

# BEA's 2006 Research and Development Satellite Account

## Preliminary Estimates of R&D for 1959–2002

### Effect on GDP and Other Measures

By Sumiye Okubo, Carol A. Robbins, Carol E. Moylan, Brian K. Sliker, Laura I. Schultz, and Lisa S. Mataloni

THE Bureau of Economic Analysis has been working on a research and development (R&D) satellite account since 2004 to help economists gain a better understanding of R&D activity and its effect on economic growth. This article introduces the 2006 satellite account, which provides preliminary estimates of R&D investment and the impact of R&D investment on such measures as gross domestic product (GDP), investment, and saving.

The full 2006 satellite account, released in September and accessible via [www.bea.gov/bea/newsrelarchive/2006/rdspend06.htm](http://www.bea.gov/bea/newsrelarchive/2006/rdspend06.htm), modifies the accounting conventions used in the national income and product accounts (NIPAs) in order to explore the impact of “capitalizing” R&D—that is, treating R&D spending as an investment rather than as an expense. The new account does not affect the official measure of GDP. Rather, the satellite account provides a framework to explore new methodologies and provide regularly updated estimates of R&D in preparation for future incorporation into the input-output (I-O) accounts and the NIPAs.

The R&D satellite account was developed in partnership with the National Science Foundation (NSF), the Federal agency that is responsible for producing R&D-related statistics for the United States. NSF provided funding for the R&D satellite account project, and its staff reviewed account methodologies and results. Using R&D expenditure data from the NSF, BEA developed estimates of R&D investment, the R&D, and the resulting macroeconomic effects for 1959–2002.<sup>1</sup> Revised estimates are scheduled to be released in September 2007.

The 2006 account measures the direct effect of R&D

1. The NSF's Division of Science Resources Statistics annually publishes *National Patterns of Research and Development Resources*, which includes data based primarily on two annual NSF surveys: The Survey of Industrial R&D (SIRD or RD-1) and the Survey of Research and Development Expenditures at Universities and Colleges. Two additional annual surveys provide information on outlays and obligations by the Federal Government for R&D: The Survey of Federal Funds for R&D and the Survey of Federal Science and Engineering Support to Universities, Colleges, and Nonprofit Institutions. The biennial Scientific and Engineering Research Facilities Survey provides information on construction plans and capital spending.

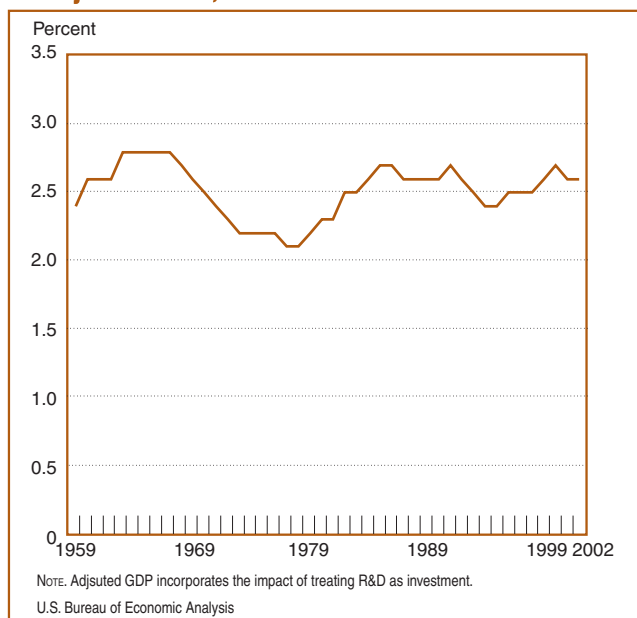
investment on final demand only; it does not include spillover effects. Spillovers—the economic benefits of R&D available to entities that did not pay to create the R&D—are not included in the national accounts framework because the national accounts value assets at their market value. This treatment is consistent with the treatment of other types of spillovers in the national accounts.

The new account makes clear that treating R&D as an investment would have a substantial impact on GDP and other measures. Highlights from the new satellite account include the following:

- Current-dollar investment in R&D totaled \$276.5 billion in 2002.
- Recognizing R&D as investment would increase the level of current-dollar GDP by an average 2½ percent per year in 1959–2002 (chart 1).<sup>2</sup>

2. The results reported in the conclusions of this report are based on estimates that value real (inflation-adjusted) R&D at prices of products produced by R&D-intensive industries.

**Chart 1. Current-Dollar R&D Investment as a Percent of Adjusted GDP, 1959–2002**



- Businesses' investment in commercial and all other types of buildings would account for just over 2 percent of real GDP growth in 1995–2002.
- R&D investment and the income flows arising from accumulated R&D capital would account for about 4½ percent of real GDP growth in 1959–2002. In 1995–2002, R&D investment would account for about 6½ percent of growth.
- R&D investment would increase current-dollar gross private domestic investment in 2002 more than 11 percent, or \$178 billion. The national saving rate in 2002 would be 16 percent, instead of 14 percent.
- Business investment in R&D as a percentage of GDP surpassed government investment as a percentage of GDP in 1981.
- Business investment accounted for just under 2 percent of current-dollar GDP in 2000, compared with just over 1 percent in 1960.

The release of the satellite account in September marks another step in BEA's efforts to adapt its measures of economic activity to structural changes in the economy (see the box "Previous NIPA Improvements Related to R&D"), particularly in the field of intangible assets. BEA plans several additional enhancements to the R&D satellite account in the near future: An improved treatment of the international aspects of R&D, improved measures of prices for R&D, and new industry-based estimates of R&D. Current plans, subject to available funding, call for the incorporation of R&D into the I-O accounts in 2012 and into the NIPAs in 2013.

The 2006 satellite account builds on the earlier work at BEA.<sup>3</sup> In 1994, BEA introduced the elements needed to translate R&D expenditures into investment, deflate investment, and develop R&D stock measures. In 2005, BEA went a step further and presented the general structure of the account along with rough estimates of the impact on GDP, gross domestic income (GDI), and national saving. The 2006 satellite account extends these previous efforts by exploring alternative scenarios that take into account the notable characteristics of R&D activity and by developing a more complete national accounts framework to estimate R&D activity.

In addition, BEA now recognizes the funder of R&D as the owner of R&D, that is, the entity that benefits from the activity; earlier versions focused on the performer of R&D. The change stems from the need to assign income flows to the economic sectors included in the national economic accounts. Assigning ownership from performer data is difficult because the performer

is not necessarily the owner. Often, the original recipient of R&D funds may subcontract to others.

### Measuring R&D as investment

Measuring the output of R&D activity presents well-known estimation challenges. Foremost among these challenges is the lack of market transactions for most R&D. Like other types of intangible investment, R&D investment is mainly created by firms and institutions for internal use; it is rarely sold on the open market. Therefore, for most of the R&D conducted in the United States, there is neither an observable market price nor a product that can be used to measure output.<sup>4</sup>

BEA's standard approach to estimating nonmarket activity—such as the output of government and non-profit entities as well as goods that businesses create for their own use—is to measure the activity as the sum of input costs. In the case of R&D, this approach is made possible by detailed, 50-year time-series data collected by the NSF. However, the input-cost approach raises a critical issue: How to adjust this proxy measure of R&D output to account for changing prices? One of the methods conventionally used for nonmarket output is to apply input price indexes to these costs, thereby producing a measure of real output. Unfortunately, this approach seems ill-suited for measuring R&D: Deflation using input prices assumes that the output prices are changing at exactly the same rate as input costs, which precludes productivity gains that stem from R&D. In other words, this approach cannot account for multifactor productivity growth.

As a result, an input-price method would not reflect the dynamism of R&D activity. Products that embody a high level of R&D, such as computers and communication equipment, tend to have relatively short life cycles, paced by the rapid introduction of new, R&D-driven technologies. This relatively fast obsolescence means that the time period during which the costs of R&D must be recovered is short. In order to earn high rates of return, companies in R&D-intensive industries must raise the productivity of new products by lowering costs and increasing sales.

To account for these market dynamics, the 2006 R&D satellite account provides estimates for four R&D scenarios—scenarios A, B, C, and D. The scenarios differ in their assumptions in these areas: Price indexes, depreciation, rates of return to businesses, and rates of return to government and nonprofit institutions serving households.

3. See Carson, Grimm, and Moylan (1994). See also Fraumeni and Okubo (2005).

4. Census Bureau data for the R&D services industries provide estimates of market R&D, but this R&D is a relatively small share of total domestic R&D activity.

The rest of this article is organized as follows:

- The first section presents the new estimates of R&D investment activity and details the impact of R&D on such measures as real GDP. It introduces the four scenarios through which R&D is measured.
- The second section presents future initiatives to enhance the R&D satellite account.
- The third section discusses key conceptual and methodological issues that underlie the account.

This article also includes a list of references and tables of estimates from the 2006 R&D satellite account.

## R&D and the Economy

This section discusses the current treatment of R&D in the NIPAs; new estimates of current-dollar R&D activity, the treatment of R&D in the 2006 satellite account, and the effect of R&D on key economic measures under the four scenarios.

### Current treatment of R&D in BEA's accounts

Domestic R&D expenditures are currently only partly identifiable in BEA's accounts.

In the I-O accounts, the identifiable portion is based on data from the Census Bureau on establishments classified in the scientific research and development services industry. In BEA's GDP-by-industry accounts, estimates for the value added of this industry are included in a broader sector: Miscellaneous professional, scientific, and technical services. While Federal Government purchases of R&D are included in the I-O accounts, they are not separately identified.

In the NIPAs, Federal purchases of R&D are treated as government consumption, and spending on R&D by foundations and nonprofit institutions serving households are included in personal consumption expenditures (consumer spending). In addition, BEA's

estimates of international trade in services provide measures of exports and imports of R&D services. BEA separately estimates royalties and licensing fees, which include transactions for the use of R&D protected by patents, considered payments for intermediate inputs.

### Estimates of current-dollar R&D

To provide a more complete picture of R&D activity, the satellite account provides new R&D investment estimates derived from data from NSF (table A). The preliminary estimates shows that current-dollar investment in R&D totaled \$276.5 billion in 2002, accounting for 2.6 percent of GDP (adjusted to include R&D as investment). Historically, the ratio of current-dollar R&D investment to current-dollar GDP rose in the mid-1960s, as the U.S. invested more in space-related technologies, and fell in the 1970s. The ratio trended upward again the early 1980s. Since 1990, the ratio has averaged 2.5 percent (chart 1).

**Business and government.** During the early era of space exploration in the mid-1960s, the R&D investment by government (Federal, state, and local governments) amounted to more than 2 percent of current-dollar GDP. Since 1960, Government R&D as a percentage of GDP has declined steadily since the 1960s, falling to a 0.8 percent of GDP in 2000. In that year, business-sector R&D investment equaled 1.8 percent of GDP.

Government's contribution to total R&D investment was also at its highest in the middle of the 1960s, when it funded almost three-quarters of all R&D investment (chart 2). By 1981, business funded more investment in R&D than government.

**Funders and performers.** The satellite account shows R&D activity by both funders and performers (table B). In the satellite account, government includes

Table A. NSF Survey Data on Expenditures and Methods Used for Current-Dollar R&D Investment

Steps		Method	Impact on investment
1	Align the survey data on expenditures for labor, material, and supplies with <i>Frascati</i> -defined R&D	Add expenditures for R&D in social sciences and the humanities. Subtract expenditures for commercialization	Increases Decreases
2	Adjust the survey data for consistency with the NIPAs	Convert data from a fiscal year to a calendar year Subtract expenditures for foreign performers	Increases or decreases Decreases
3	Adjust the data for the double-counting of capital	Subtract capital expenditures for purchase of structures, equipment, and software	Decreases
4	Adjust the data to move from expenditures to the full value of investment	Add the consumption of fixed capital on structures, equipment, and software Add other taxes on production less production-related subsidies	Increases Increases
5	Adjust the data for imports of R&D	Add imported R&D to domestic investment	Increases
6	Adjust the data for exports of R&D	Subtract exported R&D from domestic investment	Decreases

NIPAs National income and product accounts  
NSF National Science Foundation

public universities and colleges, and nonprofit institutions serving households includes private universities and colleges. The 2006 satellite account shows the marked decline in government-funded R&D, compared with business- and nonprofit-funded R&D in 1960–2002; government-funded R&D accounted for 35.5 percent of total R&D in 2002, compared with 57 percent in 1960. In contrast, the performer-based share of total R&D investment by business and government has not changed nearly as much.

**Investment and saving.** R&D investment has had a progressively greater impact on gross private domestic investment since 1960. In 2002, domestic investment would have been 11.3 percent higher if R&D were included, compared with 9.8 percent in 1990 and 7.5

percent in 1960 (table C). The national saving rate would have been 2.1 percentage points higher in 2002.

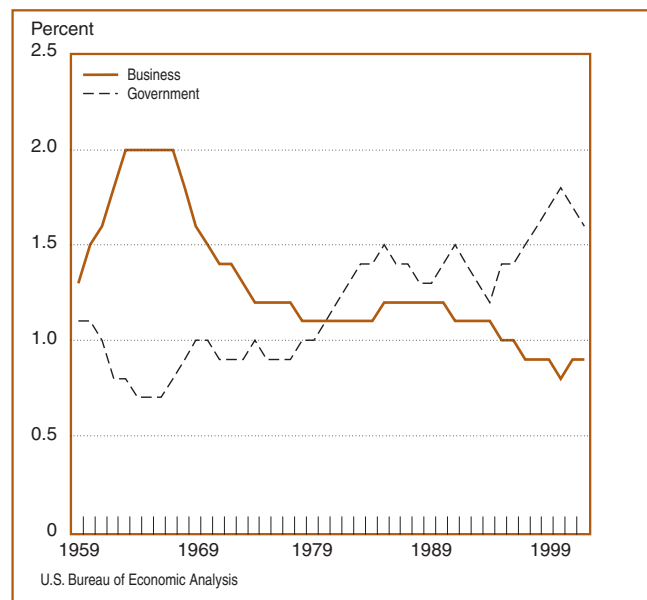
**Table C. Impact on Gross Private Domestic Investment and the Saving Rate When R&D is Treated as Investment**

	Gross private domestic investment <sup>1</sup>			National saving rate <sup>2</sup>		
	Unadjusted (billions)	Adjusted (billions)	Impact (percent)	Unadjusted (percent)	Adjusted (percent)	Impact (percentage points)
1960 .....	78.9	84.8	7.5	21.0	23.1	2.1
1970 .....	152.4	163.1	7.1	18.6	20.5	1.9
1980 .....	479.3	512.0	6.8	19.7	21.6	1.9
1990 .....	861.0	945.4	9.8	16.3	18.5	2.2
2002 .....	1,582.1	1,760.4	11.3	14.2	16.3	2.1

1. Applies to all scenarios.

2. Calculated as the ratio of the sum of gross saving (from NIPA table 5.1) to the sum of gross national income expressed as a percent. Implemented using assumptions in scenario D.

**Chart 2. Nominal R&D Investment Funded by Business and Government as a Percent of GDP**



### Proposed treatment to capitalize R&D investment

Treating R&D as an investment, rather than as an expense, in the calculation of GDP and other accounts would require significant changes to current NIPA concepts and methodologies (table D). The estimated impact is largest in the business sector, but nonprofit institutions serving households and general government are also affected.

**Business sector.** Reclassifying business R&D expenditures as investment would lead to an increase in GDP equal to the value of the R&D expenditures. Currently, business expenditures on R&D are considered intermediate input expenditures, which are not included in GDP. The recognition of R&D as investment also affects business income and private consumption of fixed capital (CFC), both components of gross domestic income (GDI). Because R&D would no longer be considered an expense, gross business income (proprietors' income and corporate profits) would increase

**Table B. Selected Summary Measures of R&D**

[Percent based on current-dollar measures]

	1960	1965	1970	1975	1980	1985	1990	1995	1998	1999	2000	2001	2002
<b>Funder-based R&amp;D investment as a percent of adjusted GDP</b>													
Business .....	1.1	0.7	1.0	0.9	1.1	1.5	1.4	1.4	1.6	1.7	1.8	1.7	1.6
Government .....	1.5	2.0	1.5	1.2	1.1	1.2	1.2	1.0	0.9	0.9	0.8	0.9	0.9
Nonprofit institutions serving households .....	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Funder-based R&amp;D investment as a percent of total R&amp;D .....</b>													
Business .....	42.0	25.4	38.9	42.4	48.4	55.1	52.5	56.3	61.8	64.2	66.7	65.1	61.8
Government .....	57.0	73.3	59.6	56.0	49.9	43.2	45.2	41.1	35.7	33.4	30.8	32.4	35.5
Nonprofit institutions serving households .....	1.0	1.3	1.5	1.6	1.7	1.7	2.3	2.5	2.5	2.5	2.4	2.5	2.7
<b>Performer-based R&amp;D investment as a percent of total R&amp;D</b>													
Business .....	76.8	70.0	68.8	67.6	69.9	73.6	71.2	71.4	74.3	74.8	75.2	73.3	70.9
Government .....	17.2	21.4	22.3	23.8	20.8	18.4	19.3	18.5	16.6	16.0	15.3	16.5	18.2
Nonprofit institutions serving households .....	6.0	8.7	8.8	8.6	9.3	8.0	9.5	10.0	9.1	9.2	9.5	10.2	11.0

NOTES. Calculations are based on tables 1.2, 2.1, and 3.1. Implemented using assumptions defined in Scenario D. Numbers do not sum to 100 because of rounding.

by the elimination of the deduction for R&D expenditures.

**Nonprofit institutions serving households and general government.** In these two sectors, R&D expenditures would be reclassified from consumption expenditures to investment; because consumption expenditures are already part of GDP, this shift alone would not change the measure of GDP. However, recognizing these expenditures as investment would increase the measure of consumption by nonprofit institutions and general government by an amount equal to the value of the CFC (depreciation) of the R&D. Thus, GDP and GDI would increase correspondingly. This treatment is consistent with the current NIPA treatment of government and nonprofit investment in which the CFC of those assets serves as a partial measure of the services they provide. The featured estimates for this account also include a net return to government and nonprofit R&D capital in addition to CFC. Therefore, GDP would rise by an amount equal to the value of CFC plus the net return for government and nonprofit R&D investment.

### The four scenarios

To further explore the effect of R&D activity on the economy, BEA constructed four R&D scenarios—sce-

narios A, B, C, and D. Each scenario adopts the sector-specific methodological changes outlined above, but each also attempts to capture some specific characteristics of R&D activity, such as relatively high productivity, rapid depreciation, and high rates of return.

The scenarios differ in regard to assumptions in four areas: Price indexes, depreciation, rates of return to businesses, and rates of return to government and nonprofit institutions (table E).

**Price indexes.** R&D investment is difficult to measure largely because most R&D is not bought and sold in markets. Typically, the companies that conduct the R&D are also the companies that use the R&D to produce new and/or better goods and services. Conceptually, the value of R&D to a company is equal to the discounted present value of the future benefits that the company derives from the R&D.

However, this value is embedded in the value of all the goods and services the company sells, and there is no direct measure of either the contribution of R&D to those sales or the market price underlying R&D assets. Companies can normally report what they spent on wages, salaries, contractors, and other costs of conducting R&D but not the market price of R&D. For computers, communications equipment, and other assets that are bought and sold in final goods markets,

**Table D. Effects of Treating R&D as Investment in the National Accounts**

Sector	Gross domestic product (GDP)			Gross domestic income (GDI)	
	Treatment in GDP	Adjusted GDP <sup>1</sup>	Change in GDP	Adjusted GDI <sup>2</sup>	Change in GDI
Business .....	Intermediate consumption	Reclassify to investment	Increase	Increase in business income equal to R&D investment less CFC Increase in CFC	Increase
Nonprofit institutions serving households	PCE	Reclassify to investment	Increase	Increase in returns to R&D capital	Increase
General government .....	Government consumption	Reclassify to investment	Increase	Increase in returns to R&D capital	Increase

1. Adjusted GDP incorporates the impact of treating R&D as investment.

2. Adjusted GDI incorporates the impact of treating R&D as investment.

NOTE: This table applies to all scenarios.

