Sustainable Prosperity in the New Economy?

Business Organization and High-Tech Employment in the United States

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1
What is New, and Permanent, about the "New Economy"?

THE END OF "THE ORGANIZATION MAN"

The Internet boom of the last half of the 1990s seemed to herald the arrival of a "New Economy" with its promise that, after the stagnation of the early 1990s, innovation in information and communication technologies (ICT) would regenerate economic prosperity. The sharp economic downturn in 2001–2002 called into question the New Economy's ability to deliver on this promise—and it even raised questions about whether there had really been anything "new" about the economy of the late 1990s after all. Perhaps the journalist John Cassidy (2002) was correct to title his book on the Internet boom *Dot.con: The Greatest Story Ever Sold*. If the New Economy was all smoke and mirrors, one would expect that, once the debris left behind by the storm of speculation and corruption had been cleared away, economic life would return to what it had been before the boom took place.

It is now clear that there was plenty of e-con in the New Economy. At the same time, however, there was something new, important, and permanent about the New Economy that transformed the economic lives of many from those they had led before. The core of that something new, important, and permanent is what I call the "New Economy business model" (NEBM), a mode of organizing business enterprises that has dramatically changed the ways in which, and terms on which, people in the United States are employed and, indeed, the way in which the U.S. economy operates.

NEBM emanated from Silicon Valley and spread to other regions of the United States. NEBM also affected employment relations in other areas of the world, especially Europe and Asia, as U.S.-based ICT companies extended their global reach and as high-tech companies based outside the United States sought to adopt elements of the new business model. With well-educated high-tech labor flowing into the United

States from abroad (especially from India and China) and with U.S.-based ICT companies offshoring various types of business activities to other countries (again especially to India and China), the ICT labor force had become vastly more globalized by the 2000s than it had been prior to the Internet revolution.

Although the Internet boom of the late 1990s made the New Economy a household phrase, the end of the boom did not result in the demise of NEBM. To the contrary, its characteristic features have become more widespread and entrenched in U.S. high-tech industries in the 2000s. With its start-up firms, vertical specialists, venture capital, and highly mobile labor, NEBM is a business model that remains dominant in the United States, and it is one that many national policymakers and corporate executives around the world seek to emulate.

At the same time, within the United States, it is a business model that has been associated with volatile stock markets, unequal incomes, and unstable employment, including the insecurity associated with the offshoring of high-skill jobs. If we define "sustainable prosperity" as a state of economic affairs in which growth results in stable employment and an equitable distribution of income, then U.S. economic prosperity would appear to be unsustainable. There is a need to understand the organizational and industrial dynamics of NEBM to determine how the tapping of its innovative capability might be rendered compatible with more socially desirable outcomes.

The "Old Economy business model" (OEBM) that dominated the U.S. corporate economy in the decades after World War II and into the 1980s offered employment that was far more stable and earnings that were far more equitable than employment and earnings in the NEBM era. The sociological foundation of OEBM was "the organization man." Popularized in the United States in the 1950s (Whyte 1956), the stereotypical organization man was a white, Anglo-Saxon, Protestant male who had obtained a college education right after high school, secured a well-paying job with an established company early in his career, and then worked his way up and around the corporate hierarchy over three or four decades of employment, with a substantial defined-benefit pension, complemented by highly subsidized medical coverage, awaiting him on retirement.[1] The employment stability offered by an established corporation was highly valued, while interfirm labor mobility was shunned.

The organization man could trace his origins back to the early decades of the twentieth century, and in the immediate post–World War II decades he was ubiquitous in the offices of U.S. corporate enterprises. Somewhat ironically, when formidable Japanese competitors confronted U.S.-based Old Economy companies in the 1980s, many U.S. observers of Japan's "lifetime employment" system viewed it as a mode of organization that was quite alien to the American way of life. During the first half of twentieth century, however, U.S. corporations had transformed the salaried professional, technical, and administrative employees who peopled the managerial structure into organization men. By the 1950s and 1960s, moreover, even unionized production workers, ostensibly paid on an "hourly" rather than salaried basis, found that collective bargaining protected their positions of seniority, so that they too experienced, and in a growing economy came to expect, lifetime employment as well as defined-benefit pensions and comprehensive health benefits, just like the salaried managers of the companies for which they worked.

From this historical perspective, NEBM can best be described as "the end of the organization man." It is not that New Economy companies have ceased to build complex and durable organizations. To attain and sustain competitive advantage, companies such as Intel, Microsoft, and Cisco—the blue-chip enterprises of the New Economy—need to integrate the labor services of tens of thousands of individuals who participate in complex hierarchical and functional divisions of labor. In an innovative enterprise, the role of an integrated division of labor is to develop and utilize new technologies. Indeed, one might argue that, given heightened technological complexity and intensified market competition in the ICT world of "open systems," the building of unique organizational capabilities has become more, not less, critical to the success of the enterprise (Lazonick 2008a).

Nor is it necessarily the case that employees who spend their entire careers with one company have become an endangered species. The leading industrial corporations still have low levels of employee turnover. Rather, what is new is the lack of a *commitment*, explicit or implicit, on the part of U.S. high-tech companies to provide their employees with stable employment, skill formation, and rewarding careers. When an employee begins to work for a company in the New Economy, he or she has no expectation of a career with that particular enterprise.

Nor does a person with high-tech capabilities necessarily want to work for one company for years and decades on end. Interfirm labor mobility can bring benefits to an employee, including working for a smaller company, choice of geographical location, a significant increase in salary, access to employee stock options, and new learning experiences. The NEBM represents dramatically diminished organizational commitment on both sides of the employment relation as compared with its Old Economy predecessor.

A corollary of this diminution in organizational commitment under NEBM has been an increased globalization of the types of labor that U.S.-based ICT firms employ. This globalization of labor has occurred through the offshoring of high-tech work and the international mobility of high-tech labor, neither of which is a new phenomenon, but both of which have intensified over the past decade or so. The employment relations of major U.S.-based ICT companies have become thoroughly globalized, based on corporate strategies that benefit from not only lower wages but also the enhancement of ICT skill levels in non-U.S. locations, especially in Asia.

While the extent of these impacts of NEBM on high-tech employment has become evident only since the last half of the 1990s, NEBM itself has taken a half-century to unfold. Indeed, its origins can be found in the mid-1950s, at precisely the time when the Old Economy industrial corporation was at the pinnacle of its power. The evolution of NEBM was integral to the microelectronics revolution. The development of computer chips since the late 1950s provided the technological foundation for the microcomputer revolution beginning in the late 1970s, which in turn created the technological infrastructure for the commercialization of the Internet in the 1990s. Although the U.S. government and the research laboratories of established Old Economy corporations played major, and indeed indispensable, roles in supporting these developments, each wave of innovation generated opportunities for the emergence of start-up companies that were to become central to the commercialization of the new technologies.

The regional concentration of these new ventures in what would become known by the beginning of the 1970s as Silicon Valley reinforced the emergence of a distinctive business model. From the late 1960s, venture capitalists backed so many high-tech start-ups in the vicinity of Stanford University that they created a whole new industry for fostering the growth of young technology firms. These start-ups lured "talent" from established companies by offering them compensation in the form of stock options, typically as a partial substitute for salaries, with the potential payoff being the high market value of the stock after an initial public offering (IPO) or the private sale of the young firm to an established corporation.

As these young companies grew, annual grants of stock options to a broad base of potentially highly mobile people became an important tool for retaining existing employees as well as attracting new ones. The subsequent growth of these companies occurred, moreover, not only by investing more capital in new facilities and hiring more people but also by acquiring even newer high-tech companies, almost invariably using their own stock rather than cash as the acquisition currency. In addition, wherever and whenever possible, ICT companies were system integrators that designed, tested, and marketed final products, while outsourcing the manufacture of components so that they could focus on higher value-added work. This outsourcing strategy became both more economical and more efficient over time as specialized contract manufacturers developed their capabilities, including their global organizations and highly automated production processes, for a larger extent of the market.

These features of the new ICT business model were already evident to industry observers in the late 1980s. It was only in the Internet boom of the last half of the 1990s, however, that this business model had a sufficient impact on new firm formation, product market competition, interfirm labor mobility, and productivity to give popular definition to a New Economy. In this book, I document the evolution of NEBM over the past half-century as a foundation for understanding the origins of the globalization of high-tech employment in the 2000s and its implications for high-tech employment opportunities in the United States.

NEBM has definitively replaced OEBM as the dominant mode of business organization in the ICT industries of the United States. NEBM has been, and continues to be, an important engine of innovation in the U.S. economy, and hence an important source of economic growth. The performance of an economy, however, is not measured by growth alone. Economists give high marks to an economy that not only generates growth but does so in a way that provides stable employment and an equitable income distribution—what I call "sustainable prosperity."

Yet over the past decade or so, NEBM has been an engine of innovation that, as I show in this book, has contributed to instability and inequity. ICT continues to help make the United States the richest economy in the world, in terms of both absolute and per capita income. The increased dominance of NEBM in the organization of the ICT industries, however, has meant increasingly insecure employment and incomes for most workers in this sector, and it has become an important factor in the trend toward greater employment instability and income inequality in the U.S. economy as a whole.

Following the Internet boom and bust, what has been particularly novel about the employment situation of the 2000s thus far is the extent to which this insecurity has afflicted highly educated and experienced members of the U.S. ICT labor force, as their former employers prefer to hire younger high-tech workers in the United States. At the same time, companies are also offshoring to lower-wage locations the types of high-skill jobs that Americans had thought could never be done abroad. In terms of their education and qualifications, the U.S. high-tech workers who suffer employment insecurity under NEBM are the types of people who in another era would have been the prototypical organization men, although they are no longer so uniformly white, Anglo-Saxon, Protestant, or male, as the organization men of the 1950s were apt to be. The public outcry against the "export of American jobs" in this first decade of the twenty-first century in effect laments the demise of the organization man.

