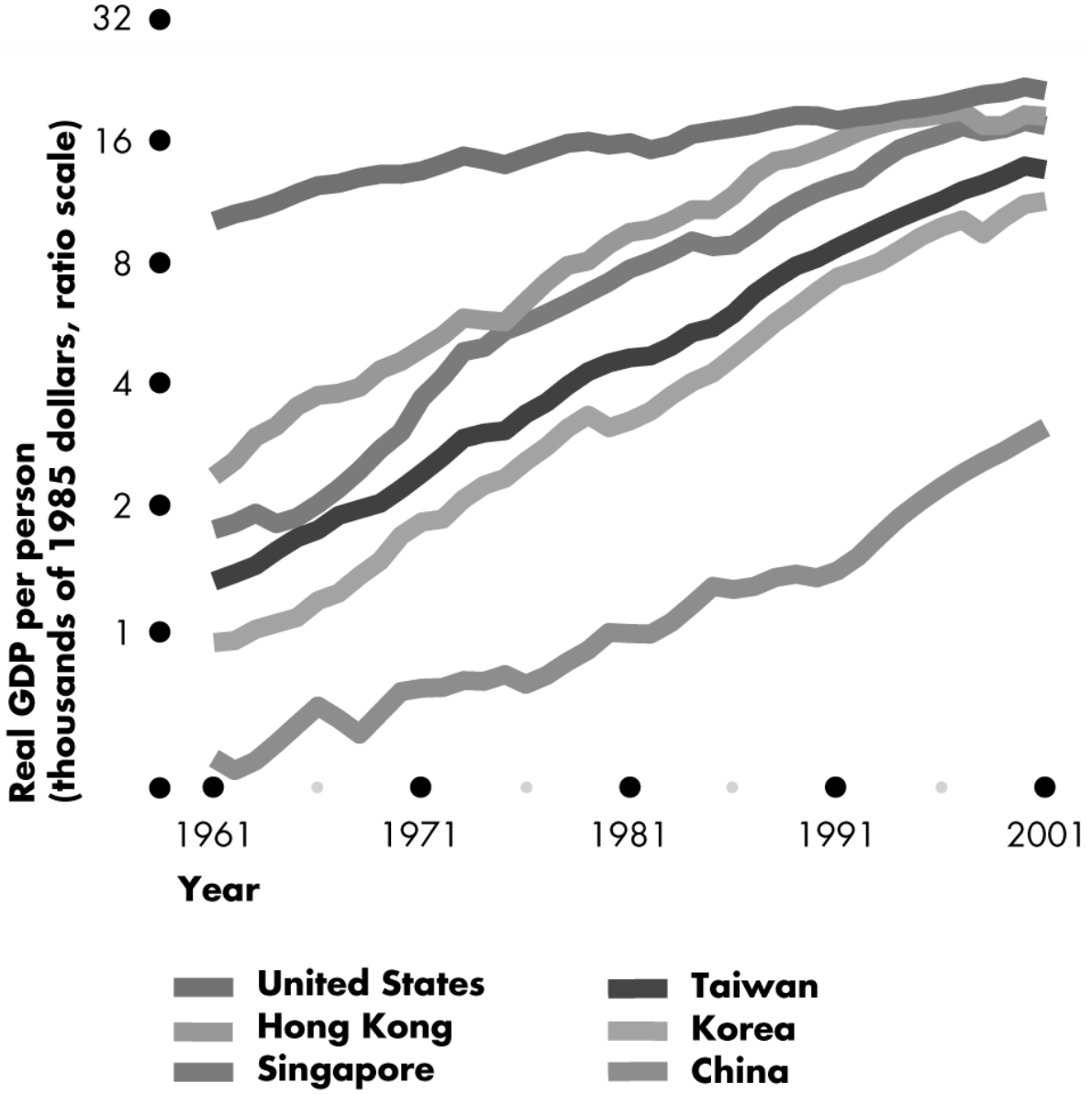
FIGURE 24.3 Catch-Up in Asia



ADDITIONAL CASE STUDY

8-1 More on the Convergence Hypothesis

The Solow growth model suggests that economies with similar rates of population growth and technological progress should exhibit similar levels of per-capita income in the long run, regardless of their initial capital stock. During the adjustment to steady state, countries with a lower capital stock will grow faster than those with higher capital stocks. This is known as the *convergence hypothesis*. Some recent theories of *endogenous growth*, by contrast, do not imply convergence. Rather, they suggest that there may be constant or increasing returns to capital and, hence, no tendency for convergence in per-capita income.