CFC Consumption of fixed capital

PCE Personal consumption expenditures

**Table E. Assumptions for the Scenarios in the R&D Satellite Account**

Parameter	Depreciation of R&D	Price index	Net return to business R&D	Net return to government and nonprofit R&D
Scenario A .....	15 percent	Input cost-component based	Same as other fixed assets	None
Scenario B .....	Before 1987: Change in private fixed investment in nonresidential equipment and software depreciation. After 1987: Information processing equipment depreciation.	Input price index adjusted with BLS multifactor productivity to proxy high-productivity growth in manufacturing.	Average net rate of 15 percent	Estimated net return based on long-term average in the 10-year real Treasury rate, plus a higher premium for R&D investment.
Scenario C .....	Same as scenario B	Composite price index based on the value added of five high-productivity service industries.	Same as scenario B	Same as scenario B
Scenario D .....	Same as scenario B	Composite price index based on the value added of the four manufacturing industries that perform the most R&D.	Same as scenario B	Same as scenario B

companies know the market price of the asset and its share of sales as well as the share of profits that came from the difference between the sales price and the cost of producing such assets. For these assets, it is straightforward to estimate real (inflation-adjusted) values by simply dividing the current-dollar value of these assets by a price index based on their sales.

However, for R&D, the value of the assets and their contribution to sales are indistinguishably bundled with those of the companies' overall assets. Therefore, the only available current-dollar value is the cost of their production. The issue then becomes how to deflate this current-dollar value to produce an estimate of real investment. Each scenario embodies a different deflation method:

- **Scenario A.** This scenario is perhaps the most straightforward way to estimate real R&D. It bases the measure of current-dollar R&D output on input costs and then deflates this output measure with the price index created from information on the cost components for R&D. This method is currently

used by BEA to measure the value of real investment that companies create for their own use. The obvious drawback to this approach is that it necessarily implies zero productivity growth because real output, by definition, grows at the same rate as real inputs. Thus, this approach seems particularly inappropriate for measuring a dynamic sector like R&D.

- **Scenario B.** This scenario assumes that the value of real R&D output is higher than the value of real R&D inputs by the amount of productivity growth recorded in higher productivity industries. The price index used to calculate real output is calculated by subtracting average multifactor productivity (MFP) growth for a group of manufacturing industries with the highest MFP growth from the increase in the price indexes used in scenario A. This adjustment provides a cost-based index that reflects the high productivity growth of R&D.

- **Scenario C.** This scenario assumes that the value of real R&D output is proportional to the output prices of the most productive services industries.

### Previous NIPA Improvements Related to R&D

The Bureau of Economic Analysis (BEA) continues to update the U.S. economic accounts to better reflect the evolving economy, with a focus on high-technology-oriented goods and services. This box summarizes two previous important improvements.

#### Hedonic indexes

In the mid-1980s, BEA introduced hedonic, or quality-adjusted, price indexes for computers and peripherals into the national income and product accounts (NIPAs). Since then, it has gradually introduced quality-adjusted indexes for other goods, including semiconductors and digital telephone equipment. Currently, approximately 20 percent of real gross domestic product (GDP) is deflated using quality-adjusted price indexes that rely at least partly on hedonic methods. Use of such methods has improved the estimates of real GDP and the value of real output of services industries that use information technology (IT).

#### Intangibles

BEA has long recognized that so-called intangible assets play a significant role in the economy. Like tangible assets, intangible assets are created from production processes and tend to be used in other processes of production. Examples include R&D, software, business processes, and business-specific training.

In 1999, BEA capitalized spending on computer software, treating it as investment in its calculation of GDP. BEA's proposed treatment of R&D investment, outlined

in this article, largely mirrors BEA's current treatment of software. The inclusion of computer software as an investment has helped economists better explain the resurgence in economic growth in the last decade. Between 1995 and 2002, software's average contribution to the growth in real GDP was 5.0 percent. Between 1973 and 1994, its average contribution was 2.7 percent.

These innovations have provided the basis for better measures of IT-related industries and their contributions to economic growth. Indeed, Triplett and Bosworth have used improved BEA data on real industry output (GDP by industry) to show that services-producing industries "have emerged as the dominant engines of U.S. economic growth" over the past decade (Triplett and Bosworth 2004).

Improved measures of IT have also been useful to researchers analyzing multifactor productivity—the unexplained portion of economic growth that remains after the contributions of labor, capital, and intermediate inputs have been measured. Improvements in both concepts and measurement have helped to both lower the unexplained portion of economic growth and to explain the contributions of information technology to the increase in growth and multifactor productivity in the last decade.

Because intangible assets are increasingly important components of the knowledge economy, BEA has begun preliminary research on prototype accounts for health care, human capital, and education.

While services industries traditionally have lower productivity growth and higher inflation than the industries in the goods sector, key industries have a good record of producing high-productivity, declining relative prices and ever-increasing real output per unit of input. In this scenario, real R&D output is estimated using a weighted average of BEA's GDP-by-industry value-added price indexes of these high-productivity services industries: Air transportation, broadcasting and telecommunications, securities and commodity brokers, and information-processing and data-processing services.<sup>5</sup>

● **Scenario D.** This scenario assumes that the value of real R&D output is proportional to the output prices of R&D-intensive products. The prices of such products may be the best proxies for the value of the R&D embodied in these products. This index is calculated from price indexes for the largest R&D-performing manufacturing industries. Based on NSF industry performer data, these industries are chemicals, computer and electronic products, machinery, and aerospace and defense.

**Depreciation.** R&D capital does not wear out the way tangible goods do, but it clearly loses value over time because of obsolescence. It loses value as new innovations appear and as earlier R&D becomes relatively less effective in the production process. An additional loss could stem from the gradual leakage of information to competitors and the expiration of intellectual property protection.

For tangible assets, BEA typically uses empirical studies of markets for used assets to determine depreciation rates. This type of information is not available for R&D, but economists have estimated the range of average annual depreciation rates for business R&D to be between 12 and 25 percent.<sup>6</sup> For government and public universities and colleges, the depreciation rate is likely to be lower because the R&D is often concentrated in basic research, which is likely to obsolesce more slowly.

The assumed depreciation rate for scenario A, the most straightforward scenario, is 15 percent a year. Scenarios B, C, and D incorporate an alternative meth-

od that proxies the effect of a more rapid pace of technological change in recent years and thus an accelerating rate of depreciation. This faster rate of obsolescence is consistent with the work of Caballero and Jaffe (1993), whose work with patents found an accelerating rate of obsolescence in the 1990s, compared with earlier decades. Scenarios B, C, and D assume a depreciation rate before 1987 that is equal to the depreciation rate of overall investment in equipment and software. After 1987, the rate is assumed to be equal to the depreciation rate for information-processing equipment and software.<sup>7</sup> The resulting depreciation series starts at about 16 percent in 1959 and reaches about 23 percent in 2002.

**Business rates of return.** Studies have shown a fairly wide range of estimates of the rate of return for R&D (table F). Despite the wide range, the private rates of return are high relative to other investments. The total returns, which include spillovers, are higher still—about twice the corresponding private returns to the originators of the R&D. Many of these studies were performed in the late 1970s and 1980s. More recently, higher returns have been necessary to offset the increasing rates of technical obsolescence, faster depreciation, volatility, and risk that have occurred for products that embody R&D, such as computers, software, and other information-communications-technology products.

**Table F. Summary of Estimated Gross Private and Total Rates of Return to R&D**

[Rate of return, percent]

Source	Gross private rates of return	Total rates of return, including spillovers
Sveikauskas 1981.....	7–25	50
Bernstein and Nadiri 1988.....	10–27	11–111
Bernstein and Nadiri 1991.....	15–28	20–110
Nadiri 1993.....	20–30	50
Mansfield et al. 1977.....	25	56
Goto and Suzuki 1989.....	26	80
Terleckyj 1974.....	29	48–78
Scherer 1982,1984.....	29–43	64–147

NOTE: The gross private rate of return to R&D includes depreciation.

SOURCE: Table 8.1 in Fraumeni and Okubo (2005).

Scenario A, the most straightforward of the scenarios, assumes an average rate of return to business R&D investment of 11 percent in 1959–2002, the same return earned by other private fixed assets. However, scenarios B, C, and D assume a higher average net rate of return, 15 percent.

**Returns to government and nonprofit institutions.** The current NIPA treatment does not include any net returns to fixed assets owned by governments

5. These indexes were used instead of producer price indexes from the Bureau of Labor Statistics (BLS) because, in most cases, the timespan for industry coverage by BLS is not long enough to enable the use of BLS producer price indexes as deflators. For example, the BLS producer price index for broadcast and telecom equipment—an industry that appears in the top five productive services index—is only available for 1991 forward. The R&D work requires an index that covers 1959 forward.

6. Pakes and Schankerman (1984) found the average annual decay rate of R&D to be 25 percent; Nadiri and Prucha (1996) estimated the annual depreciation rate of industrial R&D capital stock to be 12 percent. In 1996, Lev and Sougiannis estimated decay rates of R&D in six industries, finding a range of 12 to 20 percent and an average depreciation rate of 15 percent. Most recently, Bernstein and Mamuneaus (2004) calculated a 25-percent depreciation rate for the manufacturing sector.

7. Table I compares this faster depreciation rate to the 15-percent depreciation rate used in scenario A.

and nonprofit institutions serving households. It treats CFC (depreciation) of those assets as a partial measure of the services they provide; thus, the net return is zero by construction.

Scenario A adopts the current treatment; it does not account for any net returns to R&D investment by governments and nonprofit institutions serving households. However, scenarios B, C, and D assume a net return to R&D spending by government and nonprofit institutions equal to the average real rate on 10-year Treasury securities, adjusted to reflect a higher return to R&D relative to other types of investments. The additional returns in scenarios B, C, and D were deflated with a price index created for scenario B, the high-productivity services-sector industries.

### Impact of R&D on key NIPA measures

BEA reports the estimates based on scenario D as the preliminary estimates for the 2006 R&D satellite account. These estimates approximate a midrange of the three high-productivity options. Estimates based on scenario D for real GDP, current-dollar GDP, real GDI, and the saving rate are presented in tables 1.1–1.4.

### Scenario comparison

For analytical purposes, a look at each scenario's estimates is instructive, especially estimates of contributions to real GDP and real GDP growth.

Scenario A, which assumes no productivity growth, produces the smallest impact on GDP of the alternatives tested; in 1959–2002, R&D boosted current-dollar GDP by an annual average 2.3 percent (table G).

**Table G. Impact on Current-Dollar GDP When R&D is Treated as Investment**

	1960	1970	1980	1990	2002	Average in 1959–2002
Billions of dollars						
GDP .....	526	1,039	2,790	5,803	10,470	.....
GDP in scenario A .....	536	1,064	2,852	5,944	10,734	.....
GDP in scenario B .....	537	1,069	2,859	5,963	10,751	.....
GDP in scenario C .....	538	1,067	2,856	5,962	10,744	.....
GDP in scenario D .....	538	1,069	2,857	5,962	10,747	.....
Percent change in GDP						
Scenario A .....	1.8	2.5	2.3	2.4	2.5	2.3
Scenario B .....	2.1	2.9	2.5	2.8	2.7	2.6
Scenario C .....	2.2	2.8	2.4	2.7	2.6	2.6
Scenario D .....	2.2	2.9	2.4	2.7	2.7	2.6

NOTES. Scenario A uses an input price index.  
Scenario B uses a multifactor productivity-adjusted price index.  
Scenario C uses a high-productivity service industries price index.  
Scenario D uses a top four R&D performers price index.  
Source: Table 1.2.

The average contribution to real GDP growth was 2.2 percent (table H).

**Table H. Average Percent of Real GDP Growth Attributed to Treating R&D as Investment Selected Periods**

	1959–73	1974–94	1995–2002	1959–2002
Scenario A .....	2.3	1.8	2.7	2.2
Scenario B .....	4.5	4.7	6.8	4.9
Scenario C .....	3.9	3.9	6.3	4.3
Scenario D .....	4.0	4.3	6.7	4.6

NOTES. Scenario A uses an input price index.  
Scenario B uses a multifactor productivity-adjusted price index.  
Scenario C uses a high-productivity service industries price index.  
Scenario D uses a top four R&D performers price index.

In scenarios B, C, and D—the high-productivity-growth scenarios—the average increase in the level of current-dollar GDP was 2.6 percent each. Scenarios B, C, and D also produce a relatively tight range of contributions to the growth in real GDP (table H). The largest contribution to growth (4.9 percent) in 1959–2002 comes from scenario B, which uses the high-MFP index. In scenario C, which uses the composite price index from the high-productivity services industries, the contribution in 1959–2002 averages 4.3 percent, and the contribution in 1995–2002 is 6.3 percent. Scenario D, which uses a composite price index for R&D performing industries, yields a similar overall contribution, 4.6 percent, and a similar contribution in 1995–2002, 6.7 percent.

### Step-by-step comparisons

To get a clearer picture of the step-by-step impact of specific assumptions in each scenario, table I provides a decomposition of R&D's contribution to average real GDP growth for each scenario for 1995–2002 and 1959–2002. By looking down the columns and across the rows, the cumulative impact of each assumption can be seen.

**Table I. Average Percent of Real GDP Growth Attributed to Treating R&D as Investment Decomposition, Selected Periods**

	Depreciation		Depreciation and net return	
	1995–2002	1959–2002	1995–2002	1959–2002
Scenario A .....	2.7	2.2	n.a.	n.a.
Scenario A with accelerated depreciation rate <sup>1</sup> .....	2.8	2.4	n.a.	n.a.
Scenario B .....	6.5	4.4	6.8	4.9
Scenario C .....	6.1	3.8	6.3	4.3
Scenario D .....	6.5	4.1	6.7	4.6

n.a. Not available  
1. Scenario A with accelerated depreciation is presented as an intermediate step to scenarios B, C, and D.

NOTES. Scenario A uses an input price index.  
Scenario B uses a multifactor productivity-adjusted price index.  
Scenario C uses a high-productivity service industries price index.  
Scenario D uses a top four R&D performers price index.



Table I shows the contribution of R&D to real GDP growth for scenario A in two cases: (1) When the depreciation rate is assumed to be 15 percent and (2) when the depreciation rate is accelerated. Accelerating the depreciation rate results in a higher contribution to the average contribution to GDP growth in 1959–2002 and 1995–2002.

Scenarios B, C, and D also assume an accelerated depreciation rate; however, they include other changed assumptions as well: (1) Different output price indexes for deflation purposes and (2) a return for government and nonprofit institution capital services. The return for capital services includes both CFC and a net return, which are both deflated with the high-productivity services industries price index.

The average contributions for scenarios B, C, and D, given all assumptions, are shown in table I in the far right columns.

For scenario D, the featured estimates of the average R&D-related contributions to the average real GDP growth rate combine (1) the price-index impact that raises the contribution of R&D from 2.4 percent (scenario A) to 4.1 percent and (2) the impact of the net return component of capital services that raises the estimate from 4.1 percent to 4.6 percent in 1959–2002. Thus, the total increase in the contribution of R&D, 2.2 percentage points, is largely due to the selection of the output price index.

### Future Initiatives

In the near future, BEA intends to explore a variety of issues related to R&D investment. These issues include international flows of R&D transactions, improved output measures, improved input deflators, the treatment of R&D spillovers, the ownership of R&D assets, and improved estimates of capital services for R&D.

#### International flows of R&D transactions

There are two dimensions of international transactions for R&D and a related category of payments for the use of R&D: International trade in research, development, and testing services; business funding of foreign-performed R&D; and royalties and licensing fees for the use of industrial processes.

BEA's R&D satellite account presents estimates of the stock of R&D located in the United States, regardless of the residence of the owner. The satellite account treats all domestically performed business R&D as producing U.S. assets and excludes R&D performed abroad by foreign affiliates of U.S. companies. This treatment implicitly assumes that the private benefits of R&D are obtained in the country where the R&D is performed. The stock estimates presented in this arti-

cle are not adjusted for R&D investment by U.S. and foreign multinational companies or the exports and imports of research, development, and testing services. Adjustment for exports and imports of research, development, and testing services is planned for the 2007 R&D satellite account. Including R&D investment by multinationals requires data not currently available and remains a longer-term project.

#### Improved output measures, input deflators

In 2007, BEA plans to refine its methodology for measuring real R&D output. In particular, BEA intends to develop a methodology for weighting the relative importance of high R&D-performing industries. BEA also plans to develop improved R&D price deflators for the largest input cost: Compensation of R&D personnel in business. (These price deflators were used in scenario A.)

Over the longer term, a framework for including R&D in the U.S. industry accounts needs to be constructed. The goal is to develop a more detailed look at the composition of R&D costs across industries and to develop improved R&D deflators for compensation and the other input costs, with an emphasis on certain key industries such as computer manufacturing, electronic products, and pharmaceuticals. For example, the makeup of R&D personnel (scientists, engineers, technicians, and administrative support) or the nature of R&D physical capital investment and its depreciation may vary significantly across industries. The composition of an industry's R&D funding may also be used to develop improved R&D deflators, especially for those industries that have a high portion of their R&D funded by the Federal Government.

#### Treatment of R&D spillovers

Spillovers (externalities) exist when the social benefit (or cost) of an economic activity exceeds the private benefit (or cost). These spillovers are not currently included within the existing framework of the U.S. national accounts or the System of National Accounts (SNA), the internationally accepted national-accounts guidelines issued by the United Nations.

However, a satellite account—because it allows for the adjustment of national accounting conventions without changing the core accounts—can provide a means of exploring the effects of spillovers. Any potential experimental estimates of R&D spillovers will be included in the R&D satellite account—not the core GDP accounts.

Explicit identification of spillovers have not been included in the national accounting framework, because those accounts value assets at their private value, that

is, the value of the asset to the owner.<sup>8</sup> The effects of spillovers are implicitly reflected in those market prices, but the national accounts do not attempt to estimate, for example, what share of economic growth is determined by the market value of computers. It does not include the efficiencies and value added (over and above the price paid for the computers) that accrue to the financial and other industries that use the computers. These spillovers form part of the unexplained multifactor residual in economic growth. Nonetheless, national economic accounting agencies, including BEA, recognize the interest in the value of R&D to society as a whole.

Although no attempt has been made to estimate the total impact of R&D, including spillovers, on economic growth, it is possible to infer the relative impact using studies of rates of return. If, as earlier studies have suggested, spillovers to other industries (and other firms in the same industry) are at least as large as the returns to the original investor, then R&D might account for a fifth of the 33 percent of economic growth between 1995 and 2002 that cannot be accounted for by conventional inputs and is described as multifactor or total factor productivity.

BEA's role in growth accounting continues to be to provide the data that other economists use to analyze the sources of economic growth. BEA intends to continue to explore the issue within the satellite account framework.

### Ownership of R&D assets

The estimates presented in this satellite account assume that the funder of R&D owns the R&D. BEA plans to develop guidelines that can be applied to the existing survey data and that would use available information about the assignment of intellectual property rights—who has the right to patent and collect royalties—to refine its funder-based estimates of ownership of R&D. BEA also intends to refine the definition of R&D as an asset.

In the longer term, BEA will work with its data providers to align survey questions to the economic concepts necessary to identify ownership and location of use. Although some R&D produced by governments, nonprofits, and academic institutions may not be considered an economic asset in the final analysis, it is likely to have a measurable impact on economic activity; it is important that this type of R&D be reported separately.

### Estimates of capital services for R&D

Capital services estimates would enhance the useful-

ness of the R&D capital stocks for productivity analysis purposes, but preliminary capital services estimates would likely be somewhat speculative because of the limited availability of price data for the use of R&D. Given the efforts to harmonize BEA statistics with those of the productivity program of BLS, developing capital services estimates for R&D is a high priority.