In this book I explain the origins of this new era of employment insecurity and income inequality, and I consider what governments, businesses, and individuals can do about it. I ask whether the United States can refashion its high-tech business model to generate stable and equitable economic growth. Across the globe, government policymakers and corporate executives generally view the U.S. business model, with its innovative power, as one that, if only it could be implemented in their own nations and regions, would make their countries and communities big and strong. If the U.S. economy, including the business model that dominates the way in which it allocates resources, is to serve as an exemplar for the rest of the world, it is incumbent upon those of us who analyze its operation and seek to influence its performance to understand why it is failing to contribute to stable and equitable economic growth in the United States and what can be done to improve this record.

This book represents a step in my own quest to understand the institutional and organizational conditions under which an advanced economy—not only the U.S. economy—can achieve sustainable prosperity. Analogously, although I focus on the origins, operation, and impact of the dominant ICT industries, my interest is not in the operation and performance of the ICT sector per se. Rather, I have studied the ICT industries closely because they have been at the core of the innovative capability of the U.S. economy over much of the past century, especially over the past few decades. In order to grow, the economy needs innovation, which I define in economic terms as the generation of higher-quality, lower-cost goods and services than were previously available at prevailing factor prices. Innovation does not, however, necessarily result in sustainable prosperity. In this book I ask what types of national institutions and business organizations support the innovation process, and what are the implications of this national innovation system for employment stability and income equality in the economy as a whole.

INNOVATION AND GROWTH IN THE U.S. ECONOMY

The United States is the world's largest economy, with a gross domestic product (GDP) per capita that surpasses those of all other developed nations. Table 1.1 shows the growth of real GDP per capita from 1950 to 2006 (in 1990 international dollars) in the United States and other large advanced economies, some smaller advanced economies, and some of the most rapidly growing developing economies. These data show varying rates of change in GDP per capita, which suggests that the nation still matters as a unit of analysis for economic growth even in a globalized era (Lazonick 2007a).

The most dramatic success story of the last half of the twentieth century is that of Japan, which emerged from a state of devastation after World War II to become, in terms of total GDP, the second largest advanced economy by 1970 (see Maddison 2007). Japan became rich by transferring technology from abroad, primarily from the United States, and then developing and utilizing that technology to generate

Table 1.1 Real GDP per Capita in Selected Nations Compared with the United States, 1950–2006

	Real GDP[a]						
	1950	1960	1970	1980	1990	2000	2006
United States	$9,561	$11,328	$15,030	$18,577	$23,201	$28,403	$30,983
United States (298.4)[b]	100	100	100	100	100	100	100
Japan (127.5)	20	35	65	72	81	73	73
Canada (33.1)	76	77	80	87	81	79	80
France (61.7)	55	67	78	81	78	74	72
Germany (82.7)	41	68	72	76	69	67	65
Italy (58.1)	37	52	65	71	70	66	63
United Kingdom (60.6)	73	76	72	70	71	71	74
Finland (5.2)	44	55	64	70	73	70	75
Netherlands (16.5)	63	73	80	79	74	78	75
Norway (4.6)	57	64	67	81	80	88	90
Sweden (9.0)	70	77	85	80	76	72	77
Switzerland (7.5)	95	110	112	101	93	79	76
South Korea (48.8)	9	11	14	22	38	50	58
Taiwan (23.0)	10	13	20	32	43	60	64
China (1,310.8)	5	6	5	6	8	12	21
India (1,095.4)	6	7	6	5	6	7	8

[a] 1990 International Geary-Khamis dollars.

[b] 2006 population (in millions) in parentheses; United States = 100, for any year.

SOURCE: Maddison (2007); Conference Board (2008).

higher-quality, lower-cost products than the United States was capable of producing. What is remarkable about Japan's success is that, through innovation, it ultimately gained competitive advantage over the United States in the 1970s and 1980s in industries (such as mass-produced automobiles, consumer electronics, machine tools, steel, and semiconductors) in which the United States had reigned supreme in the 1950s and 1960s. Although low wages and long work hours (along with the oil crisis and the consequent demand for small, fuel-efficient cars) helped Japan capture U.S. markets in the 1970s, the proof that Japan had developed a highly innovative economy was its ability to extend its competitive advantage in the late 1970s and 1980s even as its wage rates rose substantially (as reflected in the GDP per capita figures in Table 1.1). Indeed, in the mid-1990s, the Japanese even began to work fewer hours per year on average than Americans (International Labour Organization 1999).

Since the 1980s, the Japanese challenge to U.S. dominance in high-technology and capital-intensive industries has been repeated by a number of other Asian economies, most notably South Korea, Taiwan, and China. In labor-intensive information-technology services, India has become a formidable competitor over the past decade as well. Critical to the development of these economies has been not only the transfer of technology from the United States but also, to an extent that was never the case for Japan, the development of the productive capabilities of nationals through graduate education and work experience in the United States—a phenomenon that I explore in considerable depth in this book.

While many of the Asian economies have been catching up, the United States remains a highly innovative economy in the 2000s. Real GDP per capita grew by an annual average of 3.04 percent in the 1960s, 2.18 percent in the 1970s, 2.10 percent in the 1980s, 1.86 percent in the 1990s, and 1.49 percent in the 2000s. Whatever problems there may be with the U.S. economy in the 2000s, they are not problems that, averaged over the whole population, result from a lack of productive power. At the same time, the United States has experienced a long-term trend toward a slower rate of increase in real GDP per capita alongside growing international competition from nations such as China and India that have developed enormous innovative capabilities but still have far lower wages than those that prevail in the United States. These changes may exacerbate tendencies to instability and inequity in the U.S. economy, thus making sustainable prosperity more difficult to attain.

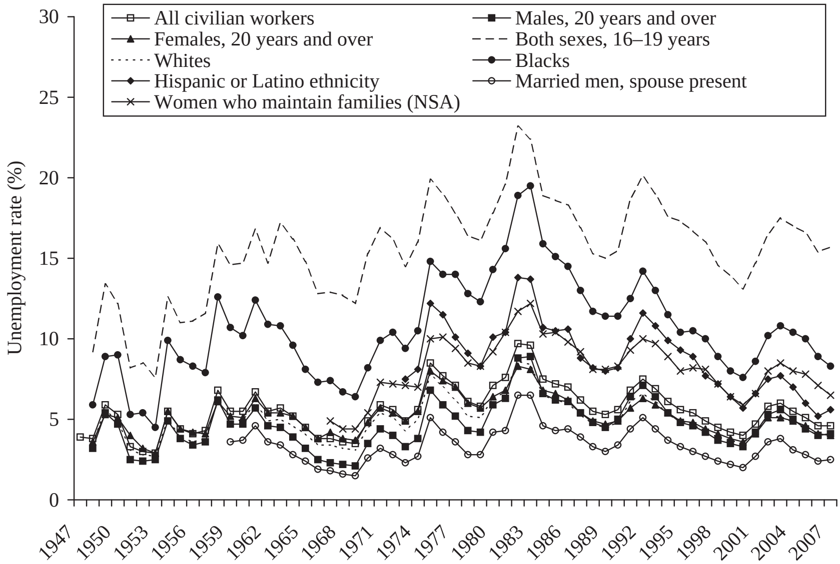
Instability

From 1930 through 1941, the U.S. unemployment rate averaged about 17.4 percent, ranging from 8.9 percent in 1930 to 25.2 percent in 1933 (U.S. Bureau of the Census 1976, p. 126). It took the United States' entry into World War II to get the nation out of the Great Depression. After the war, Congress passed the Employment Act of 1946, which placed the federal government under obligation to pursue economic policies to secure conditions of full employment for American citizens. Since then, the civilian unemployment rate has not reached double digits, although it went as high as 9.7 percent in 1982 and 9.6 percent in 1983. As shown in Figure 1.1, the unemployment rate averaged 4.5 percent in the 1950s, 4.8 percent in the 1960s, 6.2 percent in 1970s, 7.3 percent in the 1980s, 5.6 percent in the 1990s, and 5.0 percent in the 2000s (through 2007).

Although government intervention has apparently eradicated the possibility of another Great Depression, the rate at which Americans can find employment is still far from stable over time, both within and across decades, as shown in Figure 1.1. Blacks and Hispanics experience much higher unemployment rates than whites, and in 1983 the black unemployment rate was at a Depression-level 19.5 percent. Moreover, as can also be seen in Figure 1.1, married men with spouses present, who as a group have among the lowest unemployment rates, also experience substantial fluctuations over time in the rate at which they are employed.

In the era of the organization man, lengthy tenure with one company became the foundation of employment security in the United States. In a recent survey of changes in job security, Henry Farber (2008, p. 1) stated that "there is ample evidence that long-term employment [with one company] is on the decline in the United States." Using Current Population Survey data for 1973–2006, Farber (p. 27) showed that, in the 1990s and 2000s, members of the U.S. labor force experienced shortened job tenure, with the impact being most pronounced for males. Moreover, education and experience are no longer the guarantors of employment security that they once were. Using Displaced Worker Sur-

Figure 1.1 U.S. Unemployment Rates, Percent of the Relevant Labor Force, 1947–2007



NOTE: Until 1972 the black unemployment rate included other races. NSA means not seasonally adjusted. The average annual unemployment rates for the U.S. civilian labor force were as follows: 1950s, 4.5 percent; 1960s, 4.8 percent; 1970s, 6.2 percent; 1980s, 7.3 percent; 1990s, 5.8 percent; 2000–2007, 5.0 percent.

