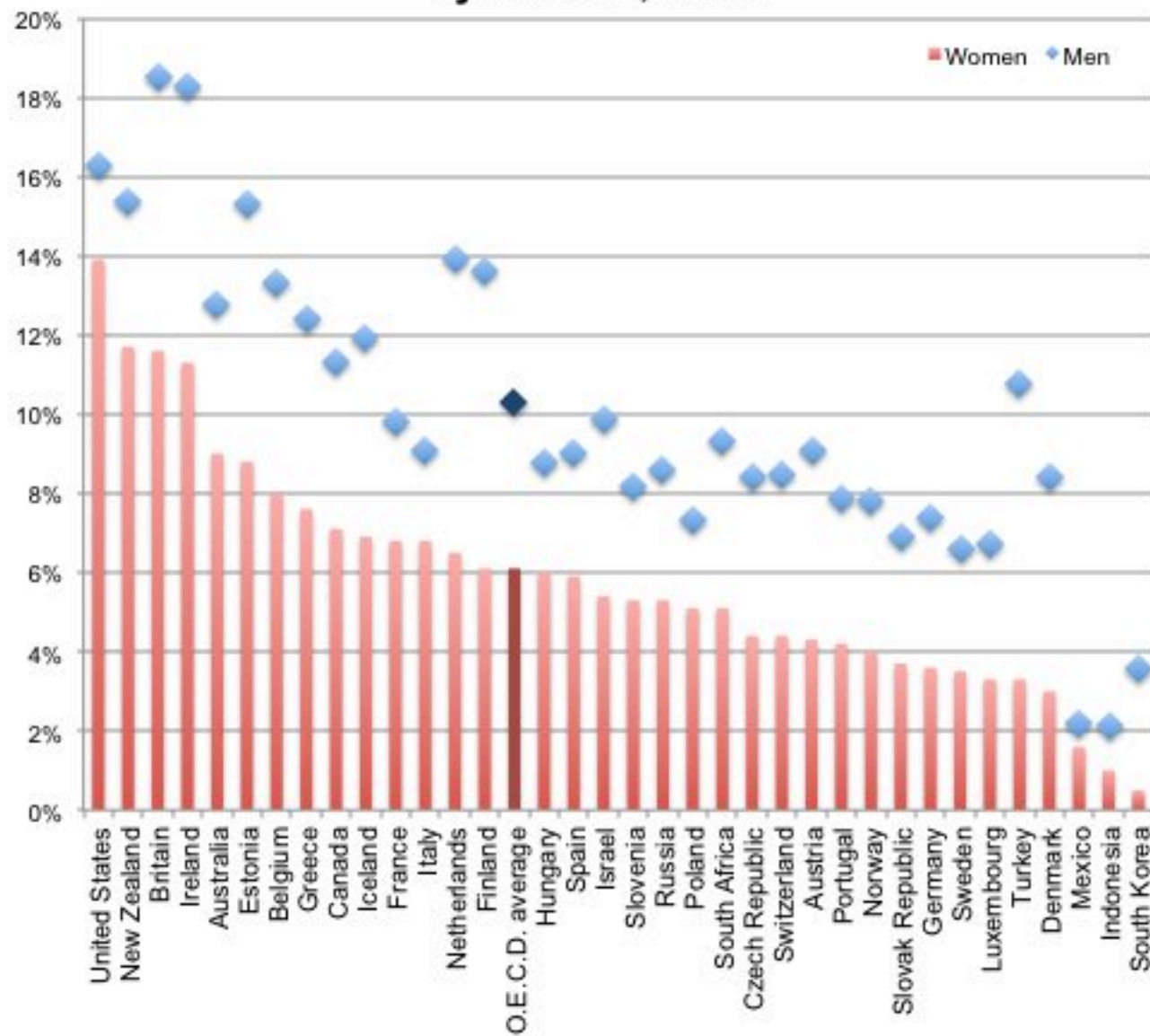


Change in real weekly wages of US-born workers by group, 1990-2006
(Percent)



An Unbalanced Chart

Percentage of Employed Who Are Senior Managers, by Gender, 2008

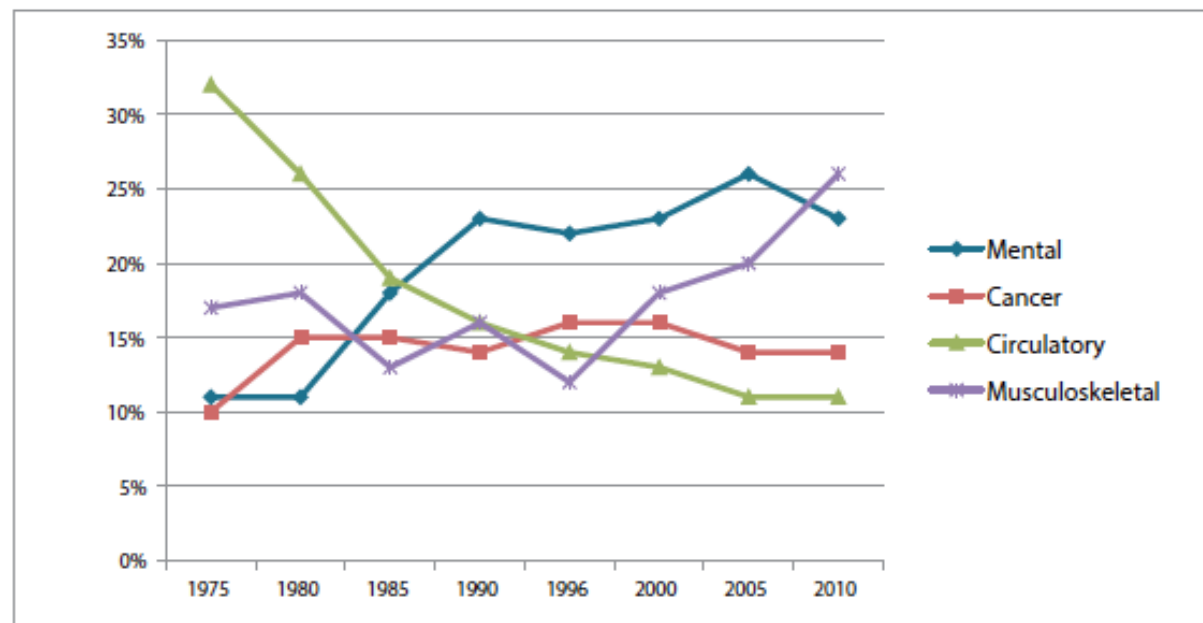


Percentage of Employed Who Are Senior Managers, by Gender, 2008 (percent)

