

2007 Research and Development Satellite Account
Bureau of Economic Analysis/National Science Foundation
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1. Introduction

This Bureau of Economic Analysis-National Science Foundation (BEA-NSF) research and development (R&D) satellite account provides updated and expanded estimates of the effect of R&D on the economy for 1959–2004. Developed with support from the National Science Foundation, the R&D satellite account of the U.S. national economic accounts estimates the effects of R&D on the economy by treating R&D spending as investment rather than an expense. The 2007 R&D satellite account updates the preliminary estimates released in 2006 to provide two more years of data (2003–2004) from the National Science Foundation. It provides additional R&D statistics for R&D intensive industries and for BEA’s regional and international economic accounts, and several estimation improvements.

Current national economic accounting treatment does not separately identify the contribution of R&D and many other intangible assets to U.S. economic growth. The satellite account, or experimental format, provides a means to illustrate the impacts of adjusting the treatment of R&D activity in the national economic accounts. The current release is part of BEA’s long-term efforts to improve its measures of intangibles in the economy. Major findings of the 2007 satellite account are:

- The level of current dollar gross domestic product (GDP) would increase by an average 2.9 percent between 1959 and 2004.
- Current dollar R&D investment would be \$316.6 billion in 2004, an increase of 5.7 percent from the \$299.6 billion in 2003.
- Current-dollar gross private domestic investment (GPDI) in 2004 would be 10.6 percent, or \$166.3 billion, higher than the published GPDI. This measure

removes the double-count of R&D expenditures in software investment. The national saving rate in 2004 would rise 2.7 percentage points, to 16.5 percent (table B).

- The contribution to real GDP growth of treating R&D as investment is approximately 0.2 percentage point of the 3.3 percent growth, or about a 7.0 percent share of the growth rate between 1995 and 2004.
- Among R&D-intensive industries, the largest contribution to this real GDP growth rate between 1995 and 2004 is from the pharmaceutical and medicine manufacturing industry. This industry's contribution accounted for more than 1 percent of the real GDP growth rate. The software publishing industry accounted for an additional 0.5 percent.
- Recognizing R&D as investment would boost the level of state GDP the most for New Mexico (8.2 percent) and for Maryland (6.2 percent) between 1998 and 2002.
- For 2004, the value added of majority-owned foreign affiliates of U.S. multinational companies (MNCs) rises by \$25.9 billion, or 3.1 percent, with R&D capitalization. The value added of majority-owned U.S. affiliates of foreign MNCs rises by \$28.1 billion, or 5.5 percent. For U.S. parent companies, value added rises by \$148.2 billion, or 6.7 percent.

This report is organized as follows. First, it describes the essentials of the enhancements made to the R&D satellite account this year. Next, the 2007 R&D satellite account estimates are compared to national income and product account (NIPA) estimates; these NIPA estimates are currently available on BEA's website. Third, the 2007 estimates are compared to the 2006 R&D satellite account estimates released last September. Fourth, the main effects on R&D-intensive industries of treating R&D as investment are described. Finally, first-time order-of-magnitude estimates of state-by-state effects and of the effects on BEA's international accounts are presented. An article

including more complete data will be published in October's Survey of Current Business and will be available online.¹

2. Estimation Improvements

The satellite account has been re-estimated beginning with 1959 to incorporate several enhancements. First, two years of data (2003–2004) are added to the estimates of R&D investment, depreciation, and net stock of R&D assets for the private sector and for the government sector, and to the estimates of the impacts of treating R&D as investment on GDP and other macroeconomic aggregates. Second, a double-count embedded in the R&D investment and software investment estimates has been eliminated. Third, estimates of R&D investment have been adjusted to account for international transactions. Fourth, the valuation of the purchase price of R&D by business has been improved. Fifth, industry-specific estimates of R&D investment, gross output, and value added are now available. Finally, the price index for R&D output has been enhanced to better reflect the value of R&D investment to the industries that purchase or create R&D for investment purposes.

2.1 Eliminating the Double Counting of R&D Expenditures in Software Investment

In the 2007 R&D satellite account, BEA eliminates a double counting of R&D expenditures contained in software investment. Within the NSF source data, the cost of developing software that is marketed outside the company is treated as an R&D activity.²

¹ These papers will address: Output price indexes for R&D; industry estimates; rates of return; R&D stocks and depreciation rates; and regional and international estimates.