SOURCE: U.S. Congress (2009, table B-42); U.S. Bureau of the Census (1976, p. 135).

vey data to analyze rates of job loss, Farber (p. 35) found that those with college educations had job loss rates 22 percent lower than those with high school educations in the 1980s, but only 12 percent lower in the 2000s. He also found that workers aged 45–54 had job loss rates 19 percent higher than workers aged 20–24 in the 1980s, whereas the job loss rates of the older age group were 58 percent higher than those of the younger age group in the 2000s.

If employment incomes have become more unstable over the course of one’s career, so too have the financial returns on accumulated wealth. Large numbers of Americans have substantial wealth invested in the stock market, not only in direct holdings but also indirectly through their investments in mutual funds, pensions, and insurance policies.

In 1999 holdings of corporate equities in the U.S. economy were at a record 211 percent of GDP, about 3.5 times the percentage in 1990, and holdings of corporate equities per capita were at a peak of $86,994 in 2007 dollars (Board of Governors of the Federal Reserve System 2008, table L213). In 2007, holdings of corporate equities per capita were 41 percent higher in real terms than they had been in 1996, at the onset of the Internet boom.

In 1945 households directly held 93 percent of the value of corporate equities in the U.S. economy; by 2007 it was only 25 percent. Nevertheless, in 2007, on a per capita basis, the direct holdings of households in 2007 dollars were more than 88 percent greater than in 1945. Pensions (private and government) held only 6 percent of corporate equities in 1965, but they held 28 percent in 1985. Although this share stood at 23 percent in 2007, a steadily increasing proportion of savings has poured into mutual funds, which represented only 5 percent of corporate stockholdings in 1985 but 26 percent in 2007. The growth of mutual funds reflected the shift from defined-benefit to defined-contribution pensions and the trend toward the management of defined-contribution pensions through individual retirement accounts (IRAs; see Chapter 4). The mutual fund share of IRA assets grew from 17 percent in 1985 to 49 percent in 1999. In 1999, mutual funds absorbed 30 percent of defined-contribution assets but only 6 percent of defined-benefit assets, and they were heavily invested in equities (Engen and Lehnert 2000, pp. 802–803).

Stock market returns are very unstable, not only from year to year but also from decade to decade, as shown in Table 1.2 (which does not include the negative results for 2008). The extraordinarily high price yields in the 1980s and 1990s lured Americans into thinking that investments in the stock market could give them long-run financial security. High price yields may reflect real productivity gains made by innovative enterprises (as was indeed partly the case in those decades), but they may also reflect a high volume of speculative stock trading that imparts instability to the stock market. Furthermore, when innovation and speculation do not sustain increases in stock prices, corporate executives, encouraged by Wall Street, may seek to do so through manipulation. Hence, as I show in Chapter 6, with stock markets sluggish in the 2000s, U.S. companies, including leading high-tech enterprises, have turned to large-scale stock repurchases to boost their stock prices, thus

Table 1.2 Average Annual U.S. Corporate Stock and Bond Yields (%), 1960–2007

	1960–69	1970–79	1980–89	1990–99	2000–07
Real stock yield	6.63	−1.66	11.67	15.01	0.96
Price yield	5.80	1.35	12.91	15.54	2.09
Dividend yield	3.19	4.08	4.32	2.47	1.64
Change in CPI[a]	2.36	7.09	5.55	3.00	2.78
Real bond yield	2.65	1.14	5.79	4.72	3.34

NOTE: Stock yields are for Standard and Poor's composite index of 500 U.S. corporate stocks. Bond yields are for Moody's AAA-rated U.S. corporate bonds.

[a] Consumer price index.

SOURCE: Updated from Lazonick and O'Sullivan (2000a) using U.S. Congress (2009, tables B-62, B-3, B-95, and B-96).

redistributing income to shareholders from other stakeholders in the corporate economy. Yet I shall argue that, even for shareholders, stock-price appreciation based on stock repurchases is not sustainable over the long run.[2]

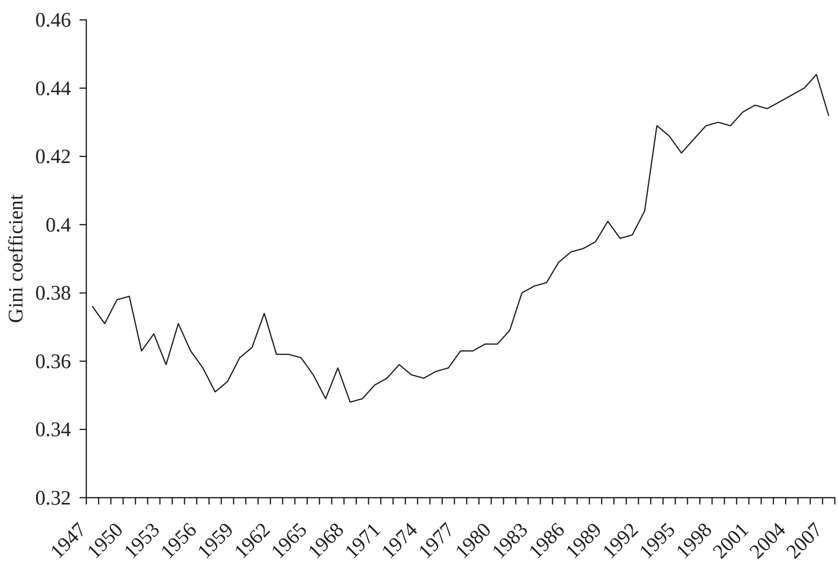
Inequity

A key characteristic of OEBM was the separation of asset ownership from managerial control over the allocation of corporate resources (Lazonick 1990, 1991). The salaries of those at the top of the corporate hierarchy were regulated much less by an external labor market for top executives than by the internal salary structure of the managerial organizations over which they presided. Managerial personnel, who generally had college educations, could look forward to promotion within the company over the course of their careers. When they retired, they would receive a guaranteed stream of income from a defined-benefit pension plan that rewarded years of service. Clerical and production workers, who generally had high school educations, could also look forward to spending their whole working lives with the same company, notwithstanding the fact that they were deemed to be "hourly" rather than "salaried" employees.

Research on the distribution of income in the United States has shown that there was a movement toward more equality in the immediate post–World War II decades that came to a halt in the mid-1970s. A marked trend to more income inequality started with the recessionary years of the early 1980s and has continued to the present (see Autor, Katz, and Kearney 2008; Bradbury 1996; Danziger and Gottschalk 1995; Goldin and Katz 2008; Jones and Weinberg 2000; Levy and Murnane 1992; Moss 2002; Piketty and Saez 2003, 2006; Pryor 2007; Saez 2005). These movements can be seen in Figure 1.2, which charts the Gini coefficient for households from 1947 to 2007. The Gini coefficient is a measure of the amount of income inequality. The higher the Gini coefficient, the greater the extent of income inequality across households—the coefficient would be 0.0 if all households had the same income and 1.0 if one family had all the income and the remaining families had no income. An improvement in income equality is discernible until the mid-1970s, after which it became much worse.

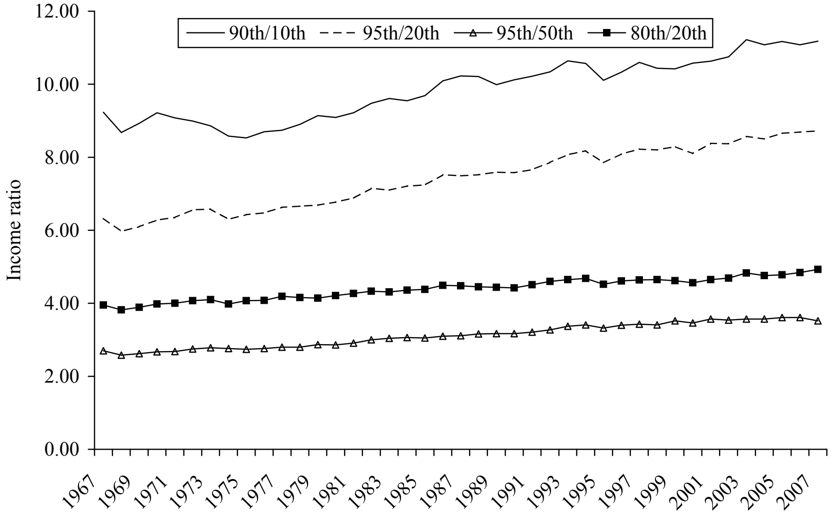
A worsening in the distribution of income among households after the mid-1970s is also evident in Figure 1.3, which shows that the household income ratios of various higher to lower percentiles in the U.S. household income distribution have all trended upwards, with the

Figure 1.2 Gini Coefficient for All U.S. Families, 1947–2007



SOURCE: Table F-4 in U.S. Census Bureau (2009).

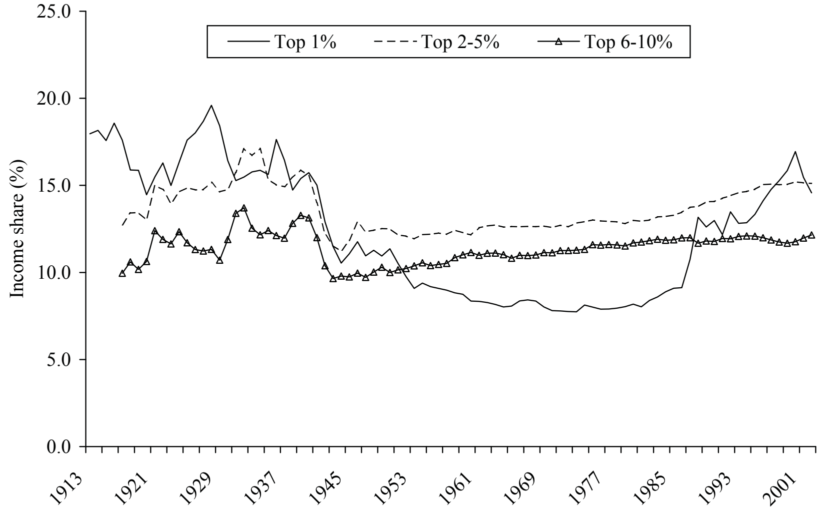
Figure 1.3 Changes in the Relative Incomes of Selected Income Percentiles in the U.S. Distribution of Income, 1967–2007



SOURCE: DeNavas-Walt, Proctor, and Smith (2008).

most marked upward trend occurring among the more extreme ratios (90th/10th and 95th/20th). Figure 1.4, based on data collected by Piketty and Saez (2006), shows that the top 1 percent of the income distribution gained a dramatically larger share of total income since 1985. The next 4 percent (top 2–5 percent in Figure 1.4) have also increased their share since the early 1980s. In 2004, 37 percent of all corporate equities were held by the wealthiest 1 percent of households and 80 percent by the top 20 percent in the wealth distribution (Allegretto 2006). And, as we shall see, many if not most of the ongoing increases in top executive pay have come from stock options as a mode of remuneration. If the increased reliance of households, governments, and corporations on the stock market has made the U.S. economy more unstable, the distribution of returns from the stock market has made the U.S. economy much more unequal.