### Other long-term improvements

**R&D stocks by type.** Estimating R&D stocks by basic research, applied research, and development of new products and processes would enhance the usefulness of the R&D satellite account. If BEA were able to create consistent time series of these stocks, an improved set of estimates could include depreciation rates that differ by type of R&D asset. BEA is exploring the issue.

**Enhanced source data.** Several long-term improvements to the R&D satellite accounts require improved survey data. For example, the estimates of CFC used in the production of R&D would be greatly improved by survey data on expenditures for structures, equipment, and software used in the production of R&D. Similarly, better data on the nature of the transaction between the funder and the performer of R&D would improve the assignment of R&D to sectors and the separation of domestic R&D investment from foreign R&D investment.

**Alignment of data.** As BEA considers incorporating R&D as investment in the NIPAs, an immediate challenge will be the alignment of NSF data and data from other sources with the industry classification systems used for enterprise and establishment data at BEA. BEA is currently working on developing an industry framework for R&D that will lead to industry-based estimates for R&D.

**Timing.** Currently, R&D surveys are conducted annually or less frequently, and the publication lag is usually between 1 and 2 years. For the NIPAs, quarterly estimates with a lag of 1 month after the end of the quarter are required.

### Conceptual and Methodological Issues

For a more detailed discussion of the methodology, see "R&D Satellite Account: Preliminary Estimates" on BEA's Web site at <[www.bea.gov/bea/newsrelarchive/2006/rdreport06.pdf](http://www.bea.gov/bea/newsrelarchive/2006/rdreport06.pdf)>. Various highlights are discussed in this section.

### Changes from previous versions

The methodologies used for the 2006 satellite account extend the methodologies used in the R&D estimates published in 1994 and the prototype account published in 2005. The 2006 satellite account includes R&D capital stocks and places R&D investment flows

8. Spillovers are not included in the value of investment in the NIPAs. However, their effects on production are captured in GDP.

and the income it generates within the accounts for GDP and the NIPA sectors.

Important methodological changes to real estimates over the period include the following:

- Chain-type price measures of real output and prices have been implemented, eliminating the overstatement of real R&D growth for periods after the base year and the understatement of real R&D growth for periods before the base year.
- For the input price index approach (scenario A), a new methodology for deflating business R&D has been developed; it uses price measures based on unpublished BEA industry accounts data from the scientific research and development services industry (NAICS 5417) instead of price measures for each industry. Also, a new methodology for deflating academic R&D has been developed; it uses an academic R&D price index developed by the National Center for Education Statistics.<sup>9</sup>
- Real R&D investment by source of funding is now presented.

Important changes to the capital stock measures include the following:

- A new measure of R&D capital stocks has been developed; it is based on the funder of the R&D that is performed, and it better approximates the ownership assumed for R&D capital.
- A geometric rate of depreciation is now used; it replaces the depreciation pattern based on a straight-line perpetual inventory method.

### Scope of R&D investment

To define the scope of R&D investment, BEA evaluated two international standards: The United Nations Sys-

9. This series ends in 1995; BEA extrapolates this academic R&D price index with NIPA personal consumption expenditures for education and research in 1996–2002 as the indicator.

tem of National Accounts (SNA) and the Organisation for Economic Co-operation and Development's *Frascati Manual*. BEA selected the *Frascati* definition of R&D as currently implemented by NSF in its R&D surveys mainly because BEA relies on NSF source data. In addition, the *Frascati* definition is closely related to the new proposed international standard, making it easier to compare BEA's estimates with other countries' estimates. The quality that distinguishes the *Frascati* definition from the SNA definition is the requirement that R&D include "an appreciable element of novelty and the resolution of scientific and/or technical uncertainty" (OECD 2002). Innovative activity that does not involve novelty or technological uncertainty is not considered R&D in this definition.

### Funders and performers

The aggregated investment measures for R&D are presented in the tables by major performer and major funder. The stocks of R&D are presented by funders.

The data are disaggregated into two major institutional categories: Private and government ("public") organizations. Several subcategories are also included. Private organizations consist of businesses; private universities and colleges; private hospitals, charitable foundations, and other nonprofit institutions serving households; and most Federally funded research and development centers (FFRDCs).<sup>10</sup> Government organizations consist of the Federal Government, state and local governments excluding universities and

10. FFRDCs are R&D organizations financed almost entirely by the Federal Government. They are shown separately and grouped with the entities that administer them in the performer-based presentation of investment (table 4.1). Grouping FFRDCs in the performing sector that administers them is consistent with the NIPAs. However, NSF reports that all FFRDC activities are more similar to Federal Government laboratories and classifies them as such. Since these institutions are by definition Federally funded, they are included with the government-funded investments and stocks of R&D.

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colleges, public universities and colleges, and FFRDCs administered by state and local governments, primarily public universities and colleges.

All estimates of current-dollar R&D investment are prepared by first compiling data available from the various NSF surveys and then by adjusting these data to be statistically and conceptually consistent with BEA definitions in the NIPAs. Performer-based estimates of real R&D expenditures are derived by deflating the most detailed current-dollar expenditures by appropriate price indexes. BEA develops real R&D capital stocks by treating the R&D expenditures as investment and aggregating them based on methodologies that BEA uses for other types of fixed assets.

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Tables 1.1 through 4.2 follow.

Table 1.1 Real Gross Domestic Product (GDP) and Real GDP with R&amp;D Adjustment, 1959–2002

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
	Millions of chained (2000) dollars										
<b>GDP</b> .....	<b>2,441,284</b>	<b>2,501,756</b>	<b>2,559,971</b>	<b>2,715,177</b>	<b>2,833,963</b>	<b>2,998,593</b>	<b>3,191,104</b>	<b>3,399,126</b>	<b>3,484,631</b>	<b>3,652,698</b>	<b>3,765,397</b>
GDP in scenario A.....	2,502,659	2,565,662	2,625,397	2,783,699	2,904,051	3,075,350	3,273,862	3,488,592	3,581,411	3,757,836	3,878,390
GDP in scenario B.....	2,420,604	2,483,638	2,542,362	2,697,952	2,820,469	2,989,212	3,185,433	3,399,490	3,490,303	3,665,215	3,786,821
GDP in scenario C.....	2,445,880	2,508,464	2,566,699	2,722,588	2,845,305	3,014,490	3,211,437	3,425,506	3,516,609	3,692,356	3,813,249
GDP in scenario D.....	2,433,272	2,495,636	2,553,750	2,709,405	2,831,435	2,999,995	3,196,455	3,410,207	3,501,384	3,677,109	3,798,474
	Percent change in GDP										
Scenario A.....	2.5	2.6	2.6	2.5	2.5	2.6	2.6	2.6	2.8	2.9	3.0
Scenario B.....	-0.8	-0.7	-0.7	-0.6	-0.5	-0.3	-0.2	0.0	0.2	0.3	0.6
Scenario C.....	0.2	0.3	0.3	0.3	0.4	0.5	0.6	0.8	0.9	1.1	1.3
Scenario D.....	-0.3	-0.2	-0.2	-0.2	-0.1	0.0	0.2	0.3	0.5	0.7	0.9
	Millions of chained (2000) dollars										
<b>GDP</b> .....	<b>3,771,876</b>	<b>3,898,613</b>	<b>4,104,966</b>	<b>4,341,456</b>	<b>4,319,565</b>	<b>4,311,220</b>	<b>4,540,937</b>	<b>4,750,529</b>	<b>5,014,999</b>	<b>5,173,444</b>	<b>5,161,664</b>
GDP in scenario A.....	3,884,122	4,010,468	4,221,217	4,459,915	4,437,032	4,426,896	4,658,709	4,870,337	5,138,778	5,301,841	5,293,226
GDP in scenario B.....	3,794,770	3,917,134	4,122,556	4,360,936	4,343,362	4,334,079	4,562,387	4,773,152	5,041,454	5,208,956	5,204,844
GDP in scenario C.....	3,821,081	3,946,060	4,153,281	4,392,222	4,372,838	4,364,135	4,594,468	4,805,887	5,074,523	5,241,918	5,237,989
GDP in scenario D.....	3,806,630	3,929,155	4,134,402	4,372,442	4,353,132	4,344,582	4,573,782	4,784,281	5,051,619	5,218,489	5,214,164
	Percent change in GDP										
Scenario A.....	3.0	2.9	2.8	2.7	2.7	2.7	2.6	2.5	2.5	2.5	2.5
Scenario B.....	0.6	0.5	0.4	0.4	0.6	0.5	0.5	0.5	0.5	0.7	0.8
Scenario C.....	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	1.5
Scenario D.....	0.9	0.8	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.9	1.0
	Millions of chained (2000) dollars										
<b>GDP</b> .....	<b>5,291,739</b>	<b>5,189,250</b>	<b>5,423,777</b>	<b>5,813,609</b>	<b>6,053,732</b>	<b>6,263,619</b>	<b>6,475,076</b>	<b>6,742,687</b>	<b>6,981,436</b>	<b>7,112,492</b>	<b>7,100,516</b>
GDP in scenario A.....	5,427,980	5,331,796	5,574,518	5,973,632	6,221,370	6,432,311	6,643,641	6,913,975	7,154,928	7,294,017	7,280,807
GDP in scenario B.....	5,342,129	5,247,277	5,488,282	5,886,756	6,132,559	6,341,916	6,563,368	6,840,134	7,086,997	7,231,365	7,232,449
GDP in scenario C.....	5,376,220	5,280,726	5,521,588	5,919,172	6,161,986	6,367,610	6,586,516	6,861,026	7,106,571	7,250,125	7,250,352
GDP in scenario D.....	5,351,827	5,256,969	5,497,665	5,895,716	6,141,307	6,350,228	6,571,094	6,847,327	7,094,000	7,238,144	7,238,603
	Percent change in GDP										
Scenario A.....	2.6	2.7	2.8	2.8	2.8	2.7	2.6	2.5	2.5	2.6	2.7
Scenario B.....	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.4	1.5	1.7	1.9
Scenario C.....	1.6	1.8	1.8	1.8	1.8	1.7	1.7	1.8	1.8	1.9	2.1
Scenario D.....	1.1	1.3	1.4	1.4	1.4	1.4	1.5	1.6	1.6	1.8	1.9
	Millions of chained (2000) dollars										
<b>GDP</b> .....	<b>7,336,614</b>	<b>7,532,658</b>	<b>7,835,512</b>	<b>8,031,655</b>	<b>8,328,913</b>	<b>8,703,528</b>	<b>9,066,854</b>	<b>9,470,332</b>	<b>9,816,973</b>	<b>9,890,694</b>	<b>10,048,846</b>
GDP in scenario A.....	7,526,957	7,719,384	8,023,550	8,234,469	8,542,059	8,928,417	9,303,370	9,721,418	10,082,823	10,151,897	10,295,813
GDP in scenario B.....	7,470,918	7,666,435	7,975,238	8,189,862	8,504,107	8,896,708	9,282,527	9,716,479	10,098,968	10,181,259	10,339,339
GDP in scenario C.....	7,487,939	7,682,131	7,989,464	8,201,751	8,513,219	8,901,578	9,285,008	9,716,956	10,097,907	10,182,661	10,342,505
GDP in scenario D.....	7,476,063	7,670,520	7,978,141	8,191,480	8,505,043	8,896,713	9,284,297	9,717,955	10,098,145	10,183,341	10,341,526
	Percent change in GDP										
Scenario A.....	2.6	2.5	2.4	2.5	2.6	2.6	2.6	2.7	2.7	2.6	2.5
Scenario B.....	1.8	1.8	1.8	2.0	2.1	2.2	2.4	2.6	2.9	2.9	2.9
Scenario C.....	2.1	2.0	2.0	2.1	2.2	2.3	2.4	2.6	2.9	3.0	2.9
Scenario D.....	1.9	1.8	1.8	2.0	2.1	2.2	2.4	2.6	2.9	3.0	2.9

Notes. Percentage change is calculated from GDP for each year.  
Adjusted GDP incorporates the impact of treating R&D as investment.  
Scenario A uses an input price index.  
Scenario B uses a multifactor productivity-adjusted price index.  
Scenario C uses a high-productivity service industries price index.  
Scenario D uses a top four R&D performers price index.

Table 1.2 Current-Dollar Gross Domestic Product (GDP) and GDP with R&amp;D Adjustments, 1959–2002

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
	Millions of dollars										
<b>GDP</b> .....	<b>506,585</b>	<b>526,398</b>	<b>544,716</b>	<b>585,627</b>	<b>617,740</b>	<b>663,615</b>	<b>719,119</b>	<b>787,788</b>	<b>832,596</b>	<b>909,989</b>	<b>984,602</b>
GDP in scenario A .....	515,740	536,110	554,792	596,139	629,137	676,479	733,416	804,140	851,070	931,319	1,008,944
GDP in scenario B .....	516,850	537,449	556,355	598,014	631,700	679,588	737,175	808,828	855,833	936,150	1,013,644
GDP in scenario C .....	517,230	537,756	556,726	598,258	631,904	679,700	737,228	808,430	855,405	935,697	1,012,453
GDP in scenario D .....	517,380	537,950	556,757	598,506	632,002	679,755	737,346	808,735	855,877	936,495	1,013,865
	Percent change in GDP										
Scenario A .....	1.8	1.8	1.8	1.8	1.8	1.9	2.0	2.1	2.2	2.3	2.5
Scenario B .....	2.0	2.1	2.1	2.1	2.3	2.4	2.5	2.7	2.8	2.9	2.9
Scenario C .....	2.1	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.8
Scenario D .....	2.1	2.2	2.2	2.2	2.3	2.4	2.5	2.7	2.8	2.9	3.0

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	Millions of dollars										
<b>GDP</b> .....	<b>1,038,545</b>	<b>1,127,118</b>	<b>1,238,292</b>	<b>1,382,704</b>	<b>1,499,978</b>	<b>1,638,339</b>	<b>1,825,267</b>	<b>2,030,945</b>	<b>2,294,706</b>	<b>2,563,326</b>	<b>2,789,504</b>
GDP in scenario A .....	1,064,390	1,154,342	1,267,947	1,414,822	1,534,975	1,676,081	1,866,147	2,075,218	2,343,566	2,618,688	2,852,494
GDP in scenario B .....	1,068,569	1,158,291	1,271,507	1,418,686	1,539,570	1,680,325	1,870,680	2,080,265	2,349,551	2,625,568	2,859,291
GDP in scenario C .....	1,067,149	1,158,009	1,271,790	1,418,623	1,538,163	1,679,626	1,871,028	2,080,758	2,349,029	2,622,846	2,855,987
GDP in scenario D .....	1,069,084	1,159,122	1,272,341	1,419,305	1,538,923	1,680,552	1,871,990	2,081,814	2,350,053	2,624,773	2,857,476
	Percent change in GDP										
Scenario A .....	2.5	2.4	2.4	2.3	2.3	2.3	2.2	2.2	2.1	2.2	2.3
Scenario B .....	2.9	2.8	2.7	2.6	2.6	2.6	2.5	2.4	2.4	2.4	2.5
Scenario C .....	2.8	2.7	2.7	2.6	2.5	2.5	2.5	2.5	2.4	2.3	2.4
Scenario D .....	2.9	2.8	2.7	2.6	2.6	2.6	2.6	2.5	2.4	2.4	2.4

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	Millions of dollars										
<b>GDP</b> .....	<b>3,128,435</b>	<b>3,255,011</b>	<b>3,536,665</b>	<b>3,933,173</b>	<b>4,220,262</b>	<b>4,462,825</b>	<b>4,739,471</b>	<b>5,103,791</b>	<b>5,484,350</b>	<b>5,803,067</b>	<b>5,995,926</b>
GDP in scenario A .....	3,200,388	3,335,419	3,625,340	4,031,912	4,327,600	4,573,170	4,854,806	5,226,089	5,613,704	5,943,750	6,148,830
GDP in scenario B .....	3,208,403	3,342,222	3,632,466	4,040,445	4,337,161	4,583,164	4,866,150	5,240,357	5,631,357	5,963,292	6,169,819
GDP in scenario C .....	3,205,224	3,341,779	3,633,847	4,043,769	4,343,431	4,590,982	4,871,027	5,244,029	5,631,720	5,961,603	6,167,636
GDP in scenario D .....	3,206,014	3,342,096	3,632,755	4,040,694	4,336,794	4,582,991	4,866,039	5,239,936	5,629,729	5,961,864	6,169,705
	Percent change in GDP										
Scenario A .....	2.3	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4	2.6
Scenario B .....	2.6	2.7	2.7	2.7	2.8	2.7	2.7	2.7	2.7	2.8	2.9
Scenario C .....	2.5	2.7	2.7	2.8	2.9	2.9	2.8	2.7	2.7	2.7	2.9
Scenario D .....	2.5	2.7	2.7	2.7	2.8	2.7	2.7	2.7	2.7	2.7	2.9

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	Millions of dollars										
<b>GDP</b> .....	<b>6,337,744</b>	<b>6,657,408</b>	<b>7,072,228</b>	<b>7,397,651</b>	<b>7,816,860</b>	<b>8,304,344</b>	<b>8,746,997</b>	<b>9,268,412</b>	<b>9,816,973</b>	<b>10,127,976</b>	<b>10,469,603</b>
GDP in scenario A .....	6,495,124	6,815,813	7,235,079	7,577,084	8,010,315	8,512,490	8,969,464	9,509,980	10,082,824	10,396,528	10,733,588
GDP in scenario B .....	6,515,711	6,837,580	7,256,189	7,597,208	8,031,684	8,533,352	8,990,650	9,529,791	10,098,969	10,414,785	10,751,493
GDP in scenario C .....	6,515,410	6,838,426	7,257,585	7,600,648	8,034,824	8,539,094	8,993,329	9,530,358	10,097,908	10,409,475	10,743,502
GDP in scenario D .....	6,517,268	6,838,562	7,258,581	7,597,809	8,030,540	8,532,485	8,985,561	9,526,281	10,098,146	10,410,270	10,747,342
	Percent change in GDP										
Scenario A .....	2.5	2.4	2.3	2.4	2.5	2.5	2.5	2.6	2.7	2.7	2.5
Scenario B .....	2.8	2.7	2.6	2.7	2.7	2.8	2.8	2.8	2.9	2.8	2.7
Scenario C .....	2.8	2.7	2.6	2.7	2.8	2.8	2.8	2.8	2.9	2.8	2.6
Scenario D .....	2.8	2.7	2.6	2.7	2.7	2.7	2.7	2.8	2.9	2.8	2.7

NOTES. Percent change is calculated from GDP for each year.  
Adjusted GDP incorporates the impact of treating R&D as investment.  
Scenario A uses an input price index.  
Scenario B uses a multifactor productivity-adjusted price index.  
Scenario C uses a high-productivity service industries price index.  
Scenario D uses a top four R&D performers price index.