² In the NIPAs, three types of computer software spending—prepackaged software, custom software, and own-account software—are treated as investment and thus are included in GDP. Own-account software

These costs were double counted in the 2006 R&D satellite account, once in R&D investment and once in software investment. For 2007, BEA has removed the amount from the software investment estimate, retaining it in R&D investment because the R&D satellite account is designed to focus on R&D as a capitalized asset. This adjustment lowers GDP by the amount of the double-count.

The distortion caused by the double count becomes substantial only in recent years. While for most of the 1980s and 1990s, the double count is estimated to be about 5 to 6 percent of business funding of R&D, by 2004, it grew to 17 percent (\$34.6 billion) of business funding of R&D and to 43 percent of total own-account software.

2.2 Adjusting R&D Investment for International Transactions

The 2007 R&D satellite account estimates of business R&D investment are improved by explicitly accounting for R&D performed in the U.S. and used abroad and for R&D performed abroad and used in the U.S. The adjustment adds R&D imports to industry investment, and subtracts the cost of R&D exports from the measure of R&D that each industry retains for its own use.

The data used are exports and imports collected by BEA on receipts and payments of Research, Development, and Testing (RDT) services for use in the international transaction accounts.³ Both unaffiliated trade data (trade between firms) and affiliated trade data (trade within firms) are included in the estimated values of exports and imports

includes all in-house software development, whether it is for software to be used exclusively for internal company operations or for software to be marketed outside the company, such as a firm developing a software program for widespread distribution.

³ Although these data are not a perfect match for the scope of R&D activity considered investment in the satellite account, the RDT series is a close proxy. The scope of R&D activity considered investment in the R&D satellite account is that of the Frascati Manual, which would include testing of prototypes, but not routine testing. Thus the RDT services data may include non-R&D transactions of unknown, but likely small magnitude.

of R&D for the satellite account. The net effect in 2004 is a subtraction of \$2.4 billion, or 1.2 percent of private domestic R&D investment. The adjustment is negative in all the years between 1987 and 2004; however it becomes less negative after 2002. Omitting an adjustment for R&D imports underestimates domestic investment in R&D and omitting an adjustment for the cost of R&D exports overestimates domestic R&D investment.⁴

2.3 Purchased R&D Valued at Purchase Price instead of Cost

The 2007 R&D satellite account distinguishes between two types of industry investment in R&D output, business purchases of R&D and own-account investment. Own-account R&D investment is when firms perform R&D for their own use rather than for sale to others. BEA estimates the value of own-account investment as the sum of costs, and purchased R&D at a value that includes the R&D seller's margin between receipts and costs. This margin is estimated using the ratio of net operating surplus to gross output for miscellaneous professional, scientific, and technical services (NAICS 5412OP) from BEA's GDP-by-Industry data. This adjustment is used for both business purchases from other businesses, and business purchases by the Federal government.

2.4 Treating R&D as Investment for Thirteen R&D Intensive Industries

⁴ Because the affiliated RDT data have only been collected separately since 2001, prior years were extrapolated using related series. Unaffiliated trade data in RDT services have been separately collected since 1986; earlier years were extrapolated with NSF-measured funds for industry performed R&D. For this round of the satellite account BEA treated affiliated and unaffiliated trade symmetrically. An important conceptual issue for the recognition of R&D as investment in the national economic accounts is the treatment of R&D trade flows between the units of multinational companies, and the extent to which these flows represent changes in national ownership.

The 2007 R&D satellite account estimates provide a first look at how BEA's industry output would change if R&D were treated as investment instead of as a business expense. BEA's GDP-by-industry accounts provide data that serve as building blocks for industry-specific productivity analysis for the U.S. economy. Industry R&D investment is developed by mapping the National Science Foundation's data on industry R&D expenditures into the industry classification framework of BEA's industry accounts. Because industry-productivity analysis for R&D requires a consistent industry accounting of inputs and outputs, this mapping is a necessary first step.