Figure 1.4 Shares of the Top Income Earners of the Total U.S. Income, 1913–2002



SOURCE: Piketty and Saez (2006, p. 201). Excel file available at http://elsa.berkeley.edu/~saez/ (accessed June 29, 2009).

ICT INDUSTRIES

What is a business model, and how do OEBM and NEBM differ? We can define a business enterprise by the product markets for which it competes and the ways in which it mobilizes capital and labor to compete for those markets (for an elaboration, see Lazonick 2007b). Hence, as shown in Table 1.3, a business model can be characterized by three components: 1) its *strategy*, the types of product markets for which a company competes and the types of production processes through which it generates goods and services for these markets; 2) its *finance*, the ways in which it funds investments in processes and products until they can generate financial returns; and 3) its *organization*, the ways in which it elicits skill and effort from its labor force to add value to these investments.

The evolution of NEBM has been intimately related to the development of the ICT industries in the United States. The U.S. Department

Table 1.3 Old Economy Business Model (OEBM) and New Economy Business Model (NEBM) in ICT Industries

	OEBM	NEBM
Strategy, product	Growth by building on internal capabilities; expansion into new product markets based on related technologies; geographic expansion to access national product markets.	New firm entry into specialized markets; sell branded components to system integrators; accumulate new capabilities by acquiring young technology firms.
Strategy, process	Development and patenting of proprietary technologies; vertical integration of the value chain at home and abroad.	Cross-license technology based on industry standards; vertical specialization of the value chain; outsourcing/offshoring of routine work.
Finance	Venture finance from personal savings, family, and business associates; NYSE listing; pay steady dividends; growth finance from retentions leveraged with bond issues.	Organized venture capital; IPO on NASDAQ; low or no dividends; growth finance from retentions plus stock as an acquisition currency; stock repurchases to support stock price.
Organization	Secure employment: career with one company; salaried and hourly employees; unions; defined-benefit pensions; employer-funded medical insurance in employment and retirement.	Insecure employment: interfirm mobility of labor; broad-based stock options; nonunion; defined-contribution pensions; employee bears greater burden of medical insurance.

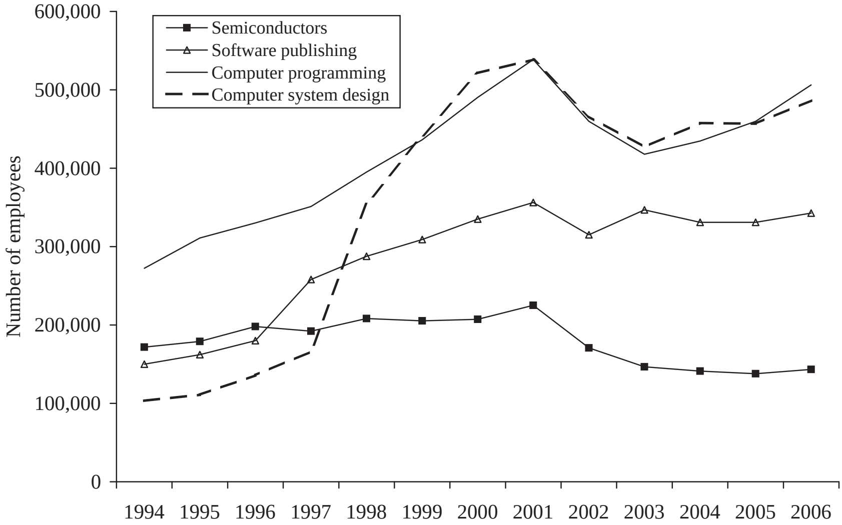
of Commerce (2003) has defined ICT industries as those engaged in producing computer hardware, computer software and services, communications equipment, and communications services.[3] According to the department's report *Digital Economy 2003*, the output of ICT industries accounted for about 9 percent of U.S. GDP in 2000 at the peak of the Internet boom and about 8 percent in the early 2000s (Henry and Dalton 2003, p. 16).

Employment in U.S. ICT industries increased by 51.9 percent from 1993 to 2000, compared with a 20.8 percent increase for all business-sector industries. In 2000 these industries employed a total of 5.38 million people, representing 4.8 percent of employment by all U.S. business-sector industries. Although ICT employment declined by 0.6 percent in 2001 and by 10.7 percent in 2002, ICT industries still employed 4.78 million people, or 4.4 percent of employment in the U.S. business sector, in 2002 (Cooke 2003, pp. 21–22). According to Bureau of Economic Analysis (BEA) data, ICT-producing industries, which do not include communications services,[4] employed (in full-time equivalents) 4.68 million people in 2000, representing 4.4 percent of all business-sector employees in the United States, 3.67 million (3.5 percent) in 2003, and 3.76 million (3.5 percent) in 2006 (BEA 2009).

Figures 1.5 and 1.6 show the changes in employment and real wages (in 2000 dollars) in four main ICT industry classifications. As shown in Figure 1.5, employment in each of these four industry classifications increased substantially in the last half of the 1990s and peaked in 2001 with a total employment of 1,658,628, almost 2.4 times the number of employees in 1994. From 2001 to 2003, there was a net loss of just over 320,000 jobs, although more than 140,000 of these jobs were regained by 2006. Real wages in all of these classifications increased in the latter half of the 1990s, and then, for reasons that will be explained in Chapter 2, spiked in 2000—dramatically in the case of semiconductors and software publishing—before falling off sharply with the downturn of 2001 and showing little if any increase through 2006 (Fig. 1.6).

Employees in ICT industries earn, on average, much more than those in most other sectors of the economy. In 2006 the average annual incomes (in current dollars) of U.S. ICT employees were $111,212 in software publishing, $77,915 in semiconductors, $76,462 in custom computer programming services, $73,497 in computer system design services, and $62,620 in data processing, hosting, and related services

Figure 1.5 Employment in Four ICT Industrial Classifications, 1994–2006

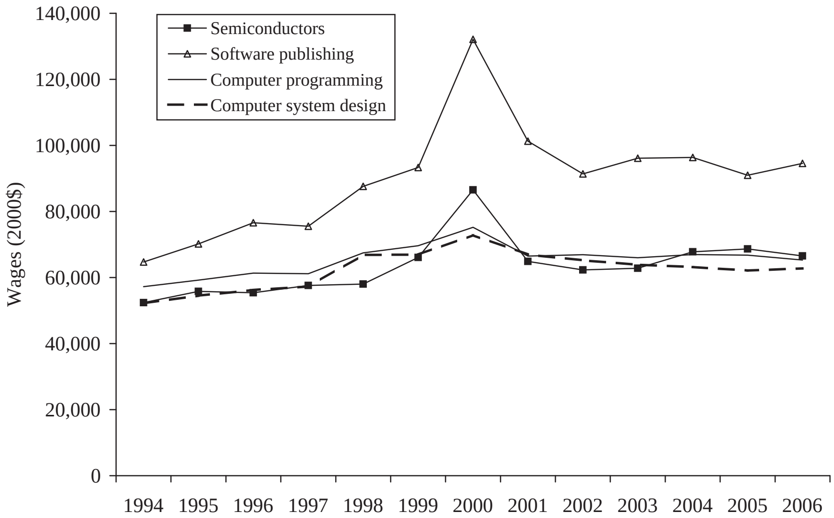


NOTE: SIC classifications for 1994–1997 and NAICS classifications for 1998–2006: Semiconductors and related devices: SIC 3674, NAICS 334413; Software publishing: SIC 7372, NAICS 511210 and 334611; Computer programming services: SIC 7371, NAICS 541511; Computer system design: SIC 7373 plus half of 7379, NAICS 54152.
SOURCE: U.S. Census Bureau (2008a).

(U.S. Census Bureau 2008a).[5] In 2006 a full-time equivalent employee in U.S. ICT-producing industries had 56 percent higher average compensation than a full-time equivalent employee in U.S. business sector goods-producing industries in general (BEA 2009). Following the ICT downturn in 2001–2002 and the “jobless recovery” of 2003–2004, ICT-producing industries had real growth in output of 13.3 percent in 2005 and 12.5 percent in 2006. The value-added of ICT-producing industries was 3.9 percent in 2006, contributing 14.2 percent of real GDP growth in the U.S. economy (Howells and Barefoot 2007).

Although the United States remains the world leader in ICT industries, it nevertheless has been running trade deficits in ICT goods, as shown in Table 1.4. The U.S. Census Bureau categorizes trade in Advanced Technology Products into 10 categories: Biotechnology,

Figure 1.6 Real Wages (in 2000 dollars) in Four ICT Industrial Classifications, 1994–2006



NOTE: See Figure 1.5 for SIC and NAICS classifications.
SOURCE: U.S. Census Bureau (2008a).