Table 1.3 Gross Domestic Income (GDI) and GDI with R&amp;D Adjustments, 1959–2002

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
	Millions of dollars										
<b>GDI</b> .....	<b>506,124</b>	<b>527,327</b>	<b>545,266</b>	<b>585,269</b>	<b>618,511</b>	<b>662,767</b>	<b>717,529</b>	<b>781,511</b>	<b>827,959</b>	<b>905,435</b>	<b>981,437</b>
GDI in scenario A.....	515,279	537,039	555,342	595,781	629,908	675,631	731,826	797,863	846,433	926,765	1,005,779
GDI in scenario B.....	516,389	538,378	556,905	597,656	632,471	678,740	735,585	802,551	851,196	931,596	1,010,479
GDI in scenario C.....	516,769	538,685	557,276	597,900	632,675	678,852	735,638	802,153	850,768	931,143	1,009,288
GDI in scenario D.....	516,919	538,879	557,307	598,148	632,773	678,907	735,756	802,458	851,240	931,941	1,010,700
	Percent change in GDI										
Scenario A.....	1.8	1.8	1.8	1.8	1.8	1.9	2.0	2.1	2.2	2.4	2.5
Scenario B.....	2.0	2.1	2.1	2.1	2.3	2.4	2.5	2.7	2.8	2.9	3.0
Scenario C.....	2.1	2.2	2.2	2.2	2.3	2.4	2.5	2.6	2.8	2.8	2.8
Scenario D.....	2.1	2.2	2.2	2.2	2.3	2.4	2.5	2.7	2.8	2.9	3.0

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	Millions of dollars										
<b>GDI</b> .....	<b>1,031,241</b>	<b>1,115,515</b>	<b>1,229,172</b>	<b>1,374,059</b>	<b>1,489,124</b>	<b>1,620,627</b>	<b>1,800,138</b>	<b>2,008,651</b>	<b>2,268,128</b>	<b>2,517,280</b>	<b>2,748,069</b>
GDI in scenario A.....	1,057,086	1,142,739	1,258,827	1,406,177	1,524,121	1,658,369	1,841,018	2,052,924	2,316,988	2,572,642	2,811,059
GDI in scenario B.....	1,061,265	1,146,688	1,262,387	1,410,041	1,528,716	1,662,613	1,845,551	2,057,971	2,322,973	2,579,522	2,817,856
GDI in scenario C.....	1,059,845	1,146,406	1,262,670	1,409,978	1,527,309	1,661,914	1,845,899	2,058,464	2,322,451	2,576,800	2,814,552
GDI in scenario D.....	1,061,780	1,147,519	1,263,221	1,410,660	1,528,069	1,662,840	1,846,861	2,059,520	2,323,475	2,578,727	2,816,041
	Percent change in GDI										
Scenario A.....	2.5	2.4	2.4	2.3	2.4	2.3	2.3	2.2	2.2	2.2	2.3
Scenario B.....	2.9	2.8	2.7	2.6	2.7	2.6	2.5	2.5	2.4	2.5	2.5
Scenario C.....	2.8	2.8	2.7	2.6	2.6	2.5	2.5	2.5	2.4	2.4	2.4
Scenario D.....	3.0	2.9	2.8	2.7	2.6	2.6	2.6	2.5	2.4	2.4	2.5

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	Millions of dollars										
<b>GDI</b> .....	<b>3,097,508</b>	<b>3,254,706</b>	<b>3,490,932</b>	<b>3,918,582</b>	<b>4,203,578</b>	<b>4,415,834</b>	<b>4,717,795</b>	<b>5,123,316</b>	<b>5,444,689</b>	<b>5,736,843</b>	<b>5,923,410</b>
GDI in scenario A.....	3,169,461	3,335,114	3,579,607	4,017,321	4,310,916	4,526,179	4,833,130	5,245,614	5,574,043	5,877,526	6,076,314
GDI in scenario B.....	3,177,476	3,341,917	3,586,733	4,025,854	4,320,477	4,536,173	4,844,474	5,259,882	5,591,696	5,897,068	6,097,303
GDI in scenario C.....	3,174,297	3,341,474	3,588,114	4,029,178	4,326,747	4,543,991	4,849,351	5,263,554	5,592,059	5,895,379	6,095,120
GDI in scenario D.....	3,175,087	3,341,791	3,587,022	4,026,103	4,320,110	4,536,000	4,844,363	5,259,461	5,590,068	5,895,640	6,097,189
	Percent change in GDI										
Scenario A.....	2.3	2.5	2.5	2.5	2.6	2.5	2.4	2.4	2.4	2.5	2.6
Scenario B.....	2.6	2.7	2.7	2.7	2.8	2.7	2.7	2.7	2.7	2.8	2.9
Scenario C.....	2.5	2.7	2.8	2.8	2.9	2.9	2.8	2.7	2.7	2.8	2.9
Scenario D.....	2.5	2.7	2.8	2.7	2.8	2.7	2.7	2.7	2.7	2.8	2.9

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	Millions of dollars										
<b>GDI</b> .....	<b>6,234,996</b>	<b>6,517,867</b>	<b>6,929,731</b>	<b>7,296,466</b>	<b>7,723,173</b>	<b>8,233,690</b>	<b>8,761,644</b>	<b>9,304,137</b>	<b>9,944,136</b>	<b>10,217,619</b>	<b>10,490,593</b>
GDI in scenario A.....	6,392,376	6,676,272	7,092,582	7,475,899	7,916,628	8,441,836	8,984,111	9,545,705	10,209,987	10,486,171	10,754,578
GDI in scenario B.....	6,412,963	6,698,039	7,113,692	7,496,023	7,937,997	8,462,698	9,005,297	9,565,516	10,226,132	10,504,428	10,772,483
GDI in scenario C.....	6,412,662	6,698,885	7,115,088	7,499,463	7,941,137	8,468,440	9,007,976	9,566,083	10,225,071	10,499,118	10,764,492
GDI in scenario D.....	6,414,520	6,699,021	7,116,084	7,496,624	7,936,853	8,461,831	9,000,208	9,562,006	10,225,309	10,499,913	10,768,332
	Percent change in GDI										
Scenario A.....	2.5	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.7	2.6	2.5
Scenario B.....	2.9	2.8	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.7
Scenario C.....	2.8	2.8	2.7	2.8	2.8	2.9	2.8	2.8	2.8	2.8	2.6
Scenario D.....	2.9	2.8	2.7	2.7	2.8	2.8	2.7	2.8	2.8	2.8	2.6

Notes. Percent change is calculated from GDI for each year.  
Adjusted GDI incorporates the impact of treating R&D as investment.

Table 1.4 National Saving and National Saving with R&amp;D Adjustment as a Percent of Adjusted Gross National Income, 1959–2002

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
National saving .....	20.9	21.0	20.8	21.2	21.4	21.5	21.9	21.4	20.5	20.0	20.1
National saving in scenario A .....	22.9	23.2	23.1	23.4	23.8	23.9	24.3	23.8	22.8	22.2	22.2
National saving in scenario B .....	22.9	23.1	23.0	23.4	23.7	23.8	24.1	23.7	22.7	22.1	22.1
National saving in scenario C .....	22.9	23.1	23.0	23.4	23.6	23.8	24.1	23.7	22.7	22.1	22.1
National saving in scenario D .....	22.9	23.1	23.0	23.3	23.6	23.8	24.1	23.7	22.7	22.1	22.1

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
National saving .....	18.6	18.6	19.2	21.1	20.0	18.2	18.8	19.6	20.9	21.1	19.7
National saving in scenario A .....	20.6	20.5	21.1	22.8	21.8	20.0	20.6	21.3	22.6	22.8	21.6
National saving in scenario B .....	20.5	20.5	21.0	22.8	21.7	19.9	20.5	21.3	22.5	22.7	21.6
National saving in scenario C .....	20.6	20.5	21.0	22.8	21.8	19.9	20.5	21.3	22.5	22.8	21.6
National saving in scenario D .....	20.5	20.5	21.0	22.7	21.8	19.9	20.5	21.3	22.5	22.7	21.6

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
National saving .....	20.9	19.1	17.3	19.6	18.1	16.5	16.8	17.8	17.3	16.3	16.2
National saving in scenario A .....	22.8	21.1	19.4	21.6	20.4	18.8	19.1	19.9	19.4	18.5	18.5
National saving in scenario B .....	22.7	21.1	19.3	21.6	20.3	18.8	19.0	19.9	19.4	18.5	18.4
National saving in scenario C .....	22.7	21.1	19.3	21.6	20.3	18.8	19.0	19.9	19.4	18.5	18.4
National saving in scenario D .....	22.7	21.1	19.3	21.6	20.3	18.8	19.0	19.9	19.4	18.5	18.4

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
National saving .....	15.1	14.7	15.4	16.2	16.6	17.7	18.2	17.9	17.7	16.2	14.2
National saving in scenario A .....	17.4	16.9	17.5	18.2	18.7	19.8	20.3	20.0	19.9	18.4	16.4
National saving in scenario B .....	17.3	16.8	17.4	18.2	18.7	19.7	20.2	20.0	19.9	18.3	16.3
National saving in scenario C .....	17.3	16.8	17.4	18.2	18.7	19.7	20.2	20.0	19.9	18.3	16.4
National saving in scenario D .....	17.3	16.8	17.4	18.2	18.7	19.7	20.2	20.0	19.9	18.3	16.3

NOTE. Adjusted national saving incorporates the impact of treating R&D as investment.

Table 1.5 Aggregate Current-Cost Returns to R&amp;D Assets, 1959–2002

[Millions of chained (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Business</b>											
Net returns .....	3,689	3,788	3,981	4,362	4,475	4,762	5,156	5,403	5,444	5,943	6,256
Depreciation .....	4,001	4,297	4,483	4,610	4,605	4,655	4,771	5,002	5,363	5,855	6,549
<b>Nonprofit institutions serving households</b>											
Net returns .....	36	37	40	48	54	63	74	84	89	100	104
Depreciation .....	94	101	109	122	135	149	165	187	212	237	262
<b>Government</b>											
Net returns .....	1,336	1,500	1,768	2,225	2,651	3,246	3,961	4,537	4,821	5,313	5,368
Depreciation .....	3,496	4,107	4,806	5,674	6,582	7,657	8,846	10,135	11,462	12,633	13,561

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Business</b>											
Net returns .....	6,361	7,200	7,869	8,664	8,741	9,904	11,380	13,017	14,213	14,920	15,626
Depreciation .....	7,493	8,272	8,976	9,793	10,984	12,619	14,205	15,748	17,058	19,054	21,497
<b>Nonprofit institutions serving households</b>											
Net returns .....	104	117	128	140	138	156	180	206	226	236	244
Depreciation .....	295	325	353	381	419	480	542	602	654	728	809
<b>Government</b>											
Net returns .....	5,147	5,559	5,832	6,127	5,875	6,380	7,067	7,800	8,202	8,212	8,159
Depreciation .....	14,631	15,413	16,055	16,713	17,816	19,616	21,288	22,771	23,755	25,309	27,087

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Business</b>											
Net returns .....	18,963	20,898	24,731	30,911	33,998	36,039	39,079	43,635	46,511	48,663	51,236
Depreciation .....	24,645	29,090	32,527	36,241	40,548	44,862	48,555	52,683	57,631	63,458	70,774
<b>Nonprofit institutions serving households</b>											
Net returns .....	290	312	359	434	464	489	543	631	707	773	840
Depreciation .....	909	1,048	1,140	1,229	1,335	1,470	1,628	1,838	2,114	2,432	2,799
<b>Government</b>											
Net returns .....	9,362	9,704	10,759	12,575	13,061	13,471	14,526	16,173	17,251	17,997	18,591
Depreciation .....	29,363	32,598	34,147	35,577	37,591	40,465	43,552	47,120	51,581	56,633	61,971

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Business</b>											
Net returns .....	54,646	57,143	60,390	62,383	67,699	73,935	74,187	78,729	84,244	83,335	88,324
Depreciation .....	76,371	79,972	82,617	83,201	87,299	93,770	98,798	109,445	122,177	134,688	141,814
<b>Nonprofit institutions serving households</b>											
Net returns .....	924	1,003	1,101	1,158	1,249	1,343	1,322	1,367	1,413	1,366	1,465
Depreciation .....	3,115	3,387	3,635	3,727	3,887	4,110	4,249	4,587	4,945	5,328	5,674
<b>Government</b>											
Net returns .....	19,400	20,118	21,258	21,579	22,425	23,199	21,886	21,608	21,242	19,654	20,478
Depreciation .....	65,426	67,944	70,180	69,452	69,781	71,003	70,335	72,489	74,342	76,654	79,343

NOTE. Implemented using assumptions defined in scenario D.

Table 2.1. Historical-Cost Investment Flows in R&amp;D Assets by Funder, 1959–2002

[Millions of dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D investment</b> .....	<b>12,575</b>	<b>13,819</b>	<b>14,625</b>	<b>15,662</b>	<b>17,483</b>	<b>19,094</b>	<b>20,374</b>	<b>22,321</b>	<b>23,728</b>	<b>25,109</b>	<b>26,286</b>
<b>Private</b> .....	<b>5,967</b>	<b>5,948</b>	<b>5,484</b>	<b>5,009</b>	<b>5,057</b>	<b>5,248</b>	<b>5,440</b>	<b>6,295</b>	<b>7,014</b>	<b>8,562</b>	<b>10,325</b>
Business .....	5,834	5,807	5,318	4,811	4,840	5,025	5,180	6,004	6,697	8,223	9,968
Universities and colleges .....	16	18	19	21	22	28	38	46	52	56	59
Other nonprofit institutions serving households .....	117	123	147	177	195	195	222	244	266	284	298
<b>Government</b> .....	<b>6,607</b>	<b>7,871</b>	<b>9,141</b>	<b>10,653</b>	<b>12,426</b>	<b>13,847</b>	<b>14,934</b>	<b>16,026</b>	<b>16,714</b>	<b>16,547</b>	<b>15,961</b>
Federal Government extramural .....	4,785	5,876	6,962	8,264	9,713	10,729	11,492	12,312	12,786	12,520	11,751
Federal Government intramural .....	1,668	1,823	1,988	2,177	2,476	2,853	3,153	3,382	3,556	3,610	3,736
State and local governments <sup>1</sup> .....	111	123	136	150	165	181	194	215	226	253	298
Universities and colleges .....	44	48	54	62	72	84	95	116	146	164	176

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D investment</b> .....	<b>26,627</b>	<b>27,460</b>	<b>29,404</b>	<b>31,738</b>	<b>34,330</b>	<b>36,757</b>	<b>40,523</b>	<b>44,432</b>	<b>49,694</b>	<b>56,878</b>	<b>65,461</b>
<b>Private</b> .....	<b>10,761</b>	<b>11,017</b>	<b>12,133</b>	<b>13,711</b>	<b>15,226</b>	<b>16,187</b>	<b>18,321</b>	<b>20,248</b>	<b>23,381</b>	<b>27,955</b>	<b>32,788</b>
Business .....	10,363	10,590	11,680	13,241	14,696	15,582	17,646	19,491	22,509	26,963	31,673
Universities and colleges .....	64	70	70	68	74	81	90	108	134	156	174
Other nonprofit institutions serving households .....	334	358	384	402	457	523	585	649	738	836	940
<b>Government</b> .....	<b>15,866</b>	<b>16,442</b>	<b>17,270</b>	<b>18,027</b>	<b>19,104</b>	<b>20,571</b>	<b>22,202</b>	<b>24,184</b>	<b>26,313</b>	<b>28,924</b>	<b>32,674</b>
Federal Government extramural .....	11,288	11,427	11,802	12,227	12,895	13,911	15,209	16,839	18,367	20,229	22,980
Federal Government intramural .....	4,053	4,430	4,831	5,084	5,405	5,777	6,037	6,271	6,706	7,292	8,106
State and local governments <sup>1</sup> .....	329	363	394	438	480	529	566	613	693	772	844
Universities and colleges .....	196	221	243	278	324	354	390	461	547	631	743

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D investment</b> .....	<b>74,798</b>	<b>82,924</b>	<b>91,680</b>	<b>103,948</b>	<b>116,262</b>	<b>122,744</b>	<b>127,619</b>	<b>135,602</b>	<b>143,924</b>	<b>154,233</b>	<b>163,575</b>
<b>Private</b> .....	<b>38,940</b>	<b>44,855</b>	<b>51,255</b>	<b>59,436</b>	<b>66,029</b>	<b>66,478</b>	<b>68,792</b>	<b>73,273</b>	<b>76,970</b>	<b>84,482</b>	<b>93,488</b>
Business .....	37,656	43,423	49,685	57,706	64,082	64,270	66,320	70,383	73,726	80,962	89,578
Universities and colleges .....	202	230	242	269	304	342	383	428	478	546	618
Other nonprofit institutions serving households .....	1,082	1,201	1,328	1,462	1,643	1,866	2,089	2,463	2,765	2,974	3,293
<b>Government</b> .....	<b>35,858</b>	<b>38,069</b>	<b>40,425</b>	<b>44,512</b>	<b>50,234</b>	<b>56,267</b>	<b>58,827</b>	<b>62,329</b>	<b>66,954</b>	<b>69,752</b>	<b>70,087</b>
Federal Government extramural .....	25,257	26,733	27,976	30,718	34,877	39,397	41,811	44,273	47,568	49,401	49,557
Federal Government intramural .....	8,795	9,333	10,256	11,390	12,604	13,688	13,510	14,190	15,109	15,675	15,566
State and local governments <sup>1</sup> .....	952	1,026	1,083	1,169	1,326	1,511	1,634	1,779	1,914	2,039	2,128
Universities and colleges .....	854	978	1,110	1,235	1,427	1,671	1,872	2,086	2,362	2,636	2,836

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D investment</b> .....	<b>167,786</b>	<b>168,051</b>	<b>171,635</b>	<b>185,086</b>	<b>198,769</b>	<b>213,827</b>	<b>227,725</b>	<b>245,878</b>	<b>268,559</b>	<b>275,294</b>	<b>276,533</b>
<b>Private</b> .....	<b>94,842</b>	<b>93,106</b>	<b>94,715</b>	<b>108,937</b>	<b>121,293</b>	<b>133,804</b>	<b>146,481</b>	<b>163,863</b>	<b>185,749</b>	<b>186,207</b>	<b>178,269</b>
Business .....	90,659	88,702	90,179	104,242	116,338	128,485	140,772	157,817	179,231	179,292	170,779
Universities and colleges .....	631	629	651	708	782	797	811	883	972	1,061	1,190
Other nonprofit institutions serving households .....	3,551	3,775	3,885	3,987	4,173	4,522	4,898	5,163	5,546	5,854	6,300
<b>Government</b> .....	<b>72,945</b>	<b>74,945</b>	<b>76,920</b>	<b>76,149</b>	<b>77,476</b>	<b>80,023</b>	<b>81,244</b>	<b>82,015</b>	<b>82,810</b>	<b>89,087</b>	<b>98,264</b>
Federal Government extramural .....	51,986	53,297	54,849	54,108	55,210	56,832	57,638	57,953	58,032	61,831	68,713
Federal Government intramural .....	15,867	16,405	16,599	16,318	16,159	16,570	16,566	16,481	16,450	18,249	19,922
State and local governments <sup>1</sup> .....	2,162	2,178	2,215	2,344	2,473	2,590	2,683	2,851	3,080	3,269	3,482
Universities and colleges .....	2,930	3,066	3,257	3,379	3,633	4,032	4,357	4,730	5,249	5,739	6,147

1. Excludes universities and colleges.

**Table 2.2. Real Investment Flows in R&D Assets by Funder, 1959–2002**  
 [Millions of chained (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D investment</b> .....	<b>19,409</b>	<b>21,224</b>	<b>22,509</b>	<b>23,972</b>	<b>27,174</b>	<b>29,844</b>	<b>31,749</b>	<b>34,247</b>	<b>35,446</b>	<b>36,558</b>	<b>37,446</b>
<b>Private</b> .....	<b>9,211</b>	<b>9,135</b>	<b>8,440</b>	<b>7,666</b>	<b>7,860</b>	<b>8,202</b>	<b>8,477</b>	<b>9,659</b>	<b>10,478</b>	<b>12,466</b>	<b>14,709</b>
Business.....	9,005	8,919	8,185	7,364	7,522	7,854	8,072	9,212	10,004	11,972	14,201
Universities and colleges.....	25	27	29	31	34	44	60	71	77	81	84
Other nonprofit institutions serving households.....	181	190	226	271	303	305	345	375	397	413	424
<b>Government</b> .....	<b>10,199</b>	<b>12,089</b>	<b>14,069</b>	<b>16,306</b>	<b>19,314</b>	<b>21,642</b>	<b>23,271</b>	<b>24,589</b>	<b>24,968</b>	<b>24,092</b>	<b>22,738</b>
Federal Government extramural.....	7,385	9,024	10,715	12,649	15,097	16,769	17,907	18,891	19,100	18,228	16,740
Federal Government intramural.....	2,574	2,801	3,060	3,332	3,848	4,459	4,913	5,190	5,312	5,256	5,322
State and local governments <sup>1</sup> .....	171	189	210	229	257	282	302	330	338	369	425
Universities and colleges.....	68	74	84	95	112	131	149	178	218	239	250