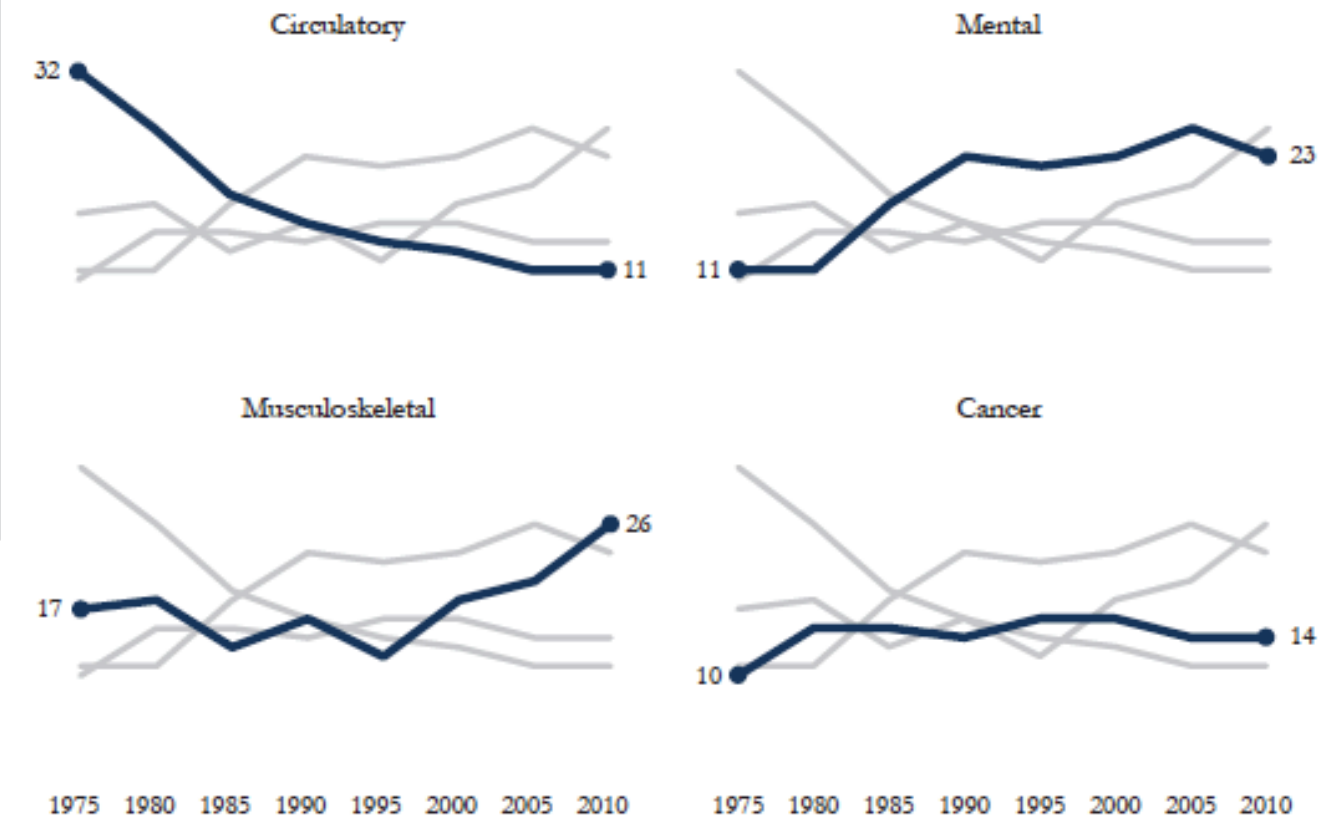
● Women ● Men



27. Initial DI Worker Awards by Major Cause of Disability—Calendar Years 1975-2010



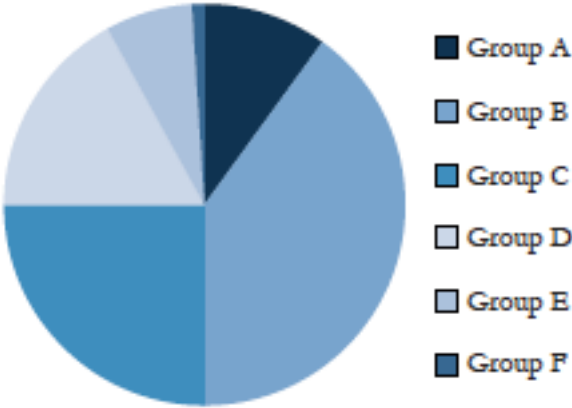
Initial DI Worker Awards by Major Cause of Disability—
Calendar Years 1975–2010
(Percent)



The contrast between light and dark helps **to highlight specific trends and reduce clutter**, as does the use of a label at either end of the main line in each set. (The y-axes are deleted, but they could be restored.)

They **emphasize the trends over time**; the approach would differ if we were trying to emphasize specific numbers.