Life Science, Opt-Electronics, Information and Technology, Electronics, Flexible Manufacturing, Advanced Materials, Aerospace, Weapons, and Nuclear Technology. Except for Aerospace exports in 2006 and 2007, ICT exports have been greater than every other category of exports since 2002, and ICT imports have been five to seven times greater than the next largest categories, Electronics and Aerospace. A substantial portion of these ICT trade deficits reflect the globalization of investment and employment in ICT value chains, with U.S.-based multinational companies playing leading roles. It cannot, therefore, be assumed that the trade deficit measures a lack of competitiveness of U.S.-based companies in ICT industries.

Indeed, in the first half of the 2000s, U.S. ICT industries remained highly innovative. U.S.-based ICT firms accounted for 26.0 percent of all company-funded research and development (R&D) in the United States in 2000 and 31.2 percent in 2001 (Henry and Dalton 2003, p. 18). At the beginning of 2003, ICT companies employed 40 percent of

Table 1.4 U.S. Exports and Imports of ICT Products, Relative to All Advanced Technology Products (ATP), 2002–2007

	ICT exports ($b)	ICT imports ($b)	ICT trade balance ($b)	ICT as % of ATP exports	ICT as % of ATP imports	ICT as % of U.S. ATP deficit
2002	53.3	100.7	−47.4	29.6	51.8	285.6
2003	53.1	110.1	−57.0	29.5	53.2	212.4
2004	59.3	132.5	−73.2	29.4	55.6	198.7
2005	64.1	147.2	−83.1	29.7	56.7	190.2
2006	69.2	160.8	−91.6	27.4	55.3	240.3
2007	74.8	179.7	−104.9	27.4	55.0	196.2

SOURCE: U.S. Census Bureau (2008b).

the 1,075,500 full-time equivalent research and development (R&D) scientists and engineers in the U.S. business sector (National Science Foundation 2003). Table 1.5 shows R&D expenditures of the U.S. ICT companies that were among the top 100 globally in R&D spending in 2006.

Firm-level R&D spending is influenced by, among other factors, the technologies that a company develops and the product markets in which it competes. Note, for example, the high levels of R&D as a percent of sales for semiconductor companies such as Intel, Texas Instruments (TI), Qualcomm (the design of integrated circuits for code division multiple access [CDMA] wireless devices that the company pioneered represents a major part of its business), Advanced Micro Devices (AMD), and Broadcom. IBM and Hewlett-Packard (HP), the two largest ICT companies by total sales revenues, had by far the lowest levels of R&D as a percentage of sales and R&D dollars spent per employee. As we will see in Chapter 3, the limited extent to which IBM and HP allocate resources to R&D in the 2000s is the direct result of their transformations from OEBM to NEBM.

Whether they are U.S.-based or foreign, ICT companies are the leading patenters in the United States. IBM has been the top patenter every year since 1993, with Canon being either second or third. In 2007 IBM (USA) had 3,148 U.S. patents, Samsung (South Korea) 2,725, Canon (Japan) 1,987, Matsushita (Japan) 1,941, Intel (USA) 1,865, Microsoft (USA) 1,637, Toshiba (Japan) 1,549, Sony (Japan) 1,481, Micron Technology (USA) 1,476, and HP (USA) 1,470. Of these top

Table 1.5 U.S. ICT Companies among the Global Top 100 R&D Spenders, 2005 and 2006

	Global rank		R&D expenditures ($m)		R&D as % of sales		R&D expenditures per employee ($000s)	
ICT Company	2006	2005	2006	2005	2006	2005	2006	2005
Microsoft	5	7	7,121	6,584	13.9	14.9	90	93
Intel	12	14	5,873	5,145	16.6	13.3	62	52
IBM	14	11	5,682	5,378	6.2	5.9	16	16
Motorola	22	24	4,106	3,680	9.6	10.0	62	53
Cisco Systems	23	30	4,067	3,322	14.3	13.4	81	86
Hewlett-Packard	28	26	3,561	3,490	3.9	4.0	23	23
Oracle	48	55	2,195	1,872	12.2	13.0	29	33
Texas Instruments	50	51	2,190	2,015	15.4	15.1	71	57
Sun Microsystems	56	49	2,008	2,046	14.5	15.7	53	54
Qualcomm	66	89	1,516	1,011	20.1	17.8	135	109
EMC	77	90	1,254	1,005	11.2	10.4	40	38
Google	79	119	1,218	578	11.5	9.4	114	102
Advanced Micro Devices	80	77	1,205	1,144	21.3	19.6	73	116
Applied Materials	86	95	1,138	941	12.4	13.5	81	73
Broadcom	89	115	1,117	681	30.5	25.5	213	159
Electronic Arts	95	108	1,041	758	33.7	25.7	132	105

NOTE: Microsoft, Oracle, Sun Microsystems, and Electronic Arts all have fiscal years that end in the first half of the year. For these companies the data for 2006 are for the fiscal year ended in the first half of 2007 and the data for 2005 are for the fiscal year ended in the first half of 2006. In 2005 Freescale Semiconductor was ranked 74th and Lucent Technologies 75th among global R&D spenders. R&D expenditures as a percentage of sales were 20.3 percent at Freescale and 12.5 percent at Lucent. R&D expenditures per employee were $52,000 at Freescale and $39,000 at Lucent. In December 2006 Freescale was taken private and Lucent was acquired by Alcatel; hence comparable data for these companies for 2006 are not available.

SOURCE: Hira and Ross (2007).

10 patenters, Matsushita, Samsung, and Sony are partially in ICT, and the other seven, including the five U.S.-based companies, are primarily or wholly in ICT. Other U.S.-based ICT companies that were among the top 35 patenters in 2007 were TI (seventeenth with 752 patents), Sun Microsystems (twenty-sixth, 610), Cisco Systems (twenty-seventh, 582), Broadcom (thirty-first, 533), and Xerox (thirty-third, 517) (IFI Patent Intelligence 2008).

ICT products contribute to productivity throughout the U.S. economy. In a review of the book *Manufacturing Matters,* by Cohen and Zysman (1987), Robert Solow (1987) observed that, despite the authors' central belief that computerized manufacturing would produce a break with past patterns of productivity growth, how effectively U.S. industry would make use of computer automation remained an open question. Solow went on to remark that Cohen and Zysman, "like everyone else, are somewhat embarrassed by the fact that what everyone feels to have been a technological revolution, a drastic change in our productive lives, has been accompanied everywhere, including Japan, by a slowing-down of productivity growth, not by a step up." Solow then quipped, now rather famously: "You can see the computer age everywhere but in the productivity statistics."

Ultimately, however, the failure of the expansion of investment in and access to computers to result in productivity growth in the 1980s and early 1990s was replaced with an explosion of ICT-related productivity growth in the late 1990s and 2000s (Baily and Sichel 2003; Brynjolfsson and Hitt 2003; Gordon 2003; Jorgenson 2001; Oliner and Sichel 2002; Roach 2003). Why did it take so long for the "computer age" to make its mark on productivity growth?

The key to answering this question is the recognition that productivity depends on the *development* and *utilization* of technology. The development of technology in and of itself does not generate productivity. Indeed, the development of technology lowers productivity because it absorbs inputs into economic activity without generating valued outputs. An individual, enterprise, region, or nation that develops technology realizes productivity over time only when it actually utilizes that technology to sell products and generate revenues. In effect, through the utilization of technology, the high fixed costs of the development of technology can be transformed into low unit costs (see Lazonick 1991, 2006, 2008b). Developmental costs, which are included in the economist’s conception of fixed costs, depend on both the size of the investment in productive resources that is made at a point in time and the duration of time over which the productive capability of those resources must be developed before they can generate financial returns.

It is for this reason that it is often necessary for a government to make developmental investments in physical infrastructure and a knowledge base in order to induce business enterprises (which by definition must generate profits to survive) to enter an industry that is based on new technology. The U.S. government played a fundamental role in funding the computer revolution. Without the backing of the developmental state, the microelectronics revolution would not have occurred (Braun and MacDonald 1982; Flamm 1987, 1988; Lécuyer 2006; Leslie 1993a,b; Mowery and Langlois 1996; National Research Council 1999; Tilton 1971).[6]

As they developed, the ICT industries created a demand for education and research in science and engineering, with externalities for other sectors of the economy in terms of access to advanced research and educated labor (e.g., Lenoir et al. 2003). The evolution in the 1960s of what would become known as Silicon Valley also created a demand for venture capital that, as I elaborate on in Chapter 2, had emerged by the early 1970s as an industry in its own right that was devoted to new firm formation.

The NEBM that was put in place in Silicon Valley in the 1970s and 1980s also depended on the investment decisions and productive resources of Old Economy companies, the most important of which was IBM. The world’s leading computer company from the 1950s, IBM’s development of the personal computer in the early 1980s based on an Intel microprocessor and a Microsoft operating system was the most important impetus to the emergence and consolidation of the vertically specialized industrial structure that came to characterize NEBM.

Even in the 1980s, when to a large extent (to paraphrase Solow), computers were everywhere but productivity nowhere, the two parts of ICT developed separately, with computer production and voice transmission having virtually nothing to do with each other as industries. It was only with the introduction of data communications based on packet switching that the information and communication technology industries came together, initially in the second half of the 1980s in the form of local area networks and then in the first half of the 1990s in the form of the Internet. Concomitantly, the wireless communications revolution was taking place, with "3G" (third-generation) convergence with information technology via the Internet in the 2000s. The contribution of the ICT industries to productivity growth from the mid-1990s on and the subsequent dominance of NEBM over OEBM in the ICT industries were part and parcel of the integration of information and communication technologies in the form of the Internet, giving meaning to the letters ICT.