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D investment</b> .....	<b>36,008</b>	<b>35,844</b>	<b>37,862</b>	<b>40,088</b>	<b>41,528</b>	<b>40,811</b>	<b>42,011</b>	<b>43,974</b>	<b>48,227</b>	<b>53,519</b>	<b>59,495</b>
<b>Private</b> .....	<b>14,552</b>	<b>14,382</b>	<b>15,624</b>	<b>17,318</b>	<b>18,419</b>	<b>17,972</b>	<b>18,994</b>	<b>20,039</b>	<b>22,690</b>	<b>26,304</b>	<b>29,799</b>
Business.....	14,014	13,823	15,040	16,724	17,777	17,301	18,294	19,290	21,845	25,370	28,786
Universities and colleges.....	86	91	90	86	89	90	93	107	130	146	159
Other nonprofit institutions serving households.....	452	467	494	508	552	581	607	642	716	787	855
<b>Government</b> .....	<b>21,455</b>	<b>21,463</b>	<b>22,238</b>	<b>22,769</b>	<b>23,109</b>	<b>22,839</b>	<b>23,017</b>	<b>23,935</b>	<b>25,536</b>	<b>27,216</b>	<b>29,695</b>
Federal Government extramural.....	15,265	14,917	15,197	15,444	15,598	15,445	15,767	16,665	17,825	19,034	20,885
Federal Government intramural.....	5,480	5,783	6,221	6,421	6,538	6,414	6,258	6,206	6,508	6,861	7,367
State and local governments <sup>1</sup> .....	444	474	508	553	580	587	587	607	673	726	767
Universities and colleges.....	266	289	313	351	392	393	405	456	531	594	675

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D investment</b> .....	<b>64,962</b>	<b>67,722</b>	<b>74,035</b>	<b>84,296</b>	<b>95,657</b>	<b>101,469</b>	<b>106,655</b>	<b>113,115</b>	<b>118,375</b>	<b>123,975</b>	<b>126,619</b>
<b>Private</b> .....	<b>33,819</b>	<b>36,632</b>	<b>41,390</b>	<b>48,199</b>	<b>54,326</b>	<b>54,955</b>	<b>57,492</b>	<b>61,123</b>	<b>63,307</b>	<b>67,908</b>	<b>72,366</b>
Business.....	32,704	35,463	40,123	46,796	52,725	53,130	55,426	58,711	60,639	65,079	69,339
Universities and colleges.....	176	188	195	218	250	282	320	357	394	439	478
Other nonprofit institutions serving households.....	939	981	1,072	1,185	1,351	1,543	1,746	2,054	2,274	2,390	2,549
<b>Government</b> .....	<b>31,143</b>	<b>31,090</b>	<b>32,644</b>	<b>36,097</b>	<b>41,331</b>	<b>46,514</b>	<b>49,164</b>	<b>51,992</b>	<b>55,069</b>	<b>56,067</b>	<b>54,252</b>
Federal Government extramural.....	21,935	21,832	22,591	24,910	28,695	32,568	34,943	36,931	39,124	39,710	38,361
Federal Government intramural.....	7,639	7,622	8,282	9,237	10,370	11,315	11,290	11,836	12,427	12,600	12,049
State and local governments <sup>1</sup> .....	827	838	875	948	1,091	1,249	1,366	1,484	1,574	1,639	1,647
Universities and colleges.....	742	798	896	1,001	1,174	1,381	1,564	1,740	1,943	2,119	2,195

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D investment</b> .....	<b>128,330</b>	<b>129,120</b>	<b>132,713</b>	<b>149,408</b>	<b>165,738</b>	<b>184,926</b>	<b>213,125</b>	<b>239,359</b>	<b>268,559</b>	<b>285,661</b>	<b>288,335</b>
<b>Private</b> .....	<b>72,539</b>	<b>71,537</b>	<b>73,237</b>	<b>87,938</b>	<b>101,137</b>	<b>115,719</b>	<b>137,090</b>	<b>159,519</b>	<b>185,749</b>	<b>193,219</b>	<b>185,877</b>
Business.....	69,340	68,153	69,729	84,148	97,005	111,119	131,747	153,633	179,231	186,044	178,067
Universities and colleges.....	483	483	504	572	652	689	759	860	972	1,101	1,241
Other nonprofit institutions serving households.....	2,716	2,900	3,004	3,218	3,480	3,911	4,584	5,026	5,546	6,074	6,569
<b>Government</b> .....	<b>55,791</b>	<b>57,583</b>	<b>59,477</b>	<b>61,470</b>	<b>64,601</b>	<b>69,207</b>	<b>76,035</b>	<b>79,841</b>	<b>82,810</b>	<b>92,442</b>	<b>102,458</b>
Federal Government extramural.....	39,761	40,950	42,411	43,678	46,036	49,150	53,943	56,417	58,032	64,159	71,645
Federal Government intramural.....	12,136	12,604	12,835	13,172	13,474	14,330	15,504	16,044	16,450	18,936	20,773
State and local governments <sup>1</sup> .....	1,653	1,673	1,713	1,892	2,062	2,240	2,511	2,775	3,080	3,392	3,631
Universities and colleges.....	2,241	2,356	2,518	2,728	3,029	3,487	4,078	4,604	5,249	5,955	6,409

1. Excludes universities and colleges.

NOTE: Implemented using assumptions defined in scenario D.

Table 2.3. Historical-Cost Net Stock of R&amp;D Assets by Funder, 1959–2002

[Millions of dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D net stock</b> .....	<b>43,541</b>	<b>49,792</b>	<b>55,851</b>	<b>61,961</b>	<b>68,838</b>	<b>76,175</b>	<b>83,595</b>	<b>91,702</b>	<b>99,895</b>	<b>108,137</b>	<b>116,231</b>
<b>Private</b> .....	<b>23,140</b>	<b>25,171</b>	<b>26,468</b>	<b>27,131</b>	<b>27,739</b>	<b>28,432</b>	<b>29,199</b>	<b>30,642</b>	<b>32,534</b>	<b>35,574</b>	<b>39,789</b>
Business .....	22,622	24,600	25,829	26,405	26,921	27,531	28,193	29,518	31,284	34,198	38,289
Universities and colleges .....	86	90	94	99	104	115	133	156	180	205	229
Other nonprofit institutions serving households .....	432	481	545	627	714	787	874	969	1,069	1,171	1,271
<b>Government</b> .....	<b>20,401</b>	<b>24,621</b>	<b>29,383</b>	<b>34,830</b>	<b>41,100</b>	<b>47,743</b>	<b>54,395</b>	<b>61,060</b>	<b>67,361</b>	<b>72,563</b>	<b>76,442</b>
Federal Government extramural .....	13,278	16,721	20,653	25,199	30,404	35,768	41,032	46,267	51,153	55,061	57,672
Federal Government intramural .....	6,508	7,218	7,975	8,792	9,763	10,938	12,214	13,510	14,773	15,896	16,967
State and local governments <sup>1</sup> .....	431	480	534	593	657	725	796	875	953	1,044	1,164
Universities and colleges .....	184	201	221	246	275	312	353	407	482	561	640

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D net stock</b> .....	<b>123,426</b>	<b>130,313</b>	<b>137,964</b>	<b>146,627</b>	<b>156,388</b>	<b>166,930</b>	<b>179,375</b>	<b>193,568</b>	<b>210,499</b>	<b>231,537</b>	<b>257,358</b>
<b>Private</b> .....	<b>43,775</b>	<b>47,399</b>	<b>51,513</b>	<b>56,469</b>	<b>62,083</b>	<b>67,743</b>	<b>74,529</b>	<b>82,079</b>	<b>91,394</b>	<b>103,543</b>	<b>118,340</b>
Business .....	42,131	45,607	49,570	54,382	59,819	65,259	71,793	79,053	88,016	99,754	114,089
Universities and colleges .....	253	280	303	321	341	365	393	434	493	563	640
Other nonprofit institutions serving households .....	1,390	1,512	1,640	1,766	1,924	2,119	2,342	2,591	2,885	3,226	3,612
<b>Government</b> .....	<b>79,652</b>	<b>82,913</b>	<b>86,451</b>	<b>90,158</b>	<b>94,305</b>	<b>99,187</b>	<b>104,846</b>	<b>111,489</b>	<b>119,106</b>	<b>127,994</b>	<b>139,018</b>
Federal Government extramural .....	59,463	61,113	62,864	64,744	66,960	69,784	73,384	77,952	83,249	89,473	97,308
Federal Government intramural .....	18,171	19,543	21,080	22,620	24,227	25,936	27,630	29,286	31,096	33,176	35,698
State and local governments <sup>1</sup> .....	1,293	1,435	1,585	1,752	1,933	2,133	2,337	2,553	2,812	3,104	3,419
Universities and colleges .....	725	821	923	1,042	1,185	1,335	1,496	1,698	1,949	2,241	2,592

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D net stock</b> .....	<b>287,942</b>	<b>321,455</b>	<b>358,041</b>	<b>400,487</b>	<b>447,957</b>	<b>494,302</b>	<b>538,204</b>	<b>582,905</b>	<b>628,598</b>	<b>676,974</b>	<b>726,735</b>
<b>Private</b> .....	<b>136,608</b>	<b>157,608</b>	<b>181,378</b>	<b>209,149</b>	<b>238,853</b>	<b>264,517</b>	<b>288,472</b>	<b>312,979</b>	<b>337,229</b>	<b>364,791</b>	<b>396,549</b>
Business .....	131,807	152,203	175,331	202,409	231,323	256,074	279,009	302,262	325,119	351,241	381,415
Universities and colleges .....	731	834	933	1,042	1,167	1,308	1,466	1,642	1,838	2,068	2,329
Other nonprofit institutions serving households .....	4,070	4,571	5,114	5,698	6,363	7,135	7,997	9,075	10,272	11,482	12,805
<b>Government</b> .....	<b>151,334</b>	<b>163,848</b>	<b>176,664</b>	<b>191,338</b>	<b>209,103</b>	<b>229,785</b>	<b>249,732</b>	<b>269,926</b>	<b>291,369</b>	<b>312,184</b>	<b>330,187</b>
Federal Government extramural .....	106,075	114,891	123,535	133,419	145,667	160,259	174,895	189,614	205,172	220,093	232,919
Federal Government intramural .....	38,479	41,340	44,626	48,468	52,857	57,589	61,447	65,356	69,528	73,598	76,957
State and local governments <sup>1</sup> .....	3,787	4,168	4,544	4,944	5,429	6,013	6,623	7,275	7,955	8,648	9,319
Universities and colleges .....	2,994	3,449	3,958	4,507	5,150	5,923	6,766	7,681	8,714	9,845	10,992

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D net stock</b> .....	<b>772,928</b>	<b>812,435</b>	<b>849,332</b>	<b>893,137</b>	<b>943,028</b>	<b>999,364</b>	<b>1,060,105</b>	<b>1,128,526</b>	<b>1,207,664</b>	<b>1,281,162</b>	<b>1,344,780</b>
<b>Private</b> .....	<b>424,795</b>	<b>447,198</b>	<b>467,730</b>	<b>498,337</b>	<b>535,783</b>	<b>579,184</b>	<b>627,802</b>	<b>685,205</b>	<b>754,242</b>	<b>813,347</b>	<b>856,244</b>
Business .....	408,062	428,902	447,982	477,208	513,240	555,103	602,051	657,725	724,855	781,972	822,646
Universities and colleges .....	2,563	2,760	2,949	3,162	3,410	3,636	3,841	4,082	4,369	4,694	5,091
Other nonprofit institutions serving households .....	14,169	15,536	16,799	17,967	19,132	20,445	21,909	23,398	25,019	26,681	28,506
<b>Government</b> .....	<b>348,133</b>	<b>365,237</b>	<b>381,602</b>	<b>394,800</b>	<b>407,245</b>	<b>420,180</b>	<b>432,303</b>	<b>443,322</b>	<b>453,422</b>	<b>467,815</b>	<b>488,537</b>
Federal Government extramural .....	246,068	258,457	270,424	279,910	288,993	298,214	306,797	314,384	320,906	329,963	344,028
Federal Government intramural .....	80,090	83,251	86,117	88,294	89,997	91,825	93,375	94,614	95,638	98,172	101,875
State and local governments <sup>1</sup> .....	9,921	10,447	10,929	11,458	12,027	12,618	13,207	13,863	14,632	15,461	16,363
Universities and colleges .....	12,054	13,082	14,132	15,138	16,227	17,523	18,925	20,461	22,247	24,218	26,271

1. Excludes universities and colleges.

Note. Implemented using assumptions defined in scenario D.

Table 2.4. Current-Cost Net Stock of R&amp;D Assets by Funder, 1959–2002

[Millions of chained (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D net stock</b> .....	<b>44,928</b>	<b>50,300</b>	<b>55,629</b>	<b>60,574</b>	<b>66,086</b>	<b>72,644</b>	<b>79,964</b>	<b>88,767</b>	<b>97,903</b>	<b>106,707</b>	<b>116,824</b>
<b>Private</b> .....	<b>23,829</b>	<b>25,412</b>	<b>26,350</b>	<b>26,496</b>	<b>26,536</b>	<b>26,947</b>	<b>27,705</b>	<b>29,419</b>	<b>31,658</b>	<b>34,915</b>	<b>39,847</b>
Business.....	23,284	24,826	25,706	25,780	25,745	26,082	26,738	28,326	30,429	33,553	38,335
Universities and colleges.....	97	97	99	101	104	113	130	154	180	205	232
Other nonprofit institutions serving households.....	448	488	545	615	687	752	837	940	1,050	1,158	1,279
<b>Government</b> .....	<b>21,099</b>	<b>24,889</b>	<b>29,279</b>	<b>34,078</b>	<b>39,550</b>	<b>45,698</b>	<b>52,259</b>	<b>59,348</b>	<b>66,245</b>	<b>71,792</b>	<b>76,977</b>
Federal Government extramural.....	13,633	16,806	20,498	24,592	29,223	34,223	39,421	44,977	50,314	54,482	58,078
Federal Government intramural.....	6,824	7,387	8,023	8,661	9,427	10,482	11,735	13,126	14,521	15,720	17,083
State and local governments <sup>1</sup> .....	449	489	536	582	633	694	763	849	936	1,032	1,171
Universities and colleges.....	193	206	223	242	266	299	340	397	475	557	646

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D net stock</b> .....	<b>126,304</b>	<b>132,890</b>	<b>139,157</b>	<b>148,558</b>	<b>163,900</b>	<b>181,171</b>	<b>196,426</b>	<b>208,336</b>	<b>222,036</b>	<b>241,444</b>	<b>267,780</b>
<b>Private</b> .....	<b>44,646</b>	<b>48,183</b>	<b>51,814</b>	<b>57,084</b>	<b>64,921</b>	<b>73,302</b>	<b>81,274</b>	<b>87,919</b>	<b>95,932</b>	<b>107,451</b>	<b>122,580</b>
Business.....	42,961	46,354	49,854	54,969	62,549	70,611	78,288	84,677	92,386	103,518	118,173
Universities and colleges.....	261	287	306	326	358	397	431	467	518	585	663
Other nonprofit institutions serving households.....	1,423	1,542	1,654	1,789	2,015	2,294	2,555	2,775	3,028	3,349	3,744
<b>Government</b> .....	<b>81,658</b>	<b>84,708</b>	<b>87,342</b>	<b>91,474</b>	<b>98,979</b>	<b>107,870</b>	<b>115,152</b>	<b>120,417</b>	<b>126,104</b>	<b>133,992</b>	<b>145,200</b>
Federal Government extramural.....	60,973	62,467	63,548	65,724	70,322	75,973	80,702	84,290	88,223	93,736	101,690
Federal Government intramural.....	18,617	19,940	21,267	22,922	25,392	28,145	30,273	31,577	32,889	34,713	37,282
State and local governments <sup>1</sup> .....	1,324	1,463	1,597	1,774	2,024	2,308	2,549	2,737	2,955	3,227	3,550
Universities and colleges.....	744	838	930	1,055	1,241	1,443	1,628	1,812	2,037	2,317	2,677

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D net stock</b> .....	<b>303,062</b>	<b>334,452</b>	<b>359,444</b>	<b>386,788</b>	<b>419,786</b>	<b>452,274</b>	<b>484,144</b>	<b>522,241</b>	<b>565,008</b>	<b>614,795</b>	<b>658,363</b>
<b>Private</b> .....	<b>143,152</b>	<b>163,190</b>	<b>181,315</b>	<b>201,441</b>	<b>223,601</b>	<b>241,898</b>	<b>259,431</b>	<b>280,404</b>	<b>303,086</b>	<b>331,405</b>	<b>359,723</b>
Business.....	138,114	157,582	175,258	194,943	216,554	234,173	250,895	270,739	292,097	318,968	345,858
Universities and colleges.....	767	865	934	1,004	1,092	1,197	1,322	1,479	1,665	1,896	2,133
Other nonprofit institutions serving households.....	4,271	4,743	5,123	5,495	5,955	6,529	7,213	8,185	9,323	10,540	11,732
<b>Government</b> .....	<b>159,910</b>	<b>171,262</b>	<b>178,129</b>	<b>185,347</b>	<b>196,185</b>	<b>210,375</b>	<b>224,713</b>	<b>241,837</b>	<b>261,923</b>	<b>283,390</b>	<b>298,639</b>
Federal Government extramural.....	112,127	120,123	124,595	129,267	136,682	146,746	157,454	170,002	184,582	199,938	210,795
Federal Government intramural.....	40,672	43,238	45,018	46,970	49,602	52,703	55,178	58,363	62,248	66,517	69,291
State and local governments <sup>1</sup> .....	3,981	4,335	4,563	4,774	5,083	5,499	5,961	6,531	7,171	7,878	8,465
Universities and colleges.....	3,130	3,565	3,952	4,336	4,818	5,428	6,120	6,942	7,922	9,058	10,087

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D net stock</b> .....	<b>683,625</b>	<b>696,604</b>	<b>694,650</b>	<b>697,116</b>	<b>710,649</b>	<b>714,429</b>	<b>726,280</b>	<b>761,111</b>	<b>803,138</b>	<b>844,879</b>	<b>887,686</b>
<b>Private</b> .....	<b>376,377</b>	<b>384,047</b>	<b>383,050</b>	<b>390,490</b>	<b>406,843</b>	<b>418,813</b>	<b>437,115</b>	<b>471,997</b>	<b>514,770</b>	<b>550,119</b>	<b>576,419</b>
Business.....	361,396	368,134	366,639	373,736	389,606	401,371	419,252	453,279	495,094	529,271	553,928
Universities and colleges.....	2,294	2,396	2,443	2,502	2,611	2,635	2,654	2,768	2,916	3,122	3,428
Other nonprofit institutions serving households.....	12,687	13,518	13,968	14,252	14,625	14,808	15,209	15,950	16,760	17,727	19,063
<b>Government</b> .....	<b>307,248</b>	<b>312,557</b>	<b>311,600</b>	<b>306,626</b>	<b>303,806</b>	<b>295,615</b>	<b>289,166</b>	<b>289,114</b>	<b>288,368</b>	<b>294,760</b>	<b>311,267</b>
Federal Government extramural.....	217,320	221,333	220,990	217,553	215,764	209,946	205,312	205,031	203,897	207,395	218,634
Federal Government intramural.....	70,335	70,875	69,916	68,120	66,566	63,942	61,666	60,771	59,782	60,913	63,986
State and local governments <sup>1</sup> .....	8,794	8,975	8,953	8,948	9,053	8,986	8,976	9,242	9,594	10,076	10,748
Universities and colleges.....	10,798	11,373	11,741	12,005	12,423	12,742	13,212	14,071	15,094	16,376	17,898

1. Excludes universities and colleges.

Note. Implemented using assumptions defined in scenario D.