There is as yet no consensus on whether or not countries do exhibit convergence in per-capita income. Figure 1 shows a scatterplot of growth rates since 1960 against output per worker in 1960. The simple convergence hypothesis suggests that these variables should be negatively related: countries with higher GDP per person should grow more slowly. Such a relationship is not apparent in Figure 1, casting doubt on the convergence hypothesis. Results on convergence depend in part upon the sample of countries examined: there is much stronger evidence of convergence among those countries that are already relatively affluent (as can be seen by looking at the right half of Figure 1), and economists who have looked at this sample have generally concluded in favor of convergence.

Greg Mankiw, David Romer, and David Weil point out that the Solow model does not literally imply that all countries should converge to the same steady state, however, because of differences in saving rates and population growth rates. After correcting for these differences and also for differences in human capital, Mankiw, Romer, and Weil find that there is much stronger evidence of convergence, as can be seen from Figure 2.[1]

Figure 1

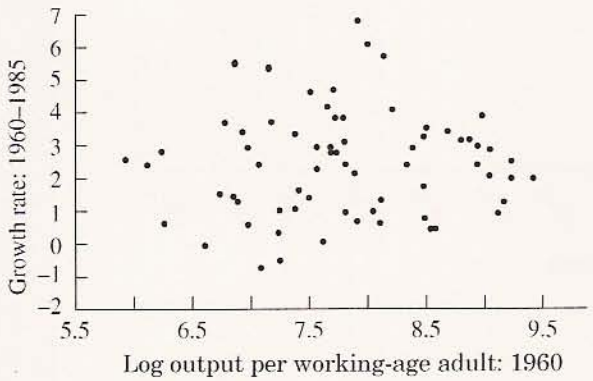
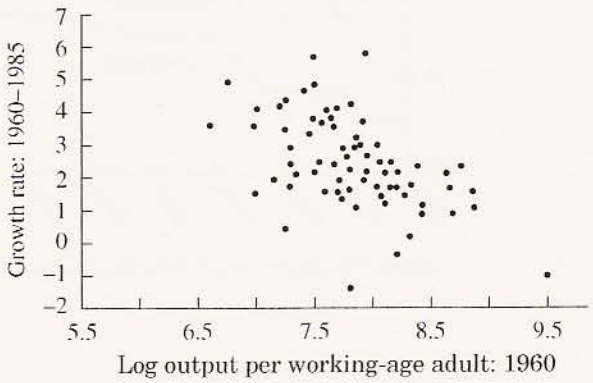


Figure 2



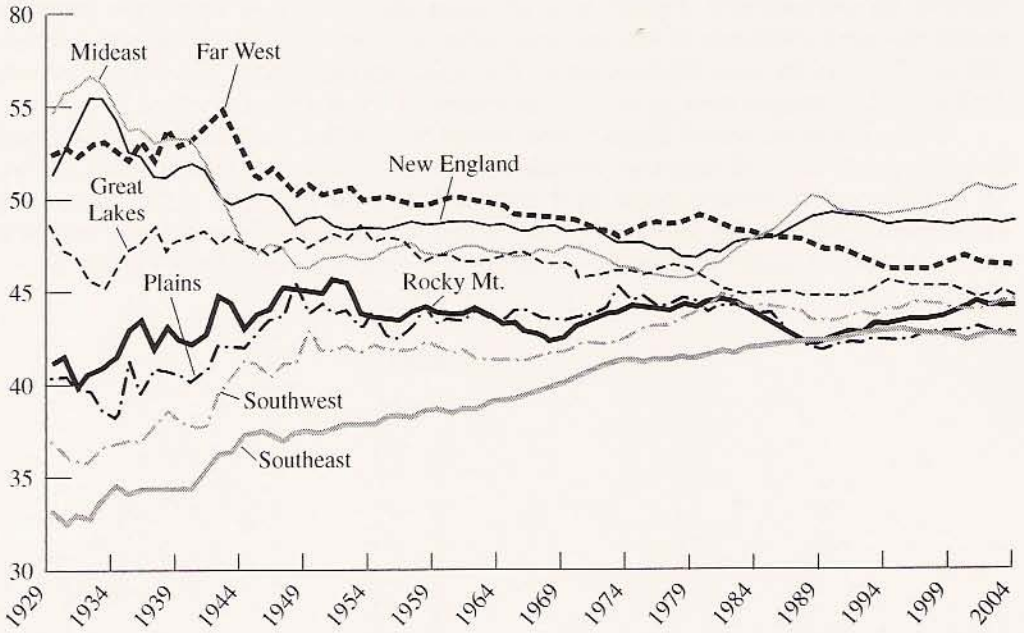
Source: Figures 1 and 2: G. Mankiw, D. Romer, and D. Weil, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics* 107, no. 2 (May 1992): 407–38.