THE TOP 20 OLD ECONOMY AND NEW ECONOMY COMPANIES

In 2005 there were 53 companies in the U.S. Fortune 500 that could be classified as ICT.[7] Combined, these 53 companies had $909 billion in revenues and 2.6 million employees. Of these 53 companies, 26, with $332 billion in revenues and 871,000 employees, could be defined as New Economy. Tables 1.6 and 1.7 list the top 20 Old Economy and top 20 New Economy ICT companies, respectively, by 2005 revenues and the number of people these companies had employed over the previous decade. For inclusion in Table 1.7 as New Economy, a company had to fulfill three criteria: 1) have been founded in 1957 or later, 2) not have been established by the spin-off of an existing division from an Old Economy company, and 3) not have grown through acquisition of, or merger with, an Old Economy company (as was the case for Electronic Data Systems, Comcast, and IAC, which are included as Old Economy companies).

I have chosen 1957 as the earliest date for inclusion in the New Economy list because that was the year that eight scientists and engineers left Shockley Semiconductor Laboratories in Palo Alto, California—itself founded just two years before—to launch Fairchild Semiconductor in nearby Mountain View. Fairchild Semiconductor was a division of Fairchild Camera and Instrument, based in Long Island, New York. As is well known, the creation of Fairchild Semiconductor sparked a chain reaction that resulted in the emergence of Silicon Valley as a center for the development of microelectronics (Berlin 2005; Kenney 2000; Lécuyer 2006; Lee et al. 2000; Lenoir et al. 2003). As I will show in Chapter

2, it was first and foremost in Silicon Valley, beginning in the late 1950s, that NEBM emerged as a viable, and ultimately dominant, business model. Note that 14 of the 20 New Economy companies listed in Table 1.7 are based in California, and 11 of those are in Silicon Valley.

Headed by the giants IBM and HP, six of the Old Economy companies in Table 1.6, including Xerox, Electronic Data Systems (EDS), First Data, and NCR, are strictly information technology companies.[8] The two semiconductor companies, TI and Freescale Semiconductor, supply chips to both the information technology and communication technology sectors of ICT but with an emphasis on communications applications. TI's major business is designing digital signal processing chips for the cell-phone industry, whereas Freescale is a 2004 spinoff of the wireless communications technology company Motorola. Along with Motorola in the communications equipment segment of ICT is Lucent Technologies, which was spun off from AT&T Corp. in 1996 and was merged with the French telecommunications equipment company Alcatel to become Alcatel-Lucent in 2006.[9]

The remaining 10 companies in Table 1.6 are communications service providers. Five of them are direct descendents of the old Bell System that, until its breakup on January 1, 1984, functioned as a regulated monopoly in the provision of local and long distance telephone services. AT&T, the parent company within the Bell System, included regional operating companies throughout the United States. AT&T's wholly owned subsidiary, Western Electric, manufactured equipment for the Bell System, while Bell Labs, the world famous research organization jointly owned by AT&T and Western Electric, engaged in basic and applied scientific research. The breakup of the Bell System separated seven regional Bell operating companies (RBOCs) from AT&T Corp., which now included Western Electric and Bell Labs within its internal organization as its AT&T Technologies division. The seven RBOCS were Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis (PacTel), Southwestern Bell Corp. (SBC), and US West. Subsequently Bell Atlantic and NYNEX were merged into Verizon; Ameritech, Pacific Telesis, and AT&T Corp. into SBC, which in 2005 changed its name to AT&T Inc.; and US West into Qwest. In December 2006 AT&T Inc. acquired BellSouth, so that in the 23 years since the breakup of the Bell System, AT&T Corp. and the seven RBOCs had become consolidated into three companies: AT&T Inc., Verizon, and Qwest.[10]

Table 1.6 Employment, 1996 and 2000–2005, at the Top 20 Old Economy Companies by 2005 Sales

Old Economy companies	2005 sales ($b)	Employees 1996	2000	2001	2002	2003	2004	2005	2005 sales/ employee
International Business Machines (1911; NY; 10)	91.1	240,615	316,309	319,876	315,889	319,273	329,001	329,373	$277,000
Hewlett-Packard (1939; CA; 11)	86.7	112,000	88,500	86,200	141,000	142,000	151,000	150,000	$578,000
Verizon Communications (1885; NY; 18)	75.1	62,600	260,000	247,000	229,500	203,100	210,000	217,000	$346,000
AT&T Inc.[a] (1885; TX; 39)	43.9	61,540	220,090	193,420	175,400	168,950	162,000	189,950	$231,000
Motorola (1928; IL; 54)	36.8	139,000	147,000	111,000	97,000	88,000	68,000	69,000	$533,000
Sprint Nextel[b] (1899; KS; 59)	34.7	48,024	84,100	83,700	72,200	66,900	59,900	79,900	$434,000
Comcast[c] (1963; PA; 194)	22.3	16,400	35,000	38,000	82,000	68,000	74,000	80,000	$279,000
BellSouth (1885; GA; 106)	20.6	81,241	103,900	87,875	77,000	76,000	62,564	63066	$326,000
Electronic Data Systems[d] (1962; TX; 108)	20.5	100,000	122,000	143,000	137,000	132,000	117,000	117,000	$175,000
Xerox (1906; CT; 142)	15.7	86,700	92,500	78,900	67,800	61,100	58,100	55,200	$284,000
Qwest Communications (1885; CO; 160)	13.9	720	67,000	61,000	47,000	47,000	41,401	39,348	$353,000
Texas Instruments (1930; TX; 167)	13.4	59,927	42,481	34,724	34,589	34,154	35,472	35,207	$381,000
DirecTV Group (1932; CA; 168)	13.2	86,000	9,000	13,700	11,600	12,300	11,800	9,200	$1,435,000
First Data (1871; CO; 224)	10.5	40000	27000	29000	29000	29000	32000	33000	$318,000
Alltel (1943; AR; 251)	9.5	16,307	27,257	23,955	25,348	19,986	18,598	21,373	$444,000
Lucent Technologies (1869; NJ; 255)	9.4	124,000	126,000	77,000	47,000	34,500	31,800	30,500	$308,000

Table 1.5 U.S. ICT Companies among the Global Top 100 R&D Spenders, 2005 and 2006

ICT Company	Global rank		R&D expenditures ($m)		R&D as % of sales		R&D expenditures per employee ($000s)	
	2006	2005	2006	2005	2006	2005	2006	2005
Microsoft	5	7	7,121	6,584	13.9	14.9	90	93
Intel	12	14	5,873	5,145	16.6	13.3	62	52
IBM	14	11	5,682	5,378	6.2	5.9	16	16
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Texas Instruments	50	51	2,190	2,015	15.4	15.1	71	57
Sun Microsystems	56	49	2,008	2,046	14.5	15.7	53	54
Qualcomm	66	89	1,516	1,011	20.1	17.8	135	109
EMC	77	90	1,254	1,005	11.2	10.4	40	38
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Advanced Micro Devices	80	77	1,205	1,144	21.3	19.6	73	116
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Broadcom	89	115	1,117	681	30.5	25.5	213	159
Electronic Arts	95	108	1,041	758	33.7	25.7	132	105

NOTE: Microsoft, Oracle, Sun Microsystems, and Electronic Arts all have fiscal years that end in the first half of the year. For these companies the data for 2006 are for the fiscal year ended in the first half of 2007 and the data for 2005 are for the fiscal year ended in the first half of 2006. In 2005 Freescale Semiconductor was ranked 74th and Lucent Technologies 75th among global R&D spenders. R&D expenditures as a percentage of sales were 20.3 percent at Freescale and 12.5 percent at Lucent. R&D expenditures per employee were $52,000 at Freescale and $39,000 at Lucent. In December 2006 Freescale was taken private and Lucent was acquired by Alcatel; hence comparable data for these companies for 2006 are not available.
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Verizon Communications (1885; NY; 18)	75.1	62,600	260,000	247,000	229,500	203,100	210,000	217,000	$346,000
AT&T Inc.[a] (1885; TX; 39)	43.9	61,540	220,090	193,420	175,400	168,950	162,000	189,950	$231,000
Motorola (1928; IL; 54)	36.8	139,000	147,000	111,000	97,000	88,000	68,000	69,000	$533,000
Sprint Nextel[b] (1899; KS; 59)	34.7	48,024	84,100	83,700	72,200	66,900	59,900	79,900	$434,000
Comcast[c] (1963; PA; 194)	22.3	16,400	35,000	38,000	82,000	68,000	74,000	80,000	$279,000
BellSouth (1885; GA; 106)	20.6	81,241	103,900	87,875	77,000	76,000	62,564	63066	$326,000
Electronic Data Systems[d] (1962; TX; 108)	20.5	100,000	122,000	143,000	137,000	132,000	117,000	117,000	$175,000
Xerox (1906; CT; 142)	15.7	86,700	92,500	78,900	67,800	61,100	58,100	55,200	$284,000
Qwest Communications (1885; CO; 160)	13.9	720	67,000	61,000	47,000	47,000	41,401	39,348	$353,000
Texas Instruments (1930; TX; 167)	13.4	59,927	42,481	34,724	34,589	34,154	35,472	35,207	$381,000
DirecTV Group (1932; CA; 168)	13.2	86,000	9,000	13,700	11,600	12,300	11,800	9,200	$1,435,000
First Data (1871; CO; 224)	10.5	40000	27000	29000	29000	29000	32000	33000	$318,000
Alltel (1943; AR; 251)	9.5	16,307	27,257	23,955	25,348	19,986	18,598	21,373	$444,000
Lucent Technologies (1869; NJ; 255)	9.4	124,000	126,000	77,000	47,000	34,500	31,800	30,500	$308,000

Cox Communications (1898; GA; 273)	9.0	7,200	19,000	20,700	21,600	22,150	22,350	22,530	$399,000
IAC/InterActiveCorp[e] (1977; NY; 313)	7.1	4,750	20,780	16,900	23,200	25,700	26,000	28,000	$254,000
NCR (1884; OH; 357)	6.0	38,600	32,900	31,400	30,100	29,000	28,500	28,200	$213,000
Freescale Semiconductor[f] (1928; TX; 368)	5.8							22,700	$256,000
Averages (per firm, except sales per employee)	27.3	72,808	96,885	89,334	87,621	83,111	81,062	81,027	$391,000

NOTE: In parentheses: year of founding, state in which headquartered, and rank in 2006 Fortune 500 list. Included in the ICT industries are companies that the Fortune 500 2006 list classifies as being in the following industries: Computer Peripherals, Computer Software, Computers, Office Equipment, Financial Data Services, Information Technology Services, Internet Services and Retailing, Network and Other Communications Equipment, Semiconductors and Other Electronic Components, and Telecommunications. Blank = not applicable.