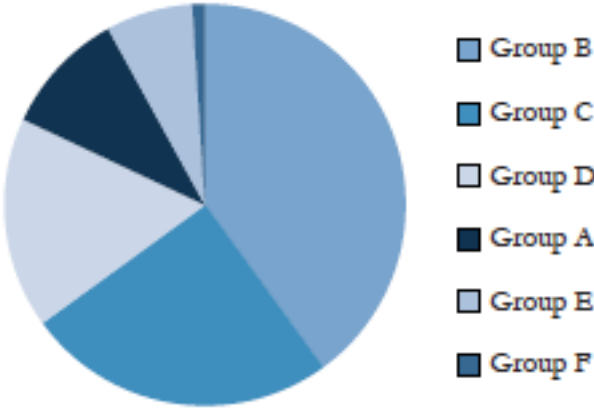
Figure 7A
A Pie Chart



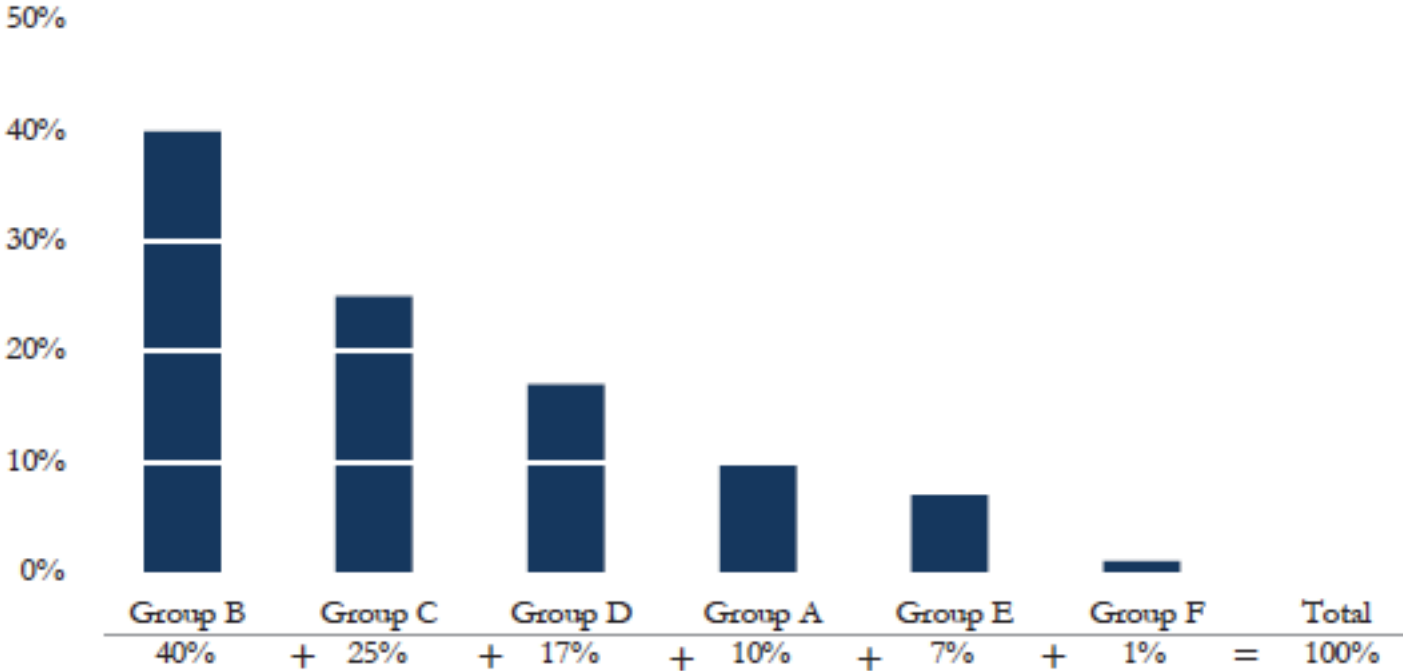
Group C is easily identified as being about 25% of the whole.

If, as in Figure 7B, the order of the segments is positioned so that the largest starts at the 12 o'clock position, the value of Group C is not so easily apprehended.