[1] G. Mankiw, D. Romer, and D. Weil, "A Contribution to the Empirics of Economic Growth," *Quarterly Journal of Economics* 107, no. 2 (May 1992): 407–38. Mankiw, Romer, and Weil suggest that a production function such as $Y = (K \times L \times H)^{1/3}$, where H is human capital, might describe the U.S. economy. This can be rewritten as $Y = K^{1/3}(E \times L)^{2/3}$, where E measures the efficiency of labor and $E = (H/L)^{1/2}$.

8-2 Convergence of Income Across the United States

The Solow growth model predicts that economies with similar rates of saving, population growth, and technological progress should converge over time. Poor economies should catch up to rich economies and eventually have similar levels of per-capita income. As Figure 1 shows, regional differences in per-capita personal income across the United States have narrowed considerably since the Great Depression. In 1929, the mideast was the richest region, with income nearly 40 percent above the national average, while the southeast was the poorest region, with income just above 50 percent of the national average. By 2004, the gap between the richest and poorest regions had narrowed considerably, with New England in the top position at a little over 20 percent above the national average and the Southeast and Southwest tied in the bottom slot at 90 percent of the national average.

Figure 2 Per Capita Personal Income as a Percentage of U.S. Average By Region



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

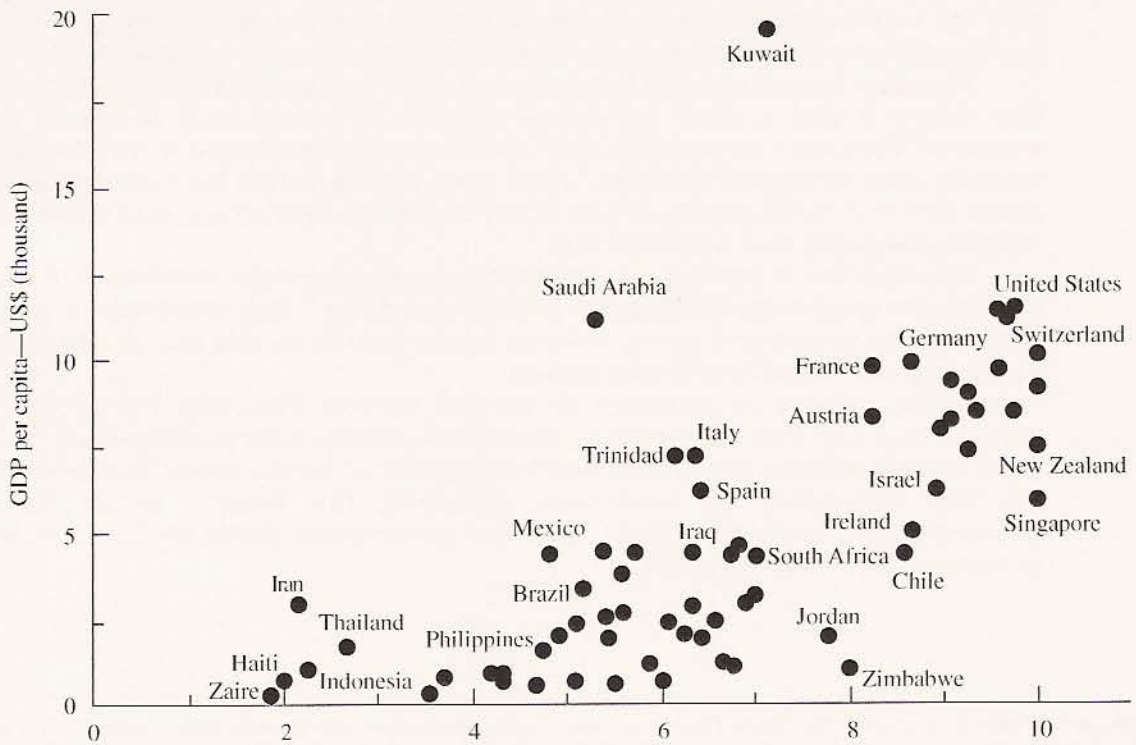
8-7 Corruption and Growth

The Solow model does quite a good job of explaining differences in living standards and growth rates among different countries. But it is not perfect, so many economists have sought additional explanations of the varying economic performance of different countries. Paolo Mauro has investigated the link between growth and the incidence of bureaucracy and corruption.[1]