[a] In 2005 SBC Communications, founded in Texas in 1885 and ranked 33rd on the Fortune 500 list, acquired AT&T, founded in 1877 and ranted 56th on the 2005 list. SBC then changed its name to AT&T Inc. Employment figures for 1996 and 2000–2004 are for SBC. AT&T Corp.'s employment figures were: 1996, 130,000; 2000, 166,000; 2001, 117,800; 2002, 71,000; 2003, 61,000; and 2004, 47,565.

[b] In August 2005 Sprint, 65th on the Fortune 500 2005 list, acquired Nextel, founded in 1987 and 157th on the 2005 list.

[c] Comcast began its transformation into the largest Internet cable company in the United States through its acquisition of subscribers from AT&T Broadband in 2000–2001.

[d] General Motors bought Electronic Data Systems in 1984 and spun it off as an independent company in 1996.

[e] In 1998 HSN (formed out of Home Shopping Network) purchased USA Networks, which had been owned by Paramount and MCA. In the early 2000s, the company changed its name, first to USA Interactive and then to IAC/InterActiveCorp.

[f] In late 2004 Motorola spun off its semiconductor division as Freescale Semiconductor.

SOURCE: *Fortune* (2006); hoovers.com; S&P Compustat database.

Table 1.7 Employment, 1996 and 2000–2005, at the Top 20 New Economy Companies by 2005 Sales

	2005 sales ($b)	Employees							2005 sales/ employee
New Economy Companies		1996	2000	2001	2002	2003	2004	2005	
Dell Computer (1984; TX; 25)	55.9	8,400	36,500	40,000	34,600	39,100	55,200	65,200	$857,000
Microsoft (1975; WA; 48)	39.8	20,561	39,100	47,600	50,500	55,000	57,000	61,000	$652,000
Intel (1968; CA; 49)	38.8	48,500	86,100	83,400	78,700	79,700	85,000	99,900	$388,888
Cisco Systems (1984; CA; 83)	24.8	8,782	34,000	38,000	36,000	34,000	34,000	38,413	$646,000
Computer Sciences (1959; CA; 141)	15.8	33,850	58,000	68,000	67,000	90,000	90,000	79,000	$200,000
Apple Computer (1977; CA; 159)	13.9	10,896	8,568	9,603	10,211	10,912	12,561	15,810	$879,000
Oracle (1977; CA; 196)	11.8	23,111	41,320	42,297	42,006	40,650	41,658	49,872	$236,000
Sanmina-SCI (1980; CA; 198)	11.7	1,726	24,000	48,774	46,030	45,008	42,115	42,821	$273,000
Sun Microsystems (1982; CA; 211)	11.1	17,400	38,900	43,700	39,400	36,100	32,600	31,000	$358,000
Solectron (1977; CA; 227)	10.5	10,781	65,273	60,000	73,000	66,000	59,500	47,000	$223,000
EMC (1979; MA; 249)	9.7	4,800	24,100	20,100	17,400	20,000	22,700	21,000	$462,000
Amazon.com (1994; WA; 272)	8.5	151	9,000	7,800	7,500	7,800	9,000	12,000	$708,000
EchoStar Communications (1993; CO; 273)	8.4	1,200	11,000	11,000	15,000	15,000	20,000	21,000	$400,000
SAIC (1969; CA; 285)	8.0	20,931	39,078	41,500	40,400	38,700	44,900	43,800	$183,000
Jabil Circuit (1966; FL; 303)	7.5	2,649	19,115	17,097	20,000	26,000	34,000	40,000	$188,000
Applied Materials (1967; CA; 317)	7.0	11,403	19,220	17,365	16,077	12,050	12,960	12,750	$549,000
Google (1998; CA; 353)	6.1					1,628	3,021	5,680	$1,074,000

Advanced Micro Devices (1969; CA; 367)	5.8	12,200	14,696	14,415	12,146	14,300	15,900	15,900	$365,000
Qualcomm (1985; CA; 381)	5.7	6,000	6,300	6,500	8,100	7,400	7,600	9,300	$613,000
Yahoo! (1995; CA; 412)	5.3	155	3,259	3,000	3,600	5,500	7,600	9,800	$541,000
Averages (per firm, except sales per employee)	15.3	12,816	30,396	32,640	32,509	32,242	34,366	36,062	$424,000

NOTE: In parentheses: year of founding, state in which headquartered, and rank in 2006 Fortune 500 list. Included in the ICT industries are companies that the Fortune 500 2006 list classifies as being in the following industries: Computer Peripherals, Computer Software, Computers, Office Equipment, Financial Data Services, Information Technology Services, Internet Services and Retailing, Network and Other Communications Equipment, Semiconductors and Other Electronic Components, and Telecommunications. Blank = not applicable.

SOURCE: *Fortune* (2006); hoovers.com; S&P Compustat database.

In contrast, only three of the top 20 New Economy companies are clearly communications technology companies: Cisco Systems, which makes Internet routers and switches; EchoStar Communications, a major force in satellite television[11]; and Qualcomm, a wireless equipment manufacturer. Even so, Cisco's rise to dominance in its industry derives from its development of software that has enabled the convergence of information and communication technology—what is called the "triple play" of voice, data, and video—using the same infrastructures and equipment. The evolution of those infrastructures and equipment has depended critically on the development of ever more powerful, compact, and affordable computers—in short, the microelectronics revolution. At the center of this revolution were the hardware company, Intel, and the software company, Microsoft, both of which grew large supplying crucial inputs to the IBM personal computer (PC) and what used to be called its clones, including Dell Computer, no. 1 on the New Economy list. AMD, founded in Silicon Valley a year after Intel, sustained its growth for decades by serving as a second source for the supply of Intel chips, although in recent years it has increasingly been competing head-to-head with Intel with its own chip designs.

Applied Materials is the world's largest maker of semiconductor production equipment, while Solectron (since 2007 part of Flextronics), Sanmina-SCI, and Jabil Circuit are among the world's leading electronic manufacturing service (EMS) providers, supplying printed circuit boards and other components to companies such as IBM, HP, Dell, and Cisco. Other companies have established their own distinctive niches in the information technology sector, such as Apple in innovative computer products, Sun Microsystems in computer workstations, and EMC in information management and storage. Oracle is the leader in database management software, while Computer Sciences (CS) and SAIC line up behind "Old Economy" EDS in providing information technology services. Finally, Amazon.com, Google, and Yahoo! are, along with "Old Economy" IAC, in the *Fortune* industry classification "Internet Services and Retailing," which was newly created for the 2005 list. The revenues that each of them generated in 2005 put them on the top 20 New Economy list for the first time (compare Lazonick 2007b, pp. 67–68).

NEBM AS A FORCE FOR UNSTABLE AND INEQUITABLE ECONOMIC GROWTH

The basic thesis of this book is that the demise of OEBM and its replacement by NEBM together represent important parts of the explanation for the trend toward greater employment instability and income inequality in the U.S. economy over the past three decades—a reversal of the trend toward more stable and more equitable economic growth in the three decades after World War II. While NEBM has been evolving since the 1960s in ICT industries, the Internet boom and bust of the late 1990s and early 2000s was pivotal in the replacement of OEBM by NEBM as the dominant mode of business organization.

New Economy companies such as Intel, Microsoft, Oracle, Sun Microsystems, and Cisco Systems grew on the basis of NEBM. Among the major Old Economy companies, IBM led the shift to NEBM during the 1990s as it changed its product market strategy from lower margin hardware to higher margin software and services; its R&D orientation from proprietary technology systems to open technology systems, with extensive patenting as a source of leverage in cross-licensing and strategic alliances with other companies; its financial behavior from providing stable dividend yields to shareholders to boosting its stock price through massive stock repurchases; and its employment relations from its signature “lifelong employment” system with defined-benefit pensions to a focus on flexibility in the employment of labor, including the move to portable pension systems designed to be attractive to younger, highly mobile employees. During the late 1990s, other major Old Economy ICT companies such as Lucent, Xerox, Motorola, TI, and HP adopted aspects of NEBM, and with the sharp downturn of the early 2000s, NEBM became the norm for all ICT companies. In this book, I document this shift to NEBM in the ICT industries and analyze its implications for the possibilities for sustainable prosperity in the United States.

Chapter 2 provides a historical analysis of the rise of NEBM, from its origins in Silicon Valley in the 1960s to its consolidation as the dominant business model in ICT in the Internet boom of the late 1990s. I stress the role of the stock market in facilitating the reallocation of capital and labor from the security of the Old Economy in which established corporations dominated to the insecurity of the New Economy with its waves of start-ups. Facilitating the reallocation of capital was the emergence of NASDAQ (National Association of Securities Dealers Automated Quotations), a national electronic stock market with much laxer listing requirements than the Old Economy New York Stock Exchange (NYSE). Facilitating the reallocation of labor was the transformation of the employee stock option from a means of increasing the after-tax income of top executives under OEBM to a mode of luring a broad base of professional, technical, and administrative employees from secure employment under OEBM to insecure employment under NEBM.