Figure 7B
B: A Pie Chart, Rotated

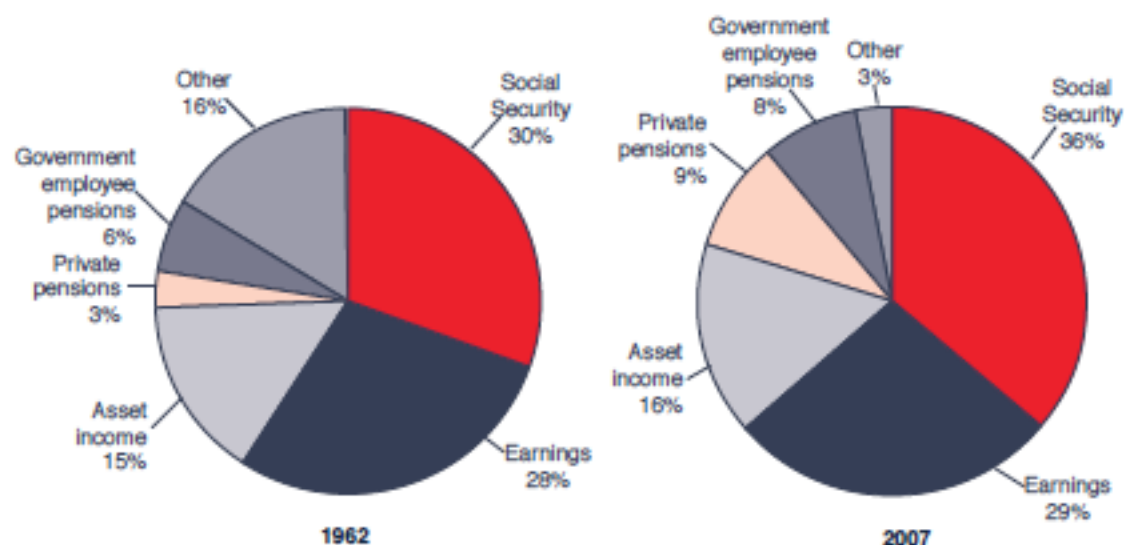


Percentage of Total Sales

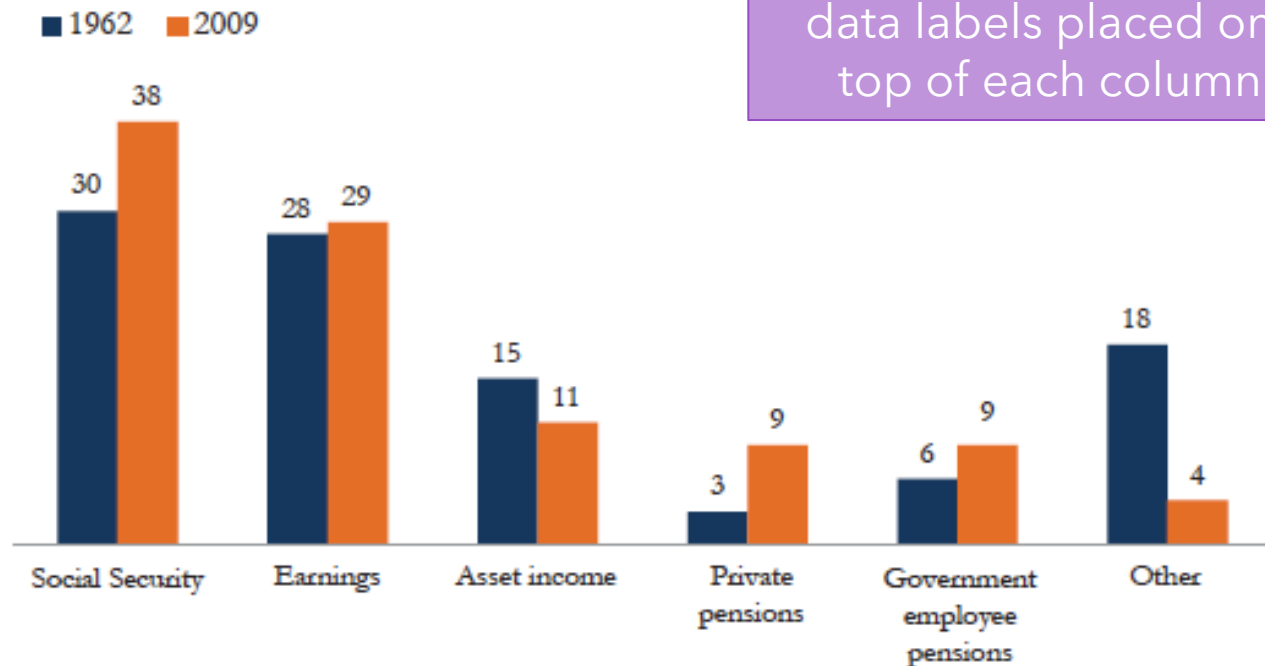


Shares of Aggregate Income, 1962 and 2007

Aggregate income, by source

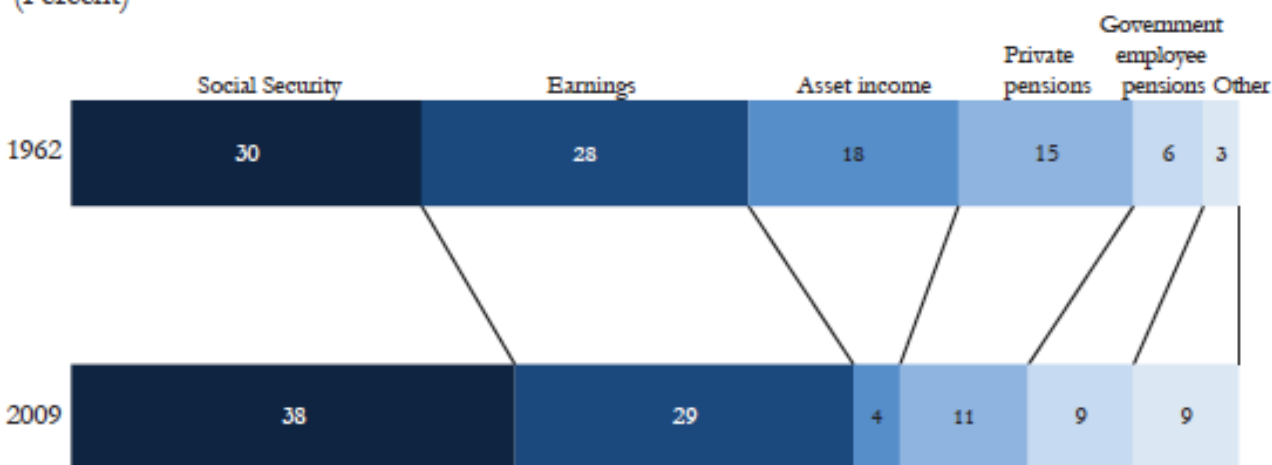


Shares of Aggregate Income, 1962 and 2009
(Percent)

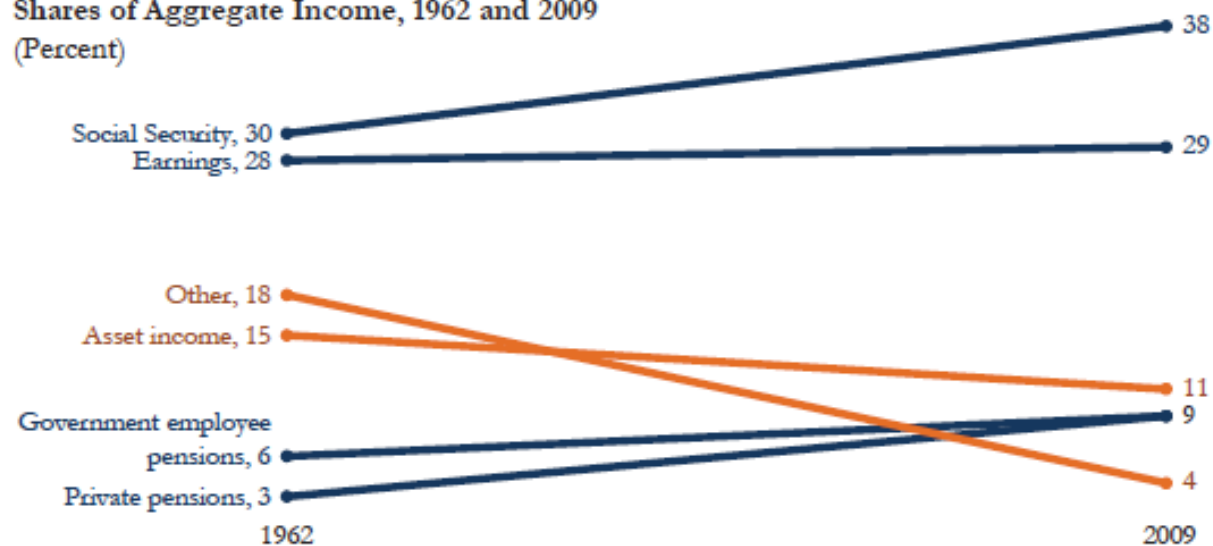


The usefulness of the y-axis is doubtful with data labels placed on top of each column.

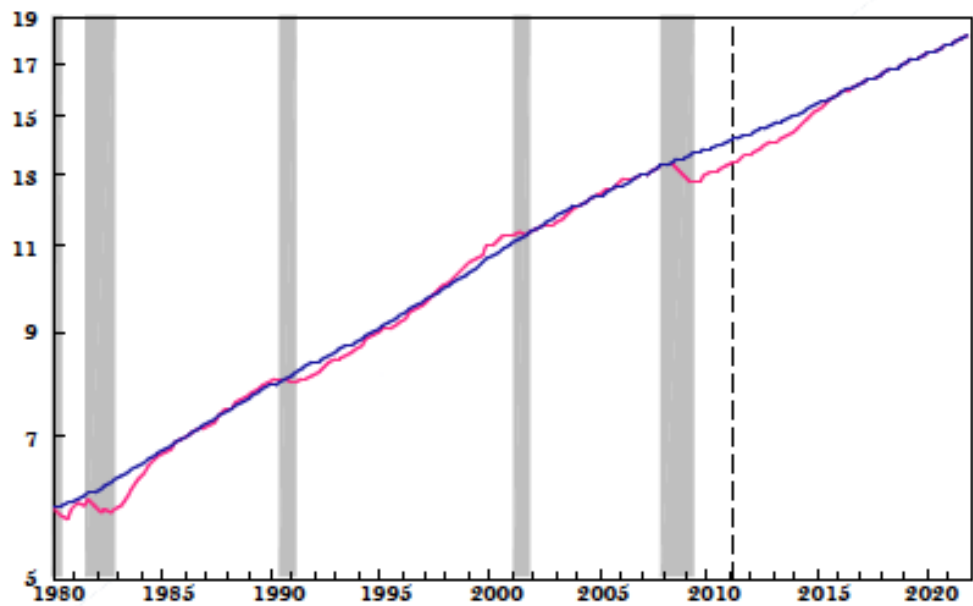
Shares of Aggregate Income, 1962 and 2009
(Percent)



Shares of Aggregate Income, 1962 and 2009
(Percent)