The satellite account provides estimates of the impact of recognizing R&D as investment on private industry gross output and value added. It also provides detail for the set of R&D-intensive industries that account for more than two thirds of business R&D investment in 2004 and have the highest ratios of R&D investment to industry receipts. These industries include pharmaceutical and medicine manufacturing, computer and peripheral equipment manufacturing, semiconductor manufacturing, software publishing, computer systems design services, and six other detailed industries.⁵

2.5 Improved Price Indexes for R&D Output

The R&D satellite account presents estimates of real R&D investment using two alternative price scenarios: One is a cost-based index consistent with current NIPA estimation; and the other is an output based index developed to capture R&D effects. A

⁵ The industries are: Pharmaceuticals and medicines (NAICS 3254), Chemicals excluding pharmaceuticals (NAICS 325 excluding 3254), Computers and peripheral equipment (NAICS 3341), Communications equipment (NAICS 3342), Semiconductors (NAICS 3344), Navigational, measuring, medical, and control instruments (NAICS 3345), Other computer and electronic products (NAICS other 334), Motor vehicles, trailers and parts (NAICS 3361-3363), Aerospace products and parts (NAICS 3364), Other transportation equipment (NAICS 3365-3369), Software (NAICS 5112), Computer systems design and related services (NAICS 5415), and Scientific R&D services (NAICS 5417).

cost-based input price index is used to provide baseline measures that are consistent with the way that prices for government and other hard-to-measure services are often estimated in the national accounts. The cost-based input price index for R&D investment is based on a Fisher aggregation of detailed price indexes for the inputs used to create R&D. While this method is useful for estimating the impact of inflation on funds for R&D performance, the obvious drawback to this approach is that it 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.

Accordingly, an alternate R&D output price index is used in measuring the effect of R&D on real output, or real GDP. This index provides a measure of real R&D investment that better approximates the impact of R&D on the growth of real GDP, and is therefore used to deflate R&D. Because R&D output prices are not available, this index uses the price of the output in the industry that invests in R&D through creating own-account R&D or by purchasing R&D output. Using a weighted combination of the output prices of the industries that invest in R&D tends to average out the extreme effects of rapidly falling or rising output prices for particular products.

The index is constructed using a Fisher-weighted combination of the output prices of the thirteen R&D-intensive industries (see Section 5), where the weights are the industry's share of annual business investment in R&D. For years prior to 1987, detailed industry investment measures are unavailable and the aggregate output price index uses the top five industry R&D performers based on NSF survey data, weighted by R&D performance.

The 2006 vintage of the R&D satellite account featured a price index created with a combination of value-added prices and output prices for the four industries that performed the most R&D. The new index uses gross output prices derived mainly from Bureau of Labor Statistics' producer price indexes. The new index also includes all thirteen R&D intensive industries rather than a smaller subset, and incorporates a finer adjustment for industry weighting and updating. The overall impact of the new price index is similar to the 2006 vintage (chart 2).

3. Impact of Treating R&D as Investment on NIPA GDP Estimates

GDP grows slightly faster on average between the years 1959-2004 when R&D is treated as investment (table C). The average difference was 0.13 percentage point between 1959 and 1973, but slowed to zero in the period between 1974 and 1994, picking up again between 1995 and 2004 to 0.12 percentage point.

Another way to show the impact of treating R&D as investment is to look at the contribution of R&D to the annual growth rate of real GDP (table D). Of the 3.65 percent change in real GDP in 2004, the contribution of the new accounting treatment for R&D is 0.17 percentage point. In 2004, the newly recognized income flows from government and nonprofit institutions serving households contribute 0.09 percentage point, while business investment contributes a smaller 0.07 percentage point. In years when economic growth slows, R&D often has a negative contribution to growth. For example, in 1975 both business and government R&D effects on the growth rate were negative. However, business and government effects can offset each other. In 2002,

after the technology bubble, business R&D subtracted 0.06 percentage point from growth while government R&D added 0.06 percentage point.

4. Comparison of the 2007 and 2006 Satellite Account Estimates

The picture of the economy presented in the revised estimates is similar to that shown by the estimates published in 2006. However, in the 2007 vintage estimates, current-dollar investment in R&D is higher for all years; investment in R&D now totals \$285.3 billion in 2002, an upward revision of \$8.8 billion from the estimates in the 2006 satellite account (chart 1). Similarly, for the period 1959-2002, current-dollar GDP is higher for all years prior to 1999. It is lower beginning with 1999 due to the increasing impact of the software adjustment.

Crosswalk of Changes in R&