Chapter 3 analyzes how major Old Economy companies—with a focus on the important cases of IBM, HP, and Lucent Technologies—restructured in attempts (in the case of Lucent unsuccessful) to make the transition from OEBM to NEBM. With its central positions in both Old Economy mainframes and New Economy PCs, in the early 1990s IBM proactively, dramatically, and successfully made the transition from OEBM to NEBM. So too did HP, beginning with its 1999 spinoff of Agilent—the original business that William Hewlett and David Packard had built—to focus on its open systems printer business, launched about 15 years earlier. In contrast, Lucent Technologies, the 1996 spinoff from AT&T that housed the famed Bell Labs and that was the largest telecommunications equipment company in the world in 1999, almost destroyed itself trying to adopt elements of NEBM and a decade later was a subsidiary of a French company, Alcatel-Lucent. All three cases in this chapter demonstrate the greatly heightened employment insecurity that the transition from OEBM to NEBM entails. In the cases of IBM and HP, we see that even when Old Economy corporations have made a successful transition to NEBM, employment insecurity increases. In the case of Lucent, we see the disastrous results of an Old Economy company in which top executives became fixated on the company's stock price as the measure of economic performance but failed to make the transition to NEBM.

Chapter 4 analyzes the relations between employment security and retirement security under both OEBM and NEBM. Under OEBM, the traditional nonportable, "back-loaded" defined-benefit pension plan encouraged employees to remain with a company for a career. In making the transition to NEBM, some Old Economy companies adopted portable but still defined-benefit cash-balance plans that favored the employment of younger workers, often as a prelude to replacing a cash-balance plan with a portable defined-contribution 401(k) plan. In contrast, most New Economy companies such as Microsoft, Oracle, Cisco, and Dell have offered their employees only defined-contribution plans over the course of their corporate histories. Many Old Economy companies have used existing defined-benefit pensions as a tool for downsizing the labor force by means of early retirement schemes that enhance the value of one's pension. By the mid-2000s, most Old Economy corporations offered only defined-contribution plans to new hires and, at some companies, even to all employees. The major exceptions can be found in those ICT companies in which industrial unions have remained strong as collective-bargaining agents. Under NEBM, members of the U.S. high-tech labor force confront a high-quality, low-wage globalized labor supply with no effective collective institutions to protect their conditions of work and pay.

Chapter 5 analyzes the forces that have underpinned the globalization of the ICT labor force. Since the 1960s the development strategies of national governments and indigenous businesses in many Asian nations have interacted with the investment strategies of U.S.-based ICT companies as well as U.S. immigration policy to generate a global high-tech labor supply. This process has entailed flows of U.S. capital to Asian labor as well as flows of Asian labor to U.S. capital. As a result, new possibilities to pursue high-tech careers, and thereby develop productive capabilities, have opened up to vast numbers of individuals in many Asian nations. By the same token, it is increasingly the case that members of the U.S. high-tech labor force must compete for jobs with highly qualified, but often much less expensive, labor situated halfway around the world. With the acceleration of offshoring in the 2000s, even well-educated and highly experienced members of the U.S. ICT labor force are facing unprecedented economic insecurity. Under these conditions, what is needed in the United States is the creation of employment opportunities that can make full use of the productive capabilities of educated and experienced U.S. high-tech labor.

Chapter 6 shows that, driven by a pervasive, but theoretically untenable, ideology that corporations should be run to maximize shareholder value, top executives of ICT companies have chosen to allocate corporate resources in a way that, at best, fails to support and, at worst, undermines the ability of members of the U.S. high-tech labor force to compete with a global labor supply without sacrificing their standards of living. Rather than use the profits of globalization to upgrade the capabilities of the U.S. high-tech labor and to create new opportunities for creative employment at home, top executives have become obsessed (if I may use such a psychological term) with allocating corporate financial resources to buying back their companies' own stock. I argue that the only purpose of stock repurchases is to boost a company's stock price, and that, as recipients of abundant stock option awards, the top executives who decide to buy back stock are themselves prime beneficiaries of these corporate allocation decisions.

Finally, Chapter 7 discusses the implications for sustainable prosperity of the rise and dominance of NEBM. With the transformation of employment relations, the globalization of the high-tech labor force, and the corporate commitment to maximizing shareholder value, well-educated and highly experienced members of the U.S. high-tech labor force are facing economic insecurity, even when the U.S. ICT corporations that could provide them with stable and remunerative employment opportunities are highly profitable. In terms of their accumulated capabilities, these ICT personnel should be among the best-positioned in the U.S. labor force to find stable and remunerative employment. Yet, notwithstanding the existence of older underemployed and unemployed high-tech workers, high-tech executives perpetually claim that there is a shortage of capable STEM (science, technology, engineering, and mathematics) labor in the United States. What these executives actually want is a large supply of younger workers who will work long hours for less pay.

These executives go on to blame an underperforming U.S. K–12 education system for failing to generate this abundant labor supply. The U.S. government does need to remain committed to investment in the nation's educational infrastructure. Government investment, however, will not in and of itself generate sustainable prosperity. The achievement of stable and equitable economic growth, both for existing members of the U.S. high-tech labor force and for those segments of U.S. society who have been left behind, will require a confrontation with the destructive "shareholder-value" ideology that currently guides the resource allocation decisions of U.S. business corporations.

Notes

1. In the early 1950s, the sociologist C. Wright Mills (1951) had written an influential academic treatise on the significance of the "white collar" employee. William H. Whyte, who wrote his best-selling *The Organization Man* while an editor of *Fortune*, later became a prominent urban sociologist. Whyte's characterization of "The Organization Man" has often been interpreted as pejorative, the victim of the bureaucratic suppression of rugged individualism. Whyte himself, however, denied this interpretation. In a 1982 interview, Whyte stated: "I didn't mean *The Organization Man* as a pejorative work. . . . After all, I've been an organization man myself in some very good organizations. And I don't think one loses grace by being a member of an organization. Yet many people interpreted this thing on its own, not having read it, as an attack on modern American life. That anybody who worked for a corporation had lost his soul. And I meant no such thing." Interview by Richard H. Heffner on "The Open Mind" October 15, 1982, available at http://www.theopenmind.tv/searcharchive_episode_transcript.asp?id=1509 (accessed June 26, 2009).
2. In Jeremy Siegel's well-known book, *Stocks for the Long Run*, now in its fourth edition, there is only one passing reference to stock buybacks (Siegel 2008, p. 98), notwithstanding the fact that, since the late 1990s, repurchases have become the major mode of distributing corporate revenues to shareholders.
3. The Department of Commerce (2003) described these industries as IT. I use the term ICT to describe the same set of industries in order to highlight the organizational separation of information and communication technologies in OEBM and the ongoing convergence of information and communication technologies that characterizes NEBM.
4. The BEA defines ICT-producing industries as consisting of computer and electronic products, publishing industries (includes software), information and data processing services, and computer systems design and related services.
5. U.S. Census Bureau (2008a, 1994–1997 data: http://censtats.census.gov/cbpsic/cbpsic.shtml; 1998–2006 data: http://censtats.census.gov/cbpnaic/cbpnaic.shtml).
6. See also Hambrecht (1984) for the views of a prominent Silicon Valley investment banker.
7. Given the gestation period of this book, I have organized collection of data around the top 20 OEBM and NEBM companies by revenues in 2005, taken from the Fortune 500 list published in 2006. The top 20 lists for 2007, taken from the Fortune 500 list published in 2008, have 15 of the same Old Economy companies and 18 of the same New Economy companies as in Tables 1.6 and 1.7, respectively. Gone from the Old Economy list in 2007 are BellSouth (acquired by AT&T Inc. in December 2006), Lucent Technologies (acquired by Alcatel in December 2006 to become Alcatel-Lucent), Cox Communications (taken private in December 2004 and included on the Fortune 500 list in 2005 but not thereafter), NCR (which with $6.2 billion in revenues in 2007 did not make the top 20 Old Economy list), and Freescale Semiconductor (taken private in December 2006). In place of these five

companies on the 2007 Old Economy list are Liberty Media (thirteenth), Automatic Data Processing (fourteenth), Liberty Global (fifteenth), Virgin Media (seventeenth), and Embarq (twentieth, a spinoff of Sprint Nextel's local telephone business in May 2006). Liberty Media, Liberty Global, and Virgin Media are all new companies with Old Economy roots. Gone from the New Economy list in 2007 are Solectron (acquired by Flextronics, based in Singapore, in October 2007) and AMD (which with $6.0 billion in revenues in 2007 did not make the top 20 list). Their replacements on the 2007 New Economy list are eBay (eighteenth) and Cablevision Systems (twentieth).

8. HP acquired EDS in August 2008 in a $13.9 billion deal.
9. In 2000, Lucent spun off Avaya, an enterprise networking company that, with $4.9 billion in revenues and 18,555 employees, ranked 434th in the Fortune 500 in 2005, and in 2001, it spun off Agere Systems, a communications chips company that, with $1.7 billion in revenues and 6,200 employees, ranked 904th in the Fortune 1000 in 2005.
10. With the growth of wireless communications, in 2001 AT&T Corp. spun off AT&T Wireless as a separate company, while in the same year, SBC and Bell South created the wireless company Cingular as a joint venture. In 2004 Cingular acquired AT&T Wireless. In December 2006, AT&T Inc. (formerly SBC) acquired BellSouth, and as a result Cingular, renamed AT&T Mobility, is now wholly owned by AT&T Inc.
11. On January 1, 2008, EchoStar Communications changed its name to DISH Network, while spinning off some of its businesses as EchoStar Corporation.