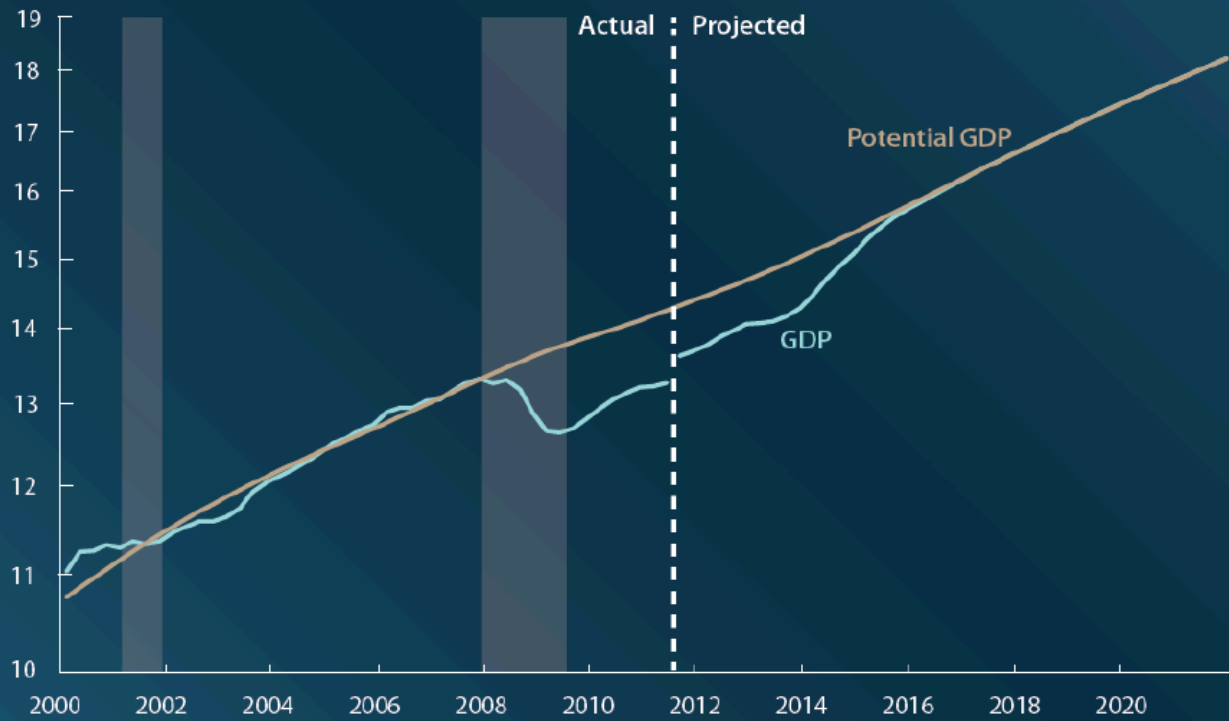
Real Gross Domestic Product



Real Gross Domestic Product

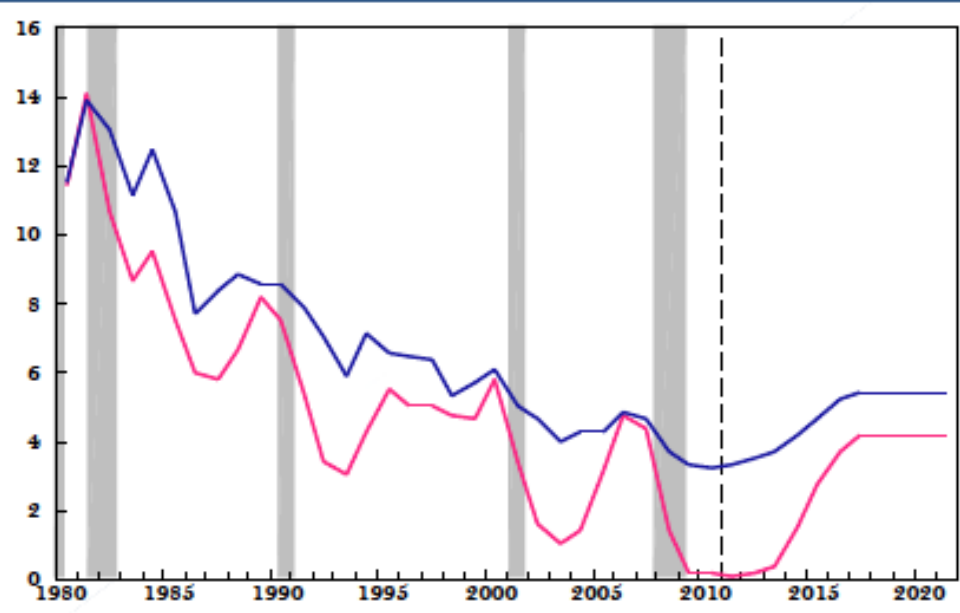
(Trillions of 2005 dollars, logarithmic scale)

CBO expects that the economic recovery will continue but that real (inflation-adjusted) GDP will stay below the economy's potential—a level that corresponds to a high rate of use of labor and capital—until 2017.



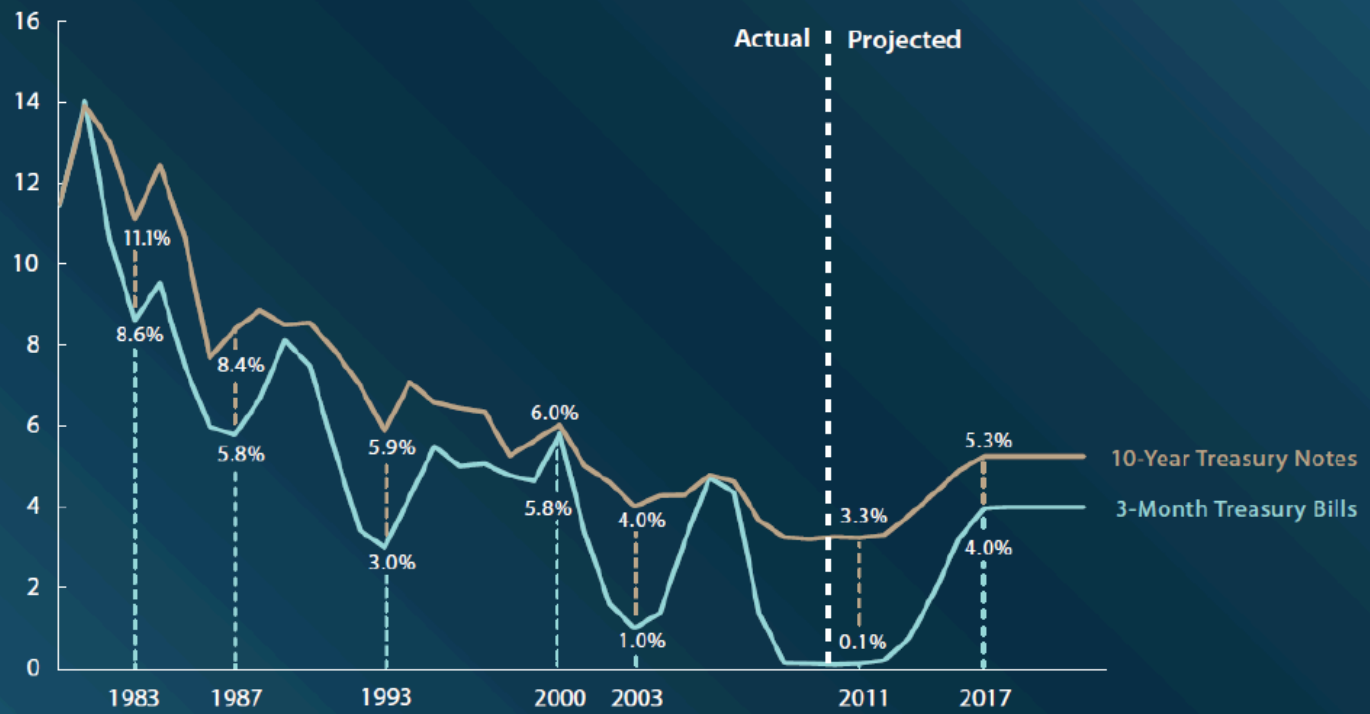
Sources: Congressional Budget Office; Department of Commerce, Bureau of Economic Analysis.
 Notes: Real gross domestic product is the output of the economy adjusted to remove the effects of inflation. Potential GDP is CBO's estimate of the output that the economy would produce with a high rate of use of its labor and capital resources. Data are quarterly. Actual data for GDP, which are plotted through the second quarter of 2011, incorporate the July 2011 revisions of the national income and product accounts. Projections of GDP, which are plotted through the fourth quarter of 2021, are based on data issued before the revisions. Shaded bars indicate periods of recession.