Table 2.5. Real Net Stock of R&amp;D Assets by Funder, 1959-2002

[Millions of chained (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D net stock</b> .....	<b>69,176</b>	<b>77,338</b>	<b>85,382</b>	<b>93,427</b>	<b>103,004</b>	<b>113,371</b>	<b>123,643</b>	<b>134,377</b>	<b>144,372</b>	<b>153,667</b>	<b>162,093</b>
<b>Private</b> .....	<b>36,690</b>	<b>39,071</b>	<b>40,443</b>	<b>40,867</b>	<b>41,360</b>	<b>42,054</b>	<b>42,839</b>	<b>44,535</b>	<b>46,684</b>	<b>50,281</b>	<b>55,287</b>
Business.....	35,850	38,170	39,454	39,762	40,128	40,705	41,343	42,880	44,872	48,319	53,190
Universities and colleges.....	150	150	152	156	162	176	201	233	265	295	322
Other nonprofit institutions serving households.....	690	751	836	948	1,071	1,173	1,295	1,422	1,548	1,667	1,775
<b>Government</b> .....	<b>32,486</b>	<b>38,267</b>	<b>44,939</b>	<b>52,560</b>	<b>61,644</b>	<b>71,317</b>	<b>80,804</b>	<b>89,842</b>	<b>97,688</b>	<b>103,386</b>	<b>106,806</b>
Federal Government extramural.....	20,990	25,840	31,461	37,929	45,548	53,410	60,954	68,086	74,195	78,459	80,582
Federal Government intramural.....	10,506	11,358	12,314	13,359	14,694	16,358	18,145	19,870	21,413	22,639	23,702
State and local governments <sup>1</sup> .....	692	752	822	898	986	1,083	1,180	1,285	1,380	1,486	1,625
Universities and colleges.....	298	317	342	373	415	466	525	601	700	802	896

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D net stock</b> .....	<b>167,784</b>	<b>172,286</b>	<b>177,461</b>	<b>183,588</b>	<b>189,770</b>	<b>194,259</b>	<b>198,913</b>	<b>204,169</b>	<b>212,152</b>	<b>223,244</b>	<b>237,847</b>
<b>Private</b> .....	<b>59,308</b>	<b>62,466</b>	<b>66,077</b>	<b>70,544</b>	<b>75,169</b>	<b>78,597</b>	<b>82,303</b>	<b>86,160</b>	<b>91,662</b>	<b>99,352</b>	<b>108,878</b>
Business.....	57,071	60,095	63,577	67,931	72,421	75,711	79,279	82,983	88,273	95,715	104,963
Universities and colleges.....	347	372	391	402	414	425	436	458	495	541	589
Other nonprofit institutions serving households.....	1,890	1,999	2,109	2,211	2,333	2,460	2,587	2,720	2,893	3,096	3,326
<b>Government</b> .....	<b>108,476</b>	<b>109,820</b>	<b>111,385</b>	<b>113,044</b>	<b>114,602</b>	<b>115,662</b>	<b>116,610</b>	<b>118,008</b>	<b>120,491</b>	<b>123,892</b>	<b>128,969</b>
Federal Government extramural.....	80,998	80,985	81,040	81,221	81,422	81,461	81,724	82,604	84,296	86,670	90,323
Federal Government intramural.....	24,731	25,852	27,122	28,327	29,400	30,179	30,657	30,946	31,425	32,096	33,115
State and local governments <sup>1</sup> .....	1,759	1,896	2,036	2,192	2,343	2,475	2,581	2,683	2,823	2,984	3,154
Universities and colleges.....	989	1,086	1,187	1,304	1,437	1,547	1,649	1,776	1,947	2,142	2,378

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D net stock</b> .....	<b>255,115</b>	<b>271,602</b>	<b>290,874</b>	<b>315,934</b>	<b>346,203</b>	<b>375,919</b>	<b>404,237</b>	<b>432,565</b>	<b>459,376</b>	<b>484,866</b>	<b>506,564</b>
<b>Private</b> .....	<b>120,504</b>	<b>132,524</b>	<b>146,726</b>	<b>164,540</b>	<b>184,407</b>	<b>201,060</b>	<b>216,612</b>	<b>232,255</b>	<b>246,422</b>	<b>261,366</b>	<b>276,782</b>
Business.....	116,263	127,969	141,825	159,232	178,595	194,639	209,485	224,250	237,488	251,558	266,114
Universities and colleges.....	646	703	756	820	901	995	1,104	1,225	1,354	1,495	1,641
Other nonprofit institutions serving households.....	3,595	3,852	4,146	4,488	4,911	5,427	6,023	6,780	7,580	8,313	9,027
<b>Government</b> .....	<b>134,610</b>	<b>139,078</b>	<b>144,148</b>	<b>151,394</b>	<b>161,796</b>	<b>174,859</b>	<b>187,625</b>	<b>200,311</b>	<b>212,954</b>	<b>223,499</b>	<b>229,782</b>
Federal Government extramural.....	94,388	97,550	100,827	105,587	112,724	121,972	131,466	140,810	150,073	157,683	162,192
Federal Government intramural.....	34,237	35,113	36,430	38,365	40,907	43,805	46,071	48,341	50,610	52,460	53,315
State and local governments <sup>1</sup> .....	3,351	3,520	3,693	3,900	4,192	4,571	4,978	5,409	5,830	6,213	6,513
Universities and colleges.....	2,635	2,895	3,198	3,542	3,973	4,512	5,110	5,750	6,441	7,143	7,761

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D net stock</b> .....	<b>524,059</b>	<b>536,926</b>	<b>548,681</b>	<b>571,854</b>	<b>603,373</b>	<b>642,243</b>	<b>693,102</b>	<b>750,886</b>	<b>817,981</b>	<b>878,812</b>	<b>930,634</b>
<b>Private</b> .....	<b>288,526</b>	<b>296,015</b>	<b>302,558</b>	<b>320,324</b>	<b>345,428</b>	<b>376,497</b>	<b>417,146</b>	<b>465,656</b>	<b>524,284</b>	<b>572,214</b>	<b>604,308</b>
Business.....	277,042	283,749	289,596	306,580	330,794	360,817	400,100	447,190	504,244	550,528	580,728
Universities and colleges.....	1,759	1,847	1,930	2,053	2,217	2,369	2,532	2,731	2,970	3,247	3,594
Other nonprofit institutions serving households.....	9,726	10,419	11,033	11,691	12,418	13,311	14,514	15,736	17,070	18,439	19,985
<b>Government</b> .....	<b>235,532</b>	<b>240,912</b>	<b>246,123</b>	<b>251,529</b>	<b>257,945</b>	<b>265,746</b>	<b>275,956</b>	<b>285,230</b>	<b>293,697</b>	<b>306,599</b>	<b>326,327</b>
Federal Government extramural.....	166,595	170,598	174,553	178,461	183,194	188,733	195,933	202,276	207,666	215,724	229,212
Federal Government intramural.....	53,918	54,629	55,224	55,880	56,518	57,481	58,849	59,954	60,887	63,360	67,082
State and local governments <sup>1</sup> .....	6,742	6,918	7,072	7,340	7,687	8,078	8,566	9,118	9,772	10,480	11,269
Universities and colleges.....	8,278	8,766	9,274	9,848	10,547	11,454	12,608	13,882	15,373	17,034	18,764

1. Excludes universities and colleges.

NOTE: Implemented using assumptions defined in scenario D.



Table 2.6. Historical-Cost Depreciation of R&amp;D Assets by Funder, 1959–2002

[Millions of dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D depreciation</b> .....	<b>6,574</b>	<b>7,568</b>	<b>8,566</b>	<b>9,552</b>	<b>10,605</b>	<b>11,758</b>	<b>12,954</b>	<b>14,213</b>	<b>15,535</b>	<b>16,867</b>	<b>18,192</b>
<b>Private</b> .....	<b>3,557</b>	<b>3,917</b>	<b>4,187</b>	<b>4,346</b>	<b>4,449</b>	<b>4,554</b>	<b>4,673</b>	<b>4,852</b>	<b>5,122</b>	<b>5,522</b>	<b>6,111</b>
Business .....	3,477	3,829	4,089	4,235	4,324	4,415	4,518	4,679	4,930	5,309	5,877
Universities and colleges .....	14	14	15	16	16	18	20	23	27	31	35
Other nonprofit institutions serving households .....	66	74	83	95	109	122	135	149	165	182	198
<b>Government</b> .....	<b>3,017</b>	<b>3,650</b>	<b>4,379</b>	<b>5,206</b>	<b>6,156</b>	<b>7,203</b>	<b>8,281</b>	<b>9,361</b>	<b>10,412</b>	<b>11,345</b>	<b>12,082</b>
Federal Government extramural .....	1,921	2,432	3,030	3,718	4,508	5,365	6,227	7,078	7,899	8,612	9,140
Federal Government intramural .....	1,001	1,113	1,232	1,359	1,504	1,678	1,877	2,086	2,293	2,487	2,665
State and local governments <sup>1</sup> .....	66	74	82	91	101	112	123	136	148	162	179
Universities and colleges .....	29	31	34	38	42	48	54	62	72	85	97

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D depreciation</b> .....	<b>19,432</b>	<b>20,573</b>	<b>21,752</b>	<b>23,075</b>	<b>24,569</b>	<b>26,215</b>	<b>28,079</b>	<b>30,239</b>	<b>32,762</b>	<b>35,841</b>	<b>39,640</b>
<b>Private</b> .....	<b>6,775</b>	<b>7,392</b>	<b>8,020</b>	<b>8,755</b>	<b>9,612</b>	<b>10,526</b>	<b>11,536</b>	<b>12,698</b>	<b>14,065</b>	<b>15,806</b>	<b>17,990</b>
Business .....	6,521	7,114	7,717	8,429	9,260	10,141	11,112	12,231	13,546	15,225	17,339
Universities and colleges .....	39	43	47	51	54	57	61	67	75	86	98
Other nonprofit institutions serving households .....	216	235	256	276	299	328	362	400	444	495	554
<b>Government</b> .....	<b>12,656</b>	<b>13,181</b>	<b>13,732</b>	<b>14,320</b>	<b>14,956</b>	<b>15,689</b>	<b>16,543</b>	<b>17,541</b>	<b>18,697</b>	<b>20,035</b>	<b>21,650</b>
Federal Government extramural .....	9,497	9,776	10,052	10,347	10,679	11,087	11,608	12,271	13,070	14,005	15,144
Federal Government intramural .....	2,849	3,058	3,294	3,543	3,798	4,067	4,343	4,615	4,896	5,211	5,584
State and local governments <sup>1</sup> .....	199	221	245	271	299	330	362	396	435	480	529
Universities and colleges .....	111	125	141	159	181	204	230	259	296	340	392

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D depreciation</b> .....	<b>44,214</b>	<b>49,411</b>	<b>55,094</b>	<b>61,502</b>	<b>68,793</b>	<b>76,399</b>	<b>83,717</b>	<b>90,901</b>	<b>98,230</b>	<b>105,857</b>	<b>113,814</b>
<b>Private</b> .....	<b>20,671</b>	<b>23,855</b>	<b>27,485</b>	<b>31,664</b>	<b>36,325</b>	<b>40,814</b>	<b>44,837</b>	<b>48,766</b>	<b>52,720</b>	<b>56,921</b>	<b>61,730</b>
Business .....	19,937	23,028	26,557	30,628	35,168	39,519	43,385	47,130	50,869	54,840	59,405
Universities and colleges .....	111	127	143	160	179	201	225	252	282	317	356
Other nonprofit institutions serving households .....	623	701	785	877	978	1,094	1,227	1,384	1,569	1,764	1,969
<b>Government</b> .....	<b>23,542</b>	<b>25,555</b>	<b>27,609</b>	<b>29,838</b>	<b>32,468</b>	<b>35,586</b>	<b>38,880</b>	<b>42,134</b>	<b>45,510</b>	<b>48,937</b>	<b>52,084</b>
Federal Government extramural .....	16,491	17,916	19,332	20,834	22,629	24,805	27,175	29,555	32,010	34,481	36,731
Federal Government intramural .....	6,014	6,472	6,970	7,548	8,216	8,955	9,652	10,281	10,937	11,605	12,207
State and local governments <sup>1</sup> .....	584	645	706	769	841	928	1,025	1,127	1,235	1,346	1,457
Universities and colleges .....	453	522	601	686	783	898	1,029	1,171	1,329	1,505	1,690

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D depreciation</b> .....	<b>121,594</b>	<b>128,543</b>	<b>134,738</b>	<b>141,281</b>	<b>148,878</b>	<b>157,491</b>	<b>166,984</b>	<b>177,457</b>	<b>189,421</b>	<b>201,797</b>	<b>212,914</b>
<b>Private</b> .....	<b>66,595</b>	<b>70,702</b>	<b>74,183</b>	<b>78,330</b>	<b>83,848</b>	<b>90,403</b>	<b>97,864</b>	<b>106,460</b>	<b>116,712</b>	<b>127,102</b>	<b>135,372</b>
Business .....	64,012	67,862	71,099	75,015	80,307	86,622	93,823	102,144	112,101	122,175	130,104
Universities and colleges .....	397	432	463	495	533	571	606	642	685	735	793
Other nonprofit institutions serving households .....	2,187	2,409	2,622	2,819	3,008	3,209	3,434	3,674	3,926	4,192	4,475
<b>Government</b> .....	<b>54,999</b>	<b>57,841</b>	<b>60,555</b>	<b>62,952</b>	<b>65,031</b>	<b>67,088</b>	<b>69,120</b>	<b>70,997</b>	<b>72,709</b>	<b>74,695</b>	<b>77,542</b>
Federal Government extramural .....	38,837	40,907	42,882	44,622	46,127	47,611	49,055	50,366	51,510	52,773	54,648
Federal Government intramural .....	12,734	13,244	13,733	14,141	14,456	14,742	15,016	15,242	15,426	15,714	16,220
State and local governments <sup>1</sup> .....	1,560	1,651	1,733	1,815	1,904	1,998	2,094	2,195	2,310	2,440	2,580
Universities and colleges .....	1,869	2,038	2,207	2,373	2,543	2,736	2,955	3,193	3,463	3,767	4,094

1. Excludes universities and colleges.

NOTE: Implemented using assumptions defined in scenario D.

Table 2.7. Current-Cost Depreciation of R&amp;D Assets by Funder, 1959–2002

[Millions of current (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D depreciation</b> .....	<b>7,591</b>	<b>8,505</b>	<b>9,399</b>	<b>10,406</b>	<b>11,322</b>	<b>12,461</b>	<b>13,782</b>	<b>15,325</b>	<b>17,037</b>	<b>18,725</b>	<b>20,371</b>
<b>Private</b> .....	<b>4,095</b>	<b>4,398</b>	<b>4,593</b>	<b>4,732</b>	<b>4,739</b>	<b>4,804</b>	<b>4,936</b>	<b>5,189</b>	<b>5,575</b>	<b>6,092</b>	<b>6,811</b>
Business.....	4,001	4,297	4,483	4,610	4,605	4,655	4,771	5,002	5,363	5,855	6,549
Universities and colleges.....	18	17	17	18	18	19	22	26	30	35	40
Other nonprofit institutions serving households.....	76	84	92	104	116	129	144	161	182	202	222
<b>Government</b> .....	<b>3,496</b>	<b>4,107</b>	<b>4,806</b>	<b>5,674</b>	<b>6,582</b>	<b>7,657</b>	<b>8,846</b>	<b>10,135</b>	<b>11,462</b>	<b>12,633</b>	<b>13,561</b>
Federal Government extramural.....	2,208	2,718	3,310	4,038	4,811	5,699	6,650	7,664	8,696	9,591	10,261
Federal Government intramural.....	1,177	1,269	1,367	1,494	1,617	1,788	2,006	2,258	2,523	2,768	2,990
State and local governments <sup>1</sup> .....	77	84	91	100	109	119	132	146	163	180	201
Universities and colleges.....	34	36	38	42	45	51	58	67	80	94	110

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D depreciation</b> .....	<b>22,419</b>	<b>24,011</b>	<b>25,384</b>	<b>26,888</b>	<b>29,219</b>	<b>32,714</b>	<b>36,034</b>	<b>39,121</b>	<b>41,467</b>	<b>45,091</b>	<b>49,393</b>
<b>Private</b> .....	<b>7,788</b>	<b>8,598</b>	<b>9,330</b>	<b>10,174</b>	<b>11,404</b>	<b>13,099</b>	<b>14,746</b>	<b>16,350</b>	<b>17,712</b>	<b>19,782</b>	<b>22,306</b>
Business.....	7,493	8,272	8,976	9,793	10,984	12,619	14,205	15,748	17,058	19,054	21,497
Universities and colleges.....	45	51	55	59	64	72	79	87	95	107	121
Other nonprofit institutions serving households.....	249	275	298	322	356	408	463	515	559	620	688
<b>Government</b> .....	<b>14,631</b>	<b>15,413</b>	<b>16,055</b>	<b>16,713</b>	<b>17,816</b>	<b>19,616</b>	<b>21,288</b>	<b>22,771</b>	<b>23,755</b>	<b>25,309</b>	<b>27,087</b>
Federal Government extramural.....	10,981	11,437	11,760	12,084	12,729	13,876	14,956	15,949	16,624	17,706	18,960
Federal Government intramural.....	3,292	3,571	3,845	4,129	4,518	5,075	5,576	5,979	6,212	6,578	6,986
State and local governments <sup>1</sup> .....	230	258	285	315	355	410	463	511	548	601	657
Universities and colleges.....	128	147	165	185	214	254	293	332	371	423	484

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D depreciation</b> .....	<b>54,916</b>	<b>62,736</b>	<b>67,814</b>	<b>73,047</b>	<b>79,473</b>	<b>86,798</b>	<b>93,735</b>	<b>101,641</b>	<b>111,326</b>	<b>122,523</b>	<b>135,544</b>
<b>Private</b> .....	<b>25,553</b>	<b>30,137</b>	<b>33,667</b>	<b>37,470</b>	<b>41,882</b>	<b>46,332</b>	<b>50,183</b>	<b>54,521</b>	<b>59,745</b>	<b>65,889</b>	<b>73,573</b>
Business.....	24,645	29,090	32,527	36,241	40,548	44,862	48,555	52,683	57,631	63,458	70,774
Universities and colleges.....	138	161	176	190	207	228	252	283	322	370	429
Other nonprofit institutions serving households.....	771	887	964	1,039	1,128	1,243	1,376	1,555	1,792	2,062	2,371
<b>Government</b> .....	<b>29,363</b>	<b>32,598</b>	<b>34,147</b>	<b>35,577</b>	<b>37,591</b>	<b>40,465</b>	<b>43,552</b>	<b>47,120</b>	<b>51,581</b>	<b>56,633</b>	<b>61,971</b>
Federal Government extramural.....	20,577	22,861	23,917	24,848	26,203	28,210	30,450	33,072	36,306	39,934	43,732
Federal Government intramural.....	7,503	8,260	8,625	9,004	9,515	10,182	10,798	11,468	12,350	13,374	14,461
State and local governments <sup>1</sup> .....	725	818	870	914	971	1,053	1,147	1,262	1,403	1,563	1,740
Universities and colleges.....	558	659	735	811	902	1,020	1,156	1,319	1,522	1,763	2,038

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D depreciation</b> .....	<b>144,913</b>	<b>151,303</b>	<b>156,432</b>	<b>156,380</b>	<b>160,967</b>	<b>168,883</b>	<b>173,382</b>	<b>186,521</b>	<b>201,464</b>	<b>216,670</b>	<b>226,832</b>
<b>Private</b> .....	<b>79,486</b>	<b>83,359</b>	<b>86,252</b>	<b>86,928</b>	<b>91,186</b>	<b>97,880</b>	<b>103,407</b>	<b>114,032</b>	<b>127,122</b>	<b>140,016</b>	<b>147,489</b>
Business.....	76,371	79,972	82,617	83,201	87,299	93,770	98,798	109,445	122,177	134,688	141,814
Universities and colleges.....	478	514	544	556	585	622	636	680	732	794	858
Other nonprofit institutions serving households.....	2,637	2,873	3,091	3,171	3,302	3,488	3,613	3,907	4,213	4,534	4,817
<b>Government</b> .....	<b>65,426</b>	<b>67,944</b>	<b>70,180</b>	<b>69,452</b>	<b>69,781</b>	<b>71,003</b>	<b>70,335</b>	<b>72,489</b>	<b>74,342</b>	<b>76,654</b>	<b>79,343</b>
Federal Government extramural.....	46,230	48,086	49,735	49,266	49,535	50,426	49,945	51,437	52,642	54,064	55,777
Federal Government intramural.....	15,078	15,480	15,829	15,506	15,395	15,456	15,104	15,346	15,518	15,865	16,352
State and local governments <sup>1</sup> .....	1,864	1,948	2,016	2,011	2,058	2,137	2,161	2,284	2,426	2,586	2,726
Universities and colleges.....	2,255	2,431	2,600	2,669	2,793	2,983	3,124	3,422	3,757	4,138	4,488

1. Excludes universities and colleges.

NOTE: Implemented using assumptions defined in scenario D.