Mauro uses data gathered by *Business International*, a private company that surveys analysts in many different countries about political, bureaucratic, and other factors that might influence the attractiveness of a country to investors. He combines assessments of the degree of red tape, the extent of corruption, and the integrity of the judicial system into a measure that he terms *bureaucratic efficiency* (BE). Countries such as the United States, Finland, Japan, New Zealand, and Singapore do well in terms of the BE index; countries like Egypt, Haiti, Indonesia, Nigeria, and Thailand do poorly.

Figure 1 is a scatterplot of BE and per-capita income in 67 countries. There is a clear positive association: countries with high levels of corruption and bureaucracy tend to have lower income. Of course, it might be the case that high-income countries develop better institutions. But Mauro's statistical analyses suggest that the link does indeed run the other way: more corrupt countries tend to be poorer and also tend to grow more slowly.

Figure 1 **Per-Capita Income and Bureaucratic Efficiency**



[1] P. Mauro, "Corruption and Growth," *The Quarterly Journal of Economics*, 105, 3 (August 1995), 688.

8-4 More on the New Economy

The step-up in economic growth during the last half of the 1990s has raised the question of whether these gains reflect a payoff from investment in computers and information technologies. To assess this question, a recent paper by Stephen Oliner and Daniel Sichel extends the growth-accounting framework presented in the textbook's appendix to this chapter.[1]

The authors take the contribution to output growth from capital accumulation and break it down into the contribution from information-technology capital (computers, software, and communications equipment) and the contribution from other forms of capital. They also separate the output contribution from multifactor productivity growth into a part arising in the computer (and computer-related semiconductor) industry and a part arising in the rest of the economy. Oliner and Sichel argue that the accumulation of information-technology capital reflects the increased *use* of computers, software, and related equipment in the production of output, while the gains in multifactor productivity for the information-technology industry reflect efficiency gains in *producing* information-technology goods.

Table 1 presents their findings. As shown, about two-thirds of the increase in the rate of output growth over the period 1996–1999 compared to the period 1991–1995 was due to either accumulation of information-technology capital or gains in multifactor productivity in computer-related industries of the economy.[2] Interestingly, multifactor productivity also surged in other sectors of the economy, perhaps in part due to indirect effects of reorganizing production to take advantage of new information technologies. The authors conclude that information technology has been an important determinant of the surge in economic growth during the last part of the 1990s and that the boost to growth from this source is likely to continue in the near future.[3]

Table 1 Contributions to Growth of Real Output in Nonfarm Business Sector, 1974–1999 (annual percentage change)

	1974–1990	1991–1995	1996–1999
Growth rate of output	3.06	2.75	4.82
Contribution from:			
Capital	1.35	1.01	1.85
Information-technology capital	0.49	0.57	1.10
Other capital	0.86	0.44	0.75
Labor hours and quality	1.38	1.26	1.81
Multifactor productivity	0.33	0.48	1.16
Multifactor productivity in computer sector plus computer-related semiconductor sector	0.17	0.23	0.49
Multifactor productivity in other sectors	0.16	0.25	0.67

Source: Tables 1 and 4 in Stephen D. Oliner and Daniel E. Sichel, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" *Journal of Economic Perspectives*, 14, no. 4 (Fall 2000).

[1] Stephen D. Oliner and Daniel E. Sichel, "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" *Journal of Economic Perspectives*, 14, no. 4, (Fall 2000): 3–22.

[2] The table reports growth for the nonfarm business sector of the economy. Results, however, would be similar if we considered overall GDP.

[3] One caveat to this finding is that the growth rate of the late 1990s may have exceeded the underlying trend rate of growth and so the long-run effects on growth may be smaller. See Robert J. Gordon, "Does the 'New Economy' Measure up to the Great Inventions of the Past," *Journal of Economic Perspectives*, 14, no. 4 (Fall 2000): 49–74.