Interest Rates



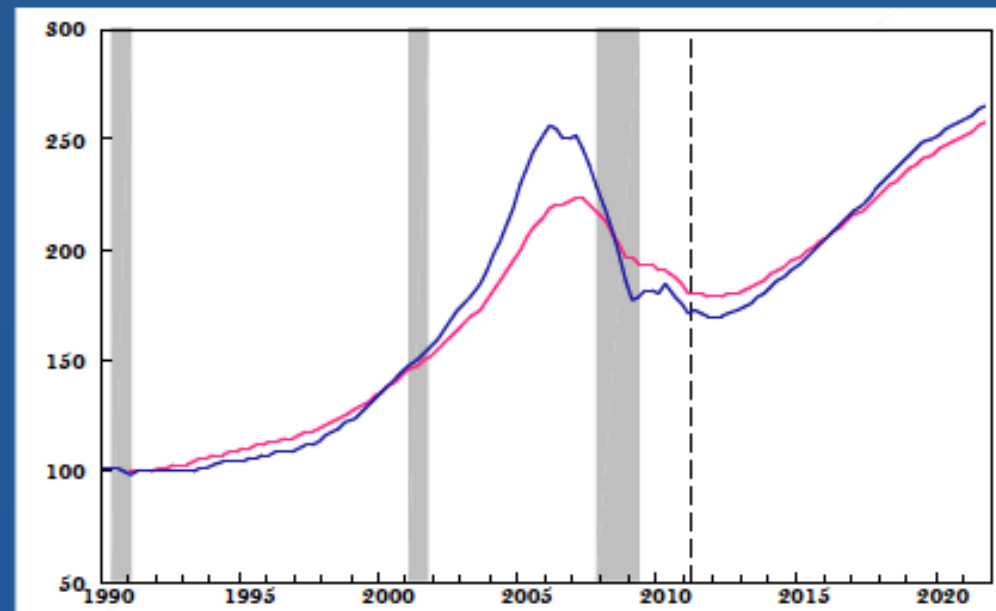
Interest Rates (Percent)

Consistent with its forecast of modest economic growth through 2013 under current law, CBO projects that interest rates will remain very low for the next few years and then rise to more-normal levels as output approaches its potential in 2017.



Sources: Congressional Budget Office; Federal Reserve.
Notes: Data are annual. Actual data are plotted through 2010; projections are plotted through 2021.

House Prices

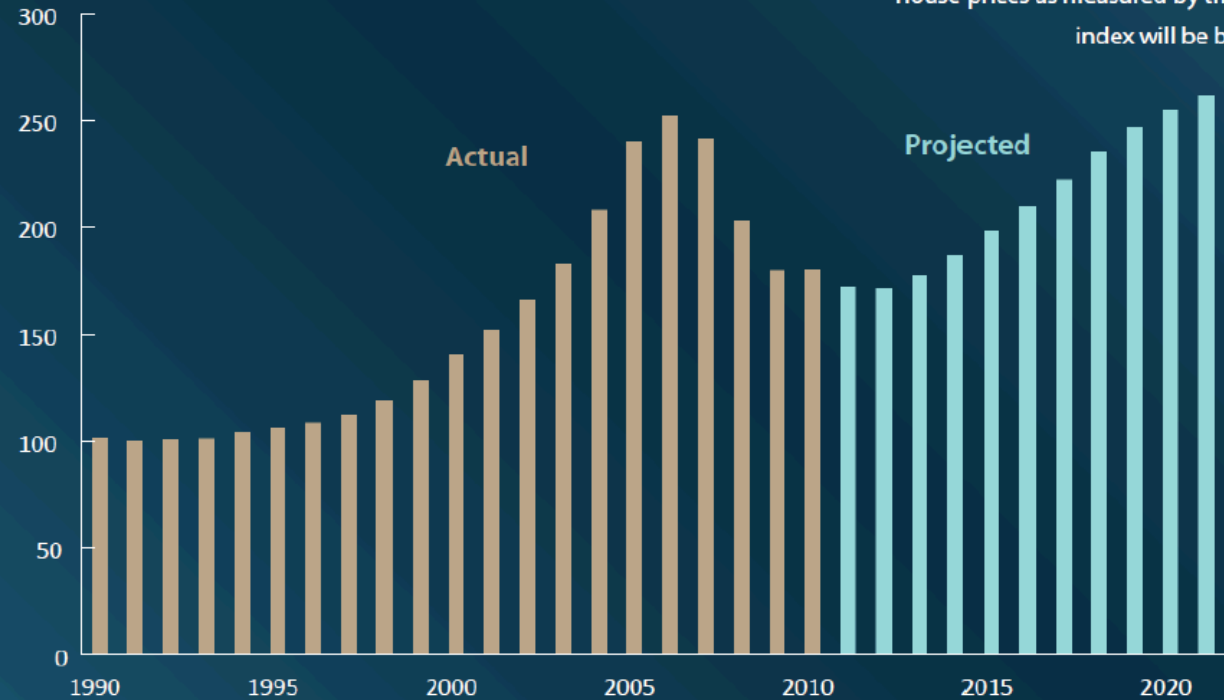


House Prices

(Index, 1991 = 100)

House prices are nearing the end of their decline, in CBO's estimation. But they probably will not begin a sustained increase until the second half of 2012, when