Table 2.8. Real Depreciation of R&amp;D Assets by Funder, 1959–2002

[Millions of current (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D depreciation</b> .....	<b>11,716</b>	<b>13,063</b>	<b>14,466</b>	<b>15,926</b>	<b>17,597</b>	<b>19,477</b>	<b>21,477</b>	<b>23,513</b>	<b>25,450</b>	<b>27,263</b>	<b>29,020</b>
<b>Private</b> .....	<b>6,321</b>	<b>6,754</b>	<b>7,069</b>	<b>7,242</b>	<b>7,366</b>	<b>7,508</b>	<b>7,693</b>	<b>7,962</b>	<b>8,329</b>	<b>8,870</b>	<b>9,702</b>
Business.....	6,176	6,599	6,901	7,056	7,157	7,276	7,435	7,675	8,012	8,525	9,329
Universities and colleges.....	27	27	27	27	29	30	34	40	45	51	57
Other nonprofit institutions serving households.....	118	128	141	159	181	202	224	248	271	294	316
<b>Government</b> .....	<b>5,395</b>	<b>6,308</b>	<b>7,397</b>	<b>8,684</b>	<b>10,231</b>	<b>11,968</b>	<b>13,784</b>	<b>15,551</b>	<b>17,122</b>	<b>18,393</b>	<b>19,318</b>
Federal Government extramural.....	3,408	4,175	5,094	6,181	7,478	8,908	10,363	11,760	12,991	13,964	14,617
Federal Government intramural.....	1,816	1,949	2,104	2,287	2,513	2,795	3,126	3,464	3,769	4,030	4,259
State and local governments <sup>1</sup> .....	119	129	140	153	169	186	205	225	243	262	286
Universities and colleges.....	52	55	59	64	71	79	90	103	119	137	156

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D depreciation</b> .....	<b>30,317</b>	<b>31,342</b>	<b>32,687</b>	<b>33,961</b>	<b>35,345</b>	<b>36,322</b>	<b>37,357</b>	<b>38,718</b>	<b>40,243</b>	<b>42,428</b>	<b>44,891</b>
<b>Private</b> .....	<b>10,532</b>	<b>11,223</b>	<b>12,013</b>	<b>12,851</b>	<b>13,794</b>	<b>14,543</b>	<b>15,288</b>	<b>16,182</b>	<b>17,189</b>	<b>18,614</b>	<b>20,273</b>
Business.....	10,134	10,798	11,558	12,370	13,287	14,011	14,726	15,586	16,554	17,929	19,538
Universities and colleges.....	62	66	71	75	77	79	82	86	92	101	110
Other nonprofit institutions serving households.....	337	358	384	406	430	453	480	510	543	584	625
<b>Government</b> .....	<b>19,786</b>	<b>20,119</b>	<b>20,673</b>	<b>21,110</b>	<b>21,551</b>	<b>21,779</b>	<b>22,069</b>	<b>22,536</b>	<b>23,054</b>	<b>23,814</b>	<b>24,618</b>
Federal Government extramural.....	14,850	14,929	15,143	15,263	15,397	15,406	15,505	15,785	16,133	16,660	17,232
Federal Government intramural.....	4,451	4,662	4,951	5,216	5,465	5,635	5,780	5,917	6,029	6,190	6,349
State and local governments <sup>1</sup> .....	311	337	368	398	429	456	480	506	532	566	597
Universities and colleges.....	173	191	212	234	259	282	304	329	360	398	440

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D depreciation</b> .....	<b>47,694</b>	<b>51,235</b>	<b>54,762</b>	<b>59,237</b>	<b>65,388</b>	<b>71,753</b>	<b>78,337</b>	<b>84,786</b>	<b>91,564</b>	<b>98,486</b>	<b>104,921</b>
<b>Private</b> .....	<b>22,193</b>	<b>24,613</b>	<b>27,188</b>	<b>30,386</b>	<b>34,459</b>	<b>38,301</b>	<b>41,940</b>	<b>45,480</b>	<b>49,140</b>	<b>52,963</b>	<b>56,951</b>
Business.....	21,404	23,757	26,267	29,389	33,361	37,086	40,579	43,947	47,401	51,008	54,784
Universities and colleges.....	119	131	142	154	170	188	211	236	265	297	332
Other nonprofit institutions serving households.....	670	724	779	843	928	1,027	1,150	1,297	1,474	1,658	1,835
<b>Government</b> .....	<b>25,501</b>	<b>26,622</b>	<b>27,575</b>	<b>28,851</b>	<b>30,928</b>	<b>33,451</b>	<b>36,398</b>	<b>39,306</b>	<b>42,425</b>	<b>45,523</b>	<b>47,970</b>
Federal Government extramural.....	17,871	18,670	19,314	20,150	21,559	23,320	25,448	27,588	29,861	32,099	33,852
Federal Government intramural.....	6,516	6,746	6,965	7,302	7,828	8,417	9,025	9,566	10,158	10,750	11,194
State and local governments <sup>1</sup> .....	629	668	702	741	799	871	959	1,052	1,154	1,256	1,347
Universities and colleges.....	485	538	593	658	742	843	966	1,100	1,251	1,417	1,577

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D depreciation</b> .....	<b>110,836</b>	<b>116,252</b>	<b>120,958</b>	<b>126,236</b>	<b>134,218</b>	<b>146,056</b>	<b>162,266</b>	<b>181,575</b>	<b>201,464</b>	<b>224,830</b>	<b>236,513</b>
<b>Private</b> .....	<b>60,795</b>	<b>64,048</b>	<b>66,693</b>	<b>70,172</b>	<b>76,033</b>	<b>84,650</b>	<b>96,441</b>	<b>111,009</b>	<b>127,122</b>	<b>145,289</b>	<b>153,783</b>
Business.....	58,412	61,446	63,882	67,163	72,792	81,095	92,464	106,543	122,177	139,760	147,867
Universities and colleges.....	366	395	421	449	488	538	596	662	732	824	894
Other nonprofit institutions serving households.....	2,017	2,207	2,390	2,560	2,753	3,017	3,381	3,804	4,213	4,705	5,022
<b>Government</b> .....	<b>50,041</b>	<b>52,204</b>	<b>54,265</b>	<b>56,064</b>	<b>58,185</b>	<b>61,406</b>	<b>65,826</b>	<b>70,567</b>	<b>74,342</b>	<b>79,541</b>	<b>82,730</b>
Federal Government extramural.....	35,359	36,946	38,457	39,769	41,303	43,611	46,743	50,073	52,642	56,100	58,158
Federal Government intramural.....	11,532	11,894	12,240	12,517	12,837	13,367	14,136	14,939	15,518	16,463	17,050
State and local governments <sup>1</sup> .....	1,425	1,497	1,559	1,624	1,716	1,848	2,022	2,224	2,426	2,683	2,843
Universities and colleges.....	1,725	1,867	2,010	2,154	2,329	2,580	2,924	3,331	3,757	4,294	4,679

1. Excludes universities and colleges.

NOTE: Implemented using assumptions defined in scenario D.

Table 3.1. Historical-Cost Investment in R&amp;D Assets by Performer, 1959–2002

[Millions of dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D investment</b> .....	<b>12,575</b>	<b>13,819</b>	<b>14,625</b>	<b>15,662</b>	<b>17,483</b>	<b>19,094</b>	<b>20,374</b>	<b>22,321</b>	<b>23,728</b>	<b>25,109</b>	<b>26,286</b>
<b>Private</b> .....	<b>10,423</b>	<b>11,437</b>	<b>11,985</b>	<b>12,711</b>	<b>14,090</b>	<b>15,179</b>	<b>16,021</b>	<b>17,588</b>	<b>18,662</b>	<b>19,846</b>	<b>20,789</b>
Business .....	9,283	10,108	10,404	11,076	12,270	13,117	13,873	15,309	16,095	17,178	18,047
Universities and colleges .....	286	346	406	467	529	605	692	784	873	931	954
Other nonprofit institutions serving households .....	178	208	256	311	376	431	496	520	606	610	592
Federally funded R&D centers .....											
Business .....	438	498	576	442	428	479	383	364	428	424	475
Universities and colleges .....	192	209	237	272	326	369	375	387	413	436	445
Other nonprofit institutions serving households .....	45	68	106	142	162	178	202	225	246	267	276
<b>Government</b> .....	<b>2,152</b>	<b>2,382</b>	<b>2,639</b>	<b>2,951</b>	<b>3,392</b>	<b>3,916</b>	<b>4,353</b>	<b>4,732</b>	<b>5,066</b>	<b>5,263</b>	<b>5,497</b>
Federal Government .....	1,668	1,823	1,988	2,177	2,476	2,853	3,153	3,382	3,556	3,610	3,736
State and local governments <sup>1</sup> .....	48	52	57	62	67	67	75	85	104	128	145
Universities and colleges .....	291	345	411	506	626	747	875	1,010	1,138	1,244	1,331
Federally funded R&D centers .....											
Universities and colleges .....	146	161	183	207	224	248	250	255	269	282	286

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D investment</b> .....	<b>26,627</b>	<b>27,460</b>	<b>29,404</b>	<b>31,738</b>	<b>34,330</b>	<b>36,757</b>	<b>40,523</b>	<b>44,432</b>	<b>49,694</b>	<b>56,878</b>	<b>65,461</b>
<b>Private</b> .....	<b>20,682</b>	<b>20,984</b>	<b>22,345</b>	<b>24,228</b>	<b>26,255</b>	<b>27,997</b>	<b>31,201</b>	<b>34,439</b>	<b>38,739</b>	<b>44,750</b>	<b>51,852</b>
Business .....	17,844	18,082	19,268	21,043	22,732	24,090	26,801	29,534	32,993	38,208	44,451
Universities and colleges .....	979	1,001	1,046	1,099	1,188	1,313	1,416	1,563	1,826	2,122	2,376
Other nonprofit institutions serving households .....	662	702	755	786	860	948	1,063	1,180	1,395	1,588	1,822
Federally funded R&D centers .....											
Business .....	487	507	572	567	677	761	930	1,005	1,128	1,214	1,333
Universities and colleges .....	449	452	478	515	557	632	725	859	1,046	1,200	1,355
Other nonprofit institutions serving households .....	261	240	227	218	241	253	267	298	352	418	515
<b>Government</b> .....	<b>5,945</b>	<b>6,476</b>	<b>7,058</b>	<b>7,510</b>	<b>8,075</b>	<b>8,760</b>	<b>9,322</b>	<b>9,993</b>	<b>10,954</b>	<b>12,128</b>	<b>13,609</b>
Federal Government .....	4,053	4,430	4,831	5,084	5,405	5,777	6,037	6,271	6,706	7,292	8,106
State and local governments <sup>1</sup> .....	162	189	223	251	266	284	301	312	340	387	428
Universities and colleges .....	1,445	1,573	1,708	1,859	2,053	2,289	2,491	2,792	3,180	3,613	4,108
Federally funded R&D centers .....											
Universities and colleges .....	286	284	296	317	352	411	493	618	729	836	967

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D investment</b> .....	<b>74,798</b>	<b>82,924</b>	<b>91,680</b>	<b>103,948</b>	<b>116,262</b>	<b>122,744</b>	<b>127,619</b>	<b>135,602</b>	<b>143,924</b>	<b>154,233</b>	<b>163,575</b>
<b>Private</b> .....	<b>59,929</b>	<b>67,048</b>	<b>74,310</b>	<b>84,687</b>	<b>94,849</b>	<b>99,225</b>	<b>103,325</b>	<b>109,567</b>	<b>115,849</b>	<b>124,540</b>	<b>133,034</b>
Business .....	51,843	58,534	65,097	74,529	83,607	87,060	90,215	94,955	99,929	107,470	114,739
Universities and colleges .....	2,599	2,770	2,956	3,244	3,608	4,024	4,462	4,953	5,398	5,753	6,132
Other nonprofit institutions serving households .....	2,046	2,186	2,415	2,730	3,090	3,433	3,658	4,297	4,916	5,380	6,072
Federally funded R&D centers .....											
Business .....	1,450	1,555	1,650	1,800	1,919	1,940	2,046	2,176	2,251	2,385	2,341
Universities and colleges .....	1,415	1,434	1,565	1,732	1,927	2,151	2,366	2,576	2,681	2,751	2,850
Other nonprofit institutions serving households .....	576	570	627	651	698	616	578	610	674	801	900
<b>Government</b> .....	<b>14,869</b>	<b>15,875</b>	<b>17,370</b>	<b>19,261</b>	<b>21,414</b>	<b>23,520</b>	<b>24,293</b>	<b>26,035</b>	<b>28,075</b>	<b>29,694</b>	<b>30,542</b>
Federal Government .....	8,795	9,333	10,256	11,390	12,604	13,688	13,510	14,190	15,109	15,675	15,566
State and local governments <sup>1</sup> .....	461	482	491	483	497	538	559	604	641	629	597
Universities and colleges .....	4,528	4,876	5,291	5,842	6,586	7,416	8,251	9,188	10,191	11,167	12,060
Federally funded R&D centers .....											
Universities and colleges .....	1,085	1,185	1,331	1,547	1,726	1,878	1,973	2,054	2,133	2,223	2,319

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D investment</b> .....	<b>167,786</b>	<b>168,051</b>	<b>171,635</b>	<b>185,086</b>	<b>198,769</b>	<b>213,827</b>	<b>227,725</b>	<b>245,878</b>	<b>268,559</b>	<b>275,294</b>	<b>276,533</b>
<b>Private</b> .....	<b>136,135</b>	<b>135,078</b>	<b>137,755</b>	<b>150,753</b>	<b>163,847</b>	<b>177,485</b>	<b>190,012</b>	<b>206,646</b>	<b>227,394</b>	<b>229,839</b>	<b>226,294</b>
Business .....	116,795	115,483	117,444	129,878	142,389	155,418	167,065	182,011	199,886	199,815	193,677
Universities and colleges .....	6,503	6,815	7,113	7,380	7,744	8,192	8,658	9,246	10,012	10,969	12,099
Other nonprofit institutions serving households .....	6,514	6,779	6,806	6,869	7,065	7,349	8,011	8,774	10,389	11,557	12,474
Federally funded R&D centers .....											
Business .....	2,415	2,017	2,261	2,338	2,362	2,186	2,131	2,001	2,010	2,072	2,316
Universities and colleges .....	2,942	2,967	3,041	3,087	3,064	3,099	3,004	2,986	3,044	3,235	3,409
Other nonprofit institutions serving households .....	965	1,017	1,090	1,201	1,223	1,241	1,143	1,628	2,053	2,192	2,319
<b>Government</b> .....	<b>31,652</b>	<b>32,972</b>	<b>33,880</b>	<b>34,333</b>	<b>34,922</b>	<b>36,342</b>	<b>37,713</b>	<b>39,232</b>	<b>41,165</b>	<b>45,455</b>	<b>50,239</b>
Federal Government .....	15,867	16,405	16,599	16,318	16,159	16,570	16,566	16,481	16,450	18,249	19,922
State and local governments <sup>1</sup> .....	566	588	596	547	506	519	583	611	609	680	769
Universities and colleges .....	12,864	13,632	14,375	15,142	15,868	16,799	17,916	19,407	21,298	23,413	25,838
Federally funded R&D centers .....											
Universities and colleges .....	2,354	2,348	2,310	2,326	2,389	2,455	2,649	2,733	2,808	3,113	3,710

1. Excludes universities and colleges.

Table 3.2. Real Investment in R&amp;D Assets by Performer, 1959–2002

[Millions of chained (2000) dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total R&amp;D investment</b> .....	<b>19,409</b>	<b>21,224</b>	<b>22,509</b>	<b>23,972</b>	<b>27,174</b>	<b>29,844</b>	<b>31,749</b>	<b>34,247</b>	<b>35,446</b>	<b>36,558</b>	<b>37,446</b>
<b>Private</b> .....	<b>16,087</b>	<b>17,566</b>	<b>18,447</b>	<b>19,455</b>	<b>21,901</b>	<b>23,724</b>	<b>24,965</b>	<b>26,987</b>	<b>27,877</b>	<b>28,895</b>	<b>29,615</b>
Business.....	14,329	15,526	16,013	16,953	19,071	20,502	21,619	23,490	24,043	25,010	25,708
Universities and colleges.....	441	532	625	715	822	945	1,079	1,203	1,304	1,355	1,359
Other nonprofit institutions serving households.....	275	319	394	476	584	674	773	798	905	888	843
Federally funded R&D centers .....											
Business.....	675	764	887	676	666	748	596	558	640	617	677
Universities and colleges .....	297	320	365	417	506	577	584	593	617	635	635
Other nonprofit institutions serving households.....	70	105	163	218	251	279	315	345	368	389	393
<b>Government</b> .....	<b>3,322</b>	<b>3,658</b>	<b>4,062</b>	<b>4,517</b>	<b>5,273</b>	<b>6,120</b>	<b>6,783</b>	<b>7,261</b>	<b>7,568</b>	<b>7,663</b>	<b>7,831</b>
Federal Government .....	2,574	2,801	3,060	3,332	3,848	4,459	4,913	5,190	5,312	5,256	5,322
State and local governments <sup>1</sup> .....	74	80	88	94	104	105	116	131	155	186	206
Universities and colleges.....	449	530	632	774	973	1,168	1,364	1,549	1,700	1,811	1,895
Federally funded R&D centers .....											
Universities and colleges .....	225	248	282	317	348	387	390	390	402	410	407

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total R&amp;D investment</b> .....	<b>36,008</b>	<b>35,844</b>	<b>37,862</b>	<b>40,088</b>	<b>41,528</b>	<b>40,811</b>	<b>42,011</b>	<b>43,974</b>	<b>48,227</b>	<b>53,519</b>	<b>59,495</b>
<b>Private</b> .....	<b>27,969</b>	<b>27,391</b>	<b>28,773</b>	<b>30,602</b>	<b>31,759</b>	<b>31,084</b>	<b>32,347</b>	<b>34,084</b>	<b>37,596</b>	<b>42,107</b>	<b>47,126</b>
Business.....	24,131	23,604	24,810	26,579	27,498	26,747	27,785	29,230	32,019	35,952	40,399
Universities and colleges.....	1,324	1,307	1,347	1,388	1,437	1,458	1,467	1,547	1,772	1,997	2,160
Other nonprofit institutions serving households.....	895	916	972	993	1,040	1,053	1,102	1,168	1,354	1,494	1,656
Federally funded R&D centers .....											
Business.....	659	661	737	717	819	845	964	995	1,095	1,142	1,212
Universities and colleges .....	608	590	615	650	674	702	751	850	1,015	1,129	1,231
Other nonprofit institutions serving households.....	353	313	292	275	291	281	277	295	341	394	468
<b>Government</b> .....	<b>8,039</b>	<b>8,453</b>	<b>9,089</b>	<b>9,486</b>	<b>9,769</b>	<b>9,727</b>	<b>9,664</b>	<b>9,890</b>	<b>10,631</b>	<b>11,412</b>	<b>12,369</b>
Federal Government .....	5,480	5,783	6,221	6,421	6,538	6,414	6,258	6,206	6,508	6,861	7,367
State and local governments <sup>1</sup> .....	219	246	287	317	322	315	313	308	330	364	389
Universities and colleges.....	1,954	2,053	2,200	2,348	2,483	2,541	2,583	2,764	3,086	3,400	3,733
Federally funded R&D centers .....											
Universities and colleges .....	386	371	382	400	425	456	511	612	707	786	879