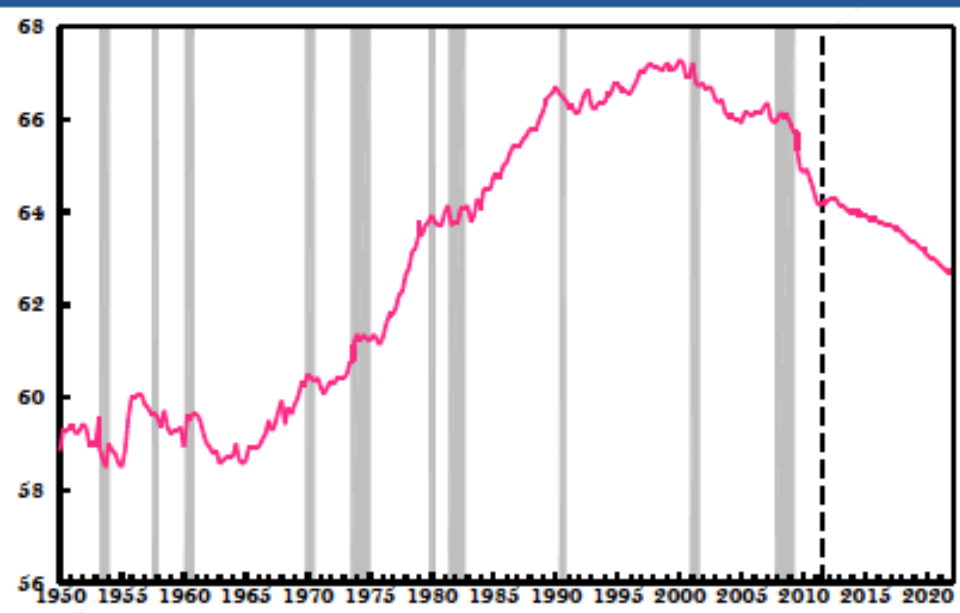
CBO expects there to be fewer foreclosures and distressed sales. CBO projects that by the end of 2013, house prices as measured by the S&P/Case-Shiller index will be back to 2003 levels.



Sources: Congressional Budget Office; Standard & Poor's (S&P) Financial Services.

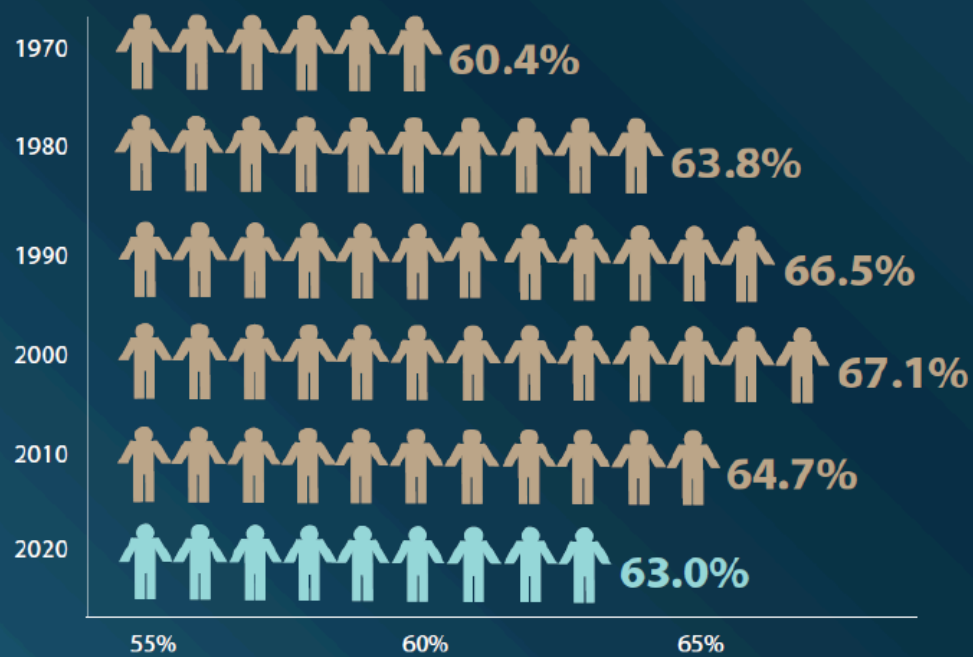
Notes: The S&P/Case-Shiller national home price index tracks the prices of home sales financed using mortgages purchased or securitized by Fannie Mae or Freddie Mac as well as sales financed with mortgages that do not conform to the size or credit criteria for purchase by Fannie Mae or Freddie Mac. Values shown are annual averages of quarterly data. Actual data are plotted through 2010; projections are plotted through 2021.

Labor Force Participation Rate



Labor Force Participation Rate (Percent)

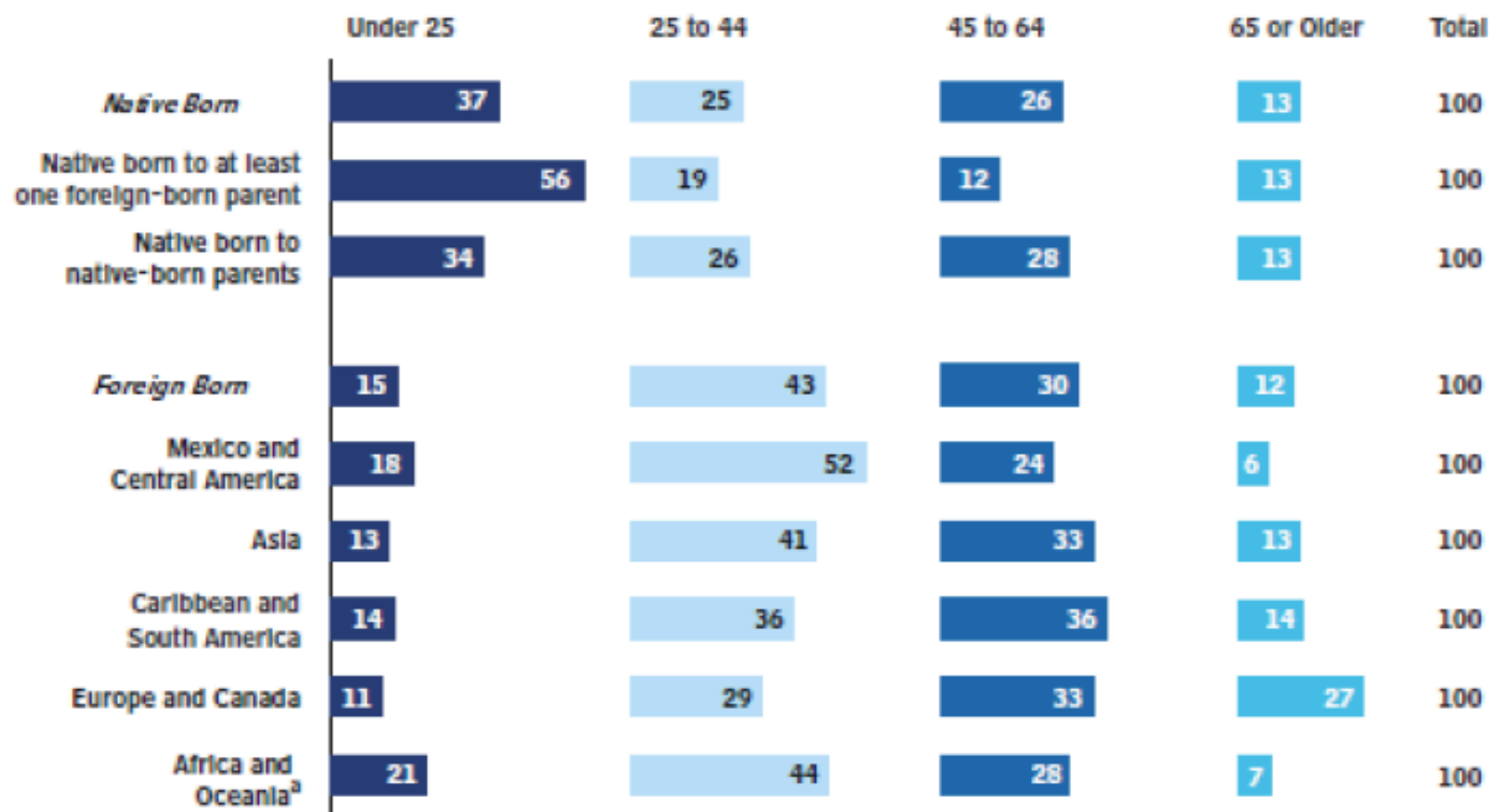
The labor force participation rate has fallen significantly in the past decade. Although economic recovery will increase the demand for labor, CBO expects that rate to continue to decline as the aging of the baby boomers and tax increases scheduled under current law prompt more people to leave the labor force.



Sources: Congressional Budget Office; Department of Labor, Bureau of Labor Statistics.
Notes: The labor force participation rate is the percentage of the civilian noninstitutionalized population age 16 or older that is either working or actively looking for work. Values are annual averages of quarterly data.

Exhibit 9.**U.S. Population, by Age and Birthplace, 2009**

(Percent)



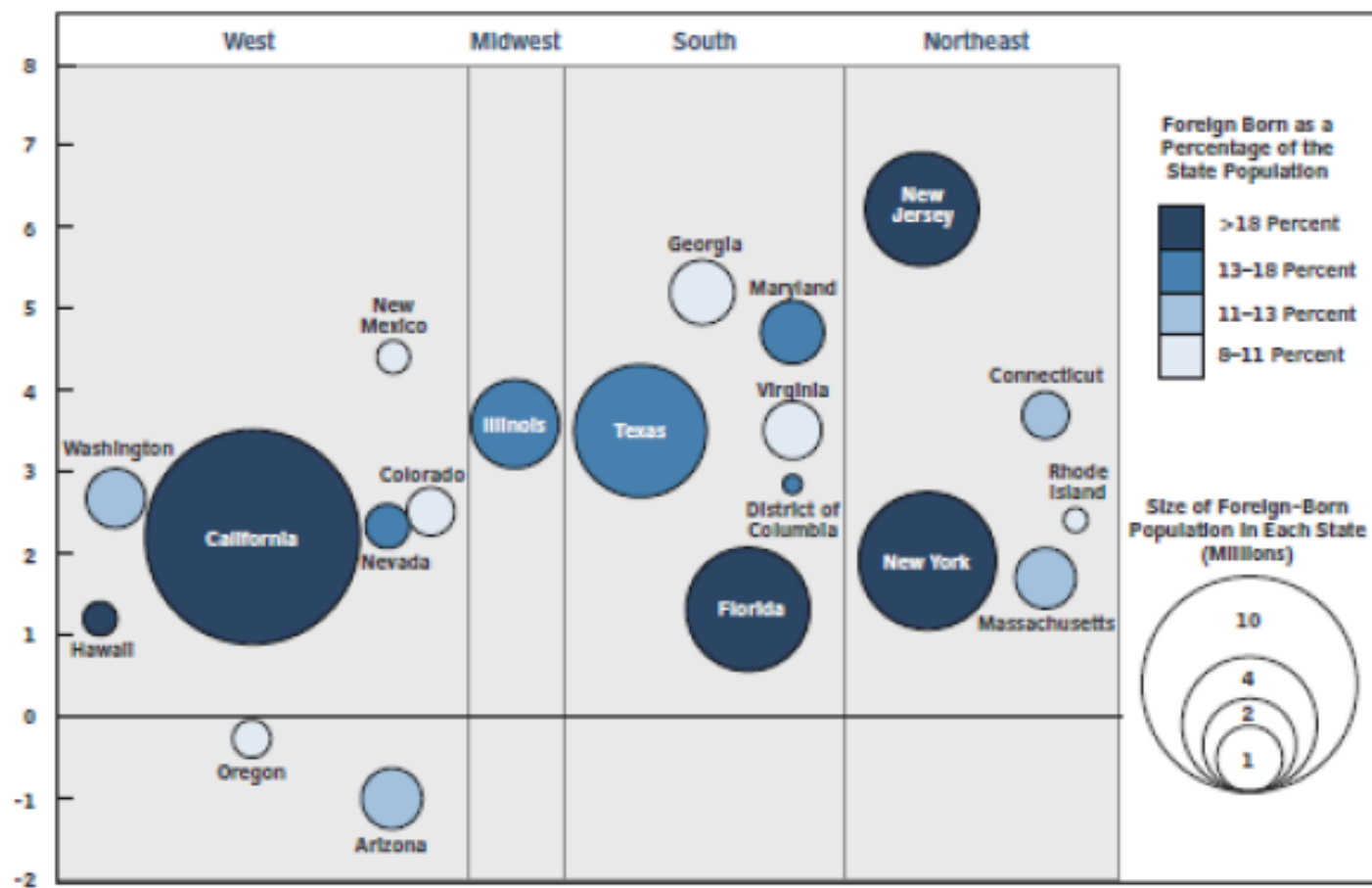
Source: Congressional Budget Office based on monthly data from Census Bureau, Current Population Survey, Outgoing Rotation Groups, 2009.

a. Includes Australia, New Zealand, and the Pacific Islands.

Exhibit 8.

Twenty States with the Highest Shares of Foreign-Born People, by Region, 2009

(Change in the percentage of foreign-born residents in the state population, 1999 to 2009)



Source: Congressional Budget Office based on monthly data from Census Bureau, Current Population Survey, Outgoing Rotation Groups, 1999 and 2009.

Note: The larger the circle, the greater the state's population in 2009. The higher the circle is on the scale, the more its foreign-born population increased (or the less it decreased) as a percentage of the state's total population from 1999 to 2009. The darker the circle, the greater the state's foreign-born population as a share of its total population in 2009.