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total R&amp;D investment</b> .....	<b>64,962</b>	<b>67,722</b>	<b>74,035</b>	<b>84,296</b>	<b>95,657</b>	<b>101,469</b>	<b>106,655</b>	<b>113,115</b>	<b>118,375</b>	<b>123,975</b>	<b>126,619</b>
<b>Private</b> .....	<b>52,048</b>	<b>54,757</b>	<b>60,008</b>	<b>68,676</b>	<b>78,039</b>	<b>82,026</b>	<b>86,352</b>	<b>91,397</b>	<b>95,284</b>	<b>100,107</b>	<b>102,977</b>
Business.....	45,025	47,803	52,568	60,438	68,790	71,970	75,396	79,208	82,190	86,386	88,816
Universities and colleges.....	2,257	2,262	2,387	2,631	2,969	3,327	3,729	4,132	4,440	4,624	4,747
Other nonprofit institutions serving households.....	1,777	1,785	1,950	2,214	2,542	2,838	3,057	3,584	4,043	4,325	4,700
Federally funded R&D centers .....											
Business.....	1,260	1,270	1,333	1,460	1,579	1,603	1,710	1,815	1,851	1,917	1,812
Universities and colleges .....	1,229	1,171	1,264	1,405	1,585	1,778	1,977	2,149	2,205	2,211	2,206
Other nonprofit institutions serving households.....	500	465	506	528	574	510	483	509	554	644	697
<b>Government</b> .....	<b>12,914</b>	<b>12,965</b>	<b>14,027</b>	<b>15,620</b>	<b>17,618</b>	<b>19,443</b>	<b>20,303</b>	<b>21,717</b>	<b>23,091</b>	<b>23,868</b>	<b>23,641</b>
Federal Government .....	7,639	7,622	8,282	9,237	10,370	11,315	11,290	11,836	12,427	12,600	12,049
State and local governments <sup>1</sup> .....	400	393	396	391	409	445	467	504	527	505	462
Universities and colleges.....	3,932	3,982	4,273	4,737	5,419	6,131	6,896	7,664	8,382	8,976	9,335
Federally funded R&D centers .....											
Universities and colleges .....	943	967	1,075	1,254	1,420	1,552	1,649	1,713	1,754	1,787	1,795

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total R&amp;D investment</b> .....	<b>128,330</b>	<b>129,120</b>	<b>132,713</b>	<b>149,408</b>	<b>165,738</b>	<b>184,926</b>	<b>213,125</b>	<b>239,359</b>	<b>268,559</b>	<b>285,661</b>	<b>288,335</b>
<b>Private</b> .....	<b>104,122</b>	<b>103,786</b>	<b>106,516</b>	<b>121,693</b>	<b>136,619</b>	<b>153,495</b>	<b>177,830</b>	<b>201,167</b>	<b>227,394</b>	<b>238,494</b>	<b>235,952</b>
Business.....	89,330	88,730	90,811	104,842	118,727	134,411	156,354	177,185	199,886	207,340	201,943
Universities and colleges.....	4,974	5,236	5,500	5,958	6,457	7,085	8,103	9,001	10,012	11,382	12,615
Other nonprofit institutions serving households.....	4,982	5,209	5,263	5,545	5,891	6,356	7,497	8,541	10,389	11,992	13,006
Federally funded R&D centers .....											
Business.....	1,847	1,550	1,748	1,887	1,969	1,890	1,994	1,948	2,010	2,150	2,415
Universities and colleges .....	2,250	2,280	2,351	2,492	2,555	2,680	2,812	2,907	3,044	3,357	3,555
Other nonprofit institutions serving households.....	738	782	843	969	1,020	1,073	1,070	1,584	2,053	2,274	2,418
<b>Government</b> .....	<b>24,209</b>	<b>25,334</b>	<b>26,197</b>	<b>27,715</b>	<b>29,118</b>	<b>31,430</b>	<b>35,295</b>	<b>38,192</b>	<b>41,165</b>	<b>47,167</b>	<b>52,383</b>
Federal Government .....	12,136	12,604	12,835	13,172	13,474	14,330	15,504	16,044	16,450	18,936	20,773
State and local governments <sup>1</sup> .....	433	452	461	442	422	448	545	594	609	706	802
Universities and colleges.....	9,839	10,474	11,115	12,223	13,231	14,528	16,767	18,893	21,298	24,295	26,941
Federally funded R&D centers .....											
Universities and colleges .....	1,800	1,804	1,786	1,877	1,992	2,123	2,479	2,661	2,808	3,231	3,868

1. Excludes universities and colleges.

NOTE: Implemented using assumptions defined in scenario D.

Table 4.1 Aggregate Input Price Indexes for R&amp;D Investment, 1959–2002

[Index numbers, 2000=100]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
<b>Total funder R&amp;D investment</b> .....	<b>18.4</b>	<b>18.4</b>	<b>18.8</b>	<b>19.1</b>	<b>19.5</b>	<b>20.0</b>	<b>20.6</b>	<b>21.3</b>	<b>22.1</b>	<b>23.1</b>	<b>24.4</b>
Federal extramural .....	24.2	24.6	25.0	26.2	24.8	25.5	26.1	26.4	27.7	28.9	30.6
Federal intramural .....	12.0	11.2	12.2	12.2	13.4	14.4	15.5	16.4	17.3	18.5	19.8
Non-federal domestic .....	17.2	17.3	17.4	16.9	19.1	19.0	19.3	20.6	20.7	21.7	22.7
<b>Total performer R&amp;D investment</b> .....	<b>18.4</b>	<b>18.4</b>	<b>18.8</b>	<b>19.1</b>	<b>19.5</b>	<b>20.0</b>	<b>20.6</b>	<b>21.3</b>	<b>22.1</b>	<b>23.1</b>	<b>24.4</b>
<b>Private</b> .....	<b>20.4</b>	<b>20.6</b>	<b>20.9</b>	<b>21.2</b>	<b>21.4</b>	<b>21.8</b>	<b>22.2</b>	<b>22.8</b>	<b>23.6</b>	<b>24.6</b>	<b>25.8</b>
Business .....	20.9	21.2	21.5	21.8	22.1	22.4	22.8	23.4	24.1	25.2	26.4
Universities and colleges .....	13.1	13.3	13.7	14.2	14.7	15.2	15.8	16.7	17.6	18.7	19.8
Other nonprofit institutions serving households .....	16.6	16.7	16.7	16.9	17.2	17.6	18.0	18.7	19.3	20.1	20.8
Federally funded R&D centers .....											
Business .....	19.2	19.0	18.9	19.6	18.5	19.1	19.7	20.6	21.6	22.6	24.2
Universities and colleges .....	24.6	24.2	24.0	24.8	23.5	24.2	24.8	25.6	26.7	27.9	29.5
Other nonprofit institutions serving households .....	24.5	25.1	25.7	27.0	25.6	26.3	26.7	26.8	28.1	29.3	31.0
<b>Public</b> .....	<b>12.4</b>	<b>11.8</b>	<b>12.6</b>	<b>12.7</b>	<b>13.6</b>	<b>14.5</b>	<b>15.4</b>	<b>16.3</b>	<b>17.1</b>	<b>18.2</b>	<b>19.5</b>
Federal Government .....	12.0	11.2	12.2	12.2	13.4	14.4	15.5	16.4	17.3	18.5	19.8
State and local governments <sup>1</sup> .....	16.6	16.7	16.7	16.9	17.2	17.6	18.0	18.7	19.3	20.1	20.8
Universities and colleges .....	13.0	13.2	13.5	13.9	14.3	14.8	15.3	16.1	16.9	17.9	19.0
Federally funded R&D centers .....											
Universities and colleges .....	19.5	19.0	18.8	19.2	18.5	19.0	19.6	20.4	21.4	22.5	24.1

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
<b>Total funder R&amp;D investment</b> .....	<b>25.8</b>	<b>27.3</b>	<b>28.8</b>	<b>30.4</b>	<b>33.2</b>	<b>36.4</b>	<b>38.6</b>	<b>41.2</b>	<b>44.0</b>	<b>47.6</b>	<b>52.2</b>
Federal extramural .....	32.1	34.0	36.7	38.5	41.6	45.6	47.7	50.4	53.4	57.0	62.0
Federal intramural .....	21.6	23.8	26.1	27.8	29.8	33.0	35.3	38.5	40.7	43.6	47.9
Non-federal domestic .....	23.9	25.0	25.2	26.9	29.7	32.4	34.6	37.0	39.9	43.8	48.1
<b>Total performer R&amp;D investment</b> .....	<b>25.8</b>	<b>27.3</b>	<b>28.8</b>	<b>30.4</b>	<b>33.2</b>	<b>36.4</b>	<b>38.6</b>	<b>41.2</b>	<b>44.0</b>	<b>47.6</b>	<b>52.2</b>
<b>Private</b> .....	<b>27.2</b>	<b>28.5</b>	<b>29.8</b>	<b>31.5</b>	<b>34.4</b>	<b>37.6</b>	<b>39.8</b>	<b>42.3</b>	<b>45.3</b>	<b>49.0</b>	<b>53.6</b>
Business .....	27.8	29.2	30.4	32.1	35.0	38.2	40.5	43.0	46.0	49.9	54.4
Universities and colleges .....	21.0	22.0	22.9	24.3	26.6	28.8	30.5	32.5	34.8	38.0	42.0
Other nonprofit institutions serving households .....	21.5	22.3	23.0	24.3	27.9	30.6	32.7	34.9	37.5	41.3	46.6
Federally funded R&D centers .....											
Business .....	25.7	27.2	29.2	31.2	34.4	38.8	41.1	44.2	47.2	51.0	56.2
Universities and colleges .....	31.2	32.9	35.1	37.0	40.4	44.7	46.8	49.4	52.1	56.0	60.8
Other nonprofit institutions serving households .....	32.6	34.5	37.3	39.2	42.6	46.6	48.8	51.3	54.0	57.9	62.8
<b>Public</b> .....	<b>21.1</b>	<b>22.9</b>	<b>24.8</b>	<b>26.4</b>	<b>28.6</b>	<b>31.5</b>	<b>33.6</b>	<b>36.4</b>	<b>38.8</b>	<b>41.9</b>	<b>46.2</b>
Federal Government .....	21.6	23.8	26.1	27.8	29.8	33.0	35.3	38.5	40.7	43.6	47.9
State and local governments <sup>1</sup> .....	21.5	22.3	23.0	24.3	27.9	30.6	32.7	34.9	37.5	41.3	46.6
Universities and colleges .....	20.2	21.5	22.5	24.0	26.4	28.7	30.4	32.4	34.9	38.3	42.4
Federally funded R&D centers .....											
Universities and colleges .....	25.6	27.1	28.9	31.0	34.2	38.6	40.7	43.9	47.2	51.1	56.5

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
<b>Total funder R&amp;D investment</b> .....	<b>57.0</b>	<b>60.5</b>	<b>62.9</b>	<b>65.3</b>	<b>67.4</b>	<b>69.1</b>	<b>71.9</b>	<b>74.5</b>	<b>77.6</b>	<b>80.2</b>	<b>82.6</b>
Federal extramural .....	66.6	71.1	74.2	76.7	78.4	80.1	80.9	81.0	82.9	85.0	86.7
Federal intramural .....	52.2	55.5	57.8	59.8	61.7	63.8	65.9	68.7	70.7	74.1	77.4
Non-federal domestic .....	53.2	56.3	58.4	60.8	63.0	64.6	68.5	72.4	76.3	79.0	81.6
<b>Total performer R&amp;D investment</b> .....	<b>57.0</b>	<b>60.5</b>	<b>62.9</b>	<b>65.3</b>	<b>67.4</b>	<b>69.1</b>	<b>71.9</b>	<b>74.5</b>	<b>77.6</b>	<b>80.2</b>	<b>82.6</b>
<b>Private</b> .....	<b>58.6</b>	<b>62.1</b>	<b>64.6</b>	<b>67.0</b>	<b>69.1</b>	<b>70.7</b>	<b>73.6</b>	<b>76.3</b>	<b>79.4</b>	<b>81.9</b>	<b>84.2</b>
Business .....	59.5	63.1	65.6	68.0	70.1	71.6	74.7	77.4	80.6	83.0	85.2
Universities and colleges .....	45.7	48.7	50.8	53.4	55.9	58.1	61.2	64.0	67.4	70.6	72.8
Other nonprofit institutions serving households .....	51.6	54.1	55.8	57.9	59.2	61.0	63.5	66.8	69.3	71.9	75.1
Federally funded R&D centers .....											
Business .....	61.4	66.0	68.7	71.0	73.5	75.2	75.9	77.5	80.1	82.5	84.6
Universities and colleges .....	65.3	69.4	72.0	74.7	76.8	78.5	79.3	81.6	83.1	85.4	87.1
Other nonprofit institutions serving households .....	67.2	71.0	73.7	76.6	78.4	80.2	81.0	82.0	82.8	84.9	86.4
<b>Public</b> .....	<b>50.3</b>	<b>53.5</b>	<b>55.7</b>	<b>57.9</b>	<b>60.0</b>	<b>62.1</b>	<b>64.5</b>	<b>67.1</b>	<b>69.6</b>	<b>72.8</b>	<b>75.6</b>
Federal Government .....	52.2	55.5	57.8	59.8	61.7	63.8	65.9	68.7	70.7	74.1	77.4
State and local governments <sup>1</sup> .....	51.6	54.1	55.8	57.9	59.2	61.0	63.5	66.8	69.3	71.9	75.1
Universities and colleges .....	46.1	49.0	51.1	53.7	56.2	58.5	61.6	64.1	67.3	70.4	72.6
Federally funded R&D centers .....											
Universities and colleges .....	62.0	66.3	69.0	71.4	74.0	75.8	77.0	78.9	81.6	84.0	86.0

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
<b>Total funder R&amp;D investment</b> .....	<b>84.9</b>	<b>87.0</b>	<b>88.8</b>	<b>90.1</b>	<b>91.9</b>	<b>93.8</b>	<b>95.1</b>	<b>96.8</b>	<b>100.0</b>	<b>102.6</b>	<b>106.3</b>
Federal extramural .....	88.9	90.1	91.5	92.7	93.4	95.3	96.6	97.7	100.0	101.9	103.9
Federal intramural .....	79.3	82.1	85.0	88.2	90.6	92.7	94.4	96.9	100.0	102.6	106.5
Non-federal domestic .....	84.1	86.5	88.2	89.4	91.6	93.4	94.7	96.5	100.0	102.8	107.2
<b>Total performer R&amp;D investment</b> .....	<b>84.9</b>	<b>87.0</b>	<b>88.8</b>	<b>90.1</b>	<b>91.9</b>	<b>93.8</b>	<b>95.1</b>	<b>96.8</b>	<b>100.0</b>	<b>102.6</b>	<b>106.3</b>
<b>Private</b> .....	<b>86.6</b>	<b>88.6</b>	<b>90.1</b>	<b>91.1</b>	<b>92.7</b>	<b>94.4</b>	<b>95.6</b>	<b>96.9</b>	<b>100.0</b>	<b>102.4</b>	<b>106.2</b>
Business .....	87.8	89.8	91.2	91.8	93.3	95.0	96.1	97.1	100.0	102.4	106.4
Universities and colleges .....	75.0	77.1	79.5	82.1	85.0	87.6	90.2	95.0	100.0	104.2	108.1
Other nonprofit institutions serving households .....	77.4	78.9	80.5	84.1	86.7	89.3	92.0	94.5	100.0	101.6	102.9
Federally funded R&D centers .....											
Business .....	87.0	88.3	90.0	92.7	93.7	95.4	96.4	97.3	100.0	102.4	104.9
Universities and colleges .....	89.6	90.6	92.3	93.8	94.4	96.0	97.0	97.7	100.0	101.7	103.6
Other nonprofit institutions serving households .....	88.9	90.0	91.7	92.9	93.5	95.5	96.7	97.6	100.0	101.9	104.0
<b>Public</b> .....	<b>77.5</b>	<b>80.0</b>	<b>82.6</b>	<b>85.5</b>	<b>88.1</b>	<b>90.4</b>	<b>92.5</b>	<b>96.0</b>	<b>100.0</b>	<b>103.3</b>	<b>107.0</b>
Federal Government .....	79.3	82.1	85.0	88.2	90.6	92.7	94.4	96.9	100.0	102.6	106.5
State and local governments <sup>1</sup> .....	77.4	78.9	80.5	84.1	86.7	89.3	92.0	94.5	100.0	101.6	102.9
Universities and colleges .....	74.7	77.0	79.5	82.1	85.1	87.6	90.3	95.0	100.0	104.2	107.9
Federally funded R&D centers .....											
Universities and colleges .....	88.2	89.5	91.2	94.2	95.3	96.6	97.2	97.6	100.0	101.9	104.0

1. Excludes universities and colleges.

Table 4.2 Alternative Scenario Price Indexes for R&amp;D Investment, 1959–2002

[Index numbers, 2000=100]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Scenario A.....	18.4	18.4	18.8	19.1	19.5	20.0	20.6	21.3	22.1	23.1	24.4
Scenario B.....	94.5	92.3	91.0	87.9	86.5	85.4	84.1	85.9	86.6	86.1	87.7
Scenario C.....	43.6	43.6	45.2	44.6	45.3	45.8	46.4	47.0	48.0	48.5	47.7
Scenario D.....	64.8	65.1	65.0	65.3	64.3	64.0	64.2	65.2	66.9	68.7	70.2

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Scenario A.....	25.8	27.3	28.8	30.4	33.2	36.4	38.6	41.2	44.0	47.6	52.2
Scenario B.....	90.3	90.8	90.7	92.1	101.1	105.8	107.6	110.1	114.6	122.2	130.3
Scenario C.....	48.3	52.2	54.4	55.4	57.6	62.5	67.1	70.3	72.0	72.0	75.3
Scenario D.....	73.9	76.6	77.7	79.2	82.7	90.1	96.5	101.0	103.0	106.3	110.0

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Scenario A.....	57.0	60.5	62.9	65.3	67.4	69.1	71.9	74.5	77.6	80.2	82.6
Scenario B.....	138.1	139.0	137.9	135.7	134.2	132.1	129.3	128.9	132.2	134.4	136.5
Scenario C.....	80.8	87.2	92.0	97.2	104.9	110.4	107.2	108.4	108.4	108.7	110.8
Scenario D.....	115.1	122.4	123.8	123.3	121.5	121.0	119.7	119.9	121.6	124.4	129.2

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Scenario A.....	84.9	87.0	88.8	90.1	91.9	93.8	95.1	96.8	100.0	102.6	106.3
Scenario B.....	134.2	132.9	128.4	123.8	121.0	115.4	111.4	105.8	100.0	100.0	99.4
Scenario C.....	112.8	115.1	114.2	115.2	115.2	116.1	111.6	105.8	100.0	96.3	93.2
Scenario D.....	130.7	130.2	129.3	123.9	119.9	115.6	106.9	102.7	100.0	96.4	95.9

NOTES. Scenario A uses an input price index.

Scenario B uses a multifactor productivity-adjusted price index.

Scenario C uses a high-productivity service industries price index.

Scenario D uses a top four R&D performers price index.

The price index for scenario A corresponds to the total price indexes for funders and performers in table 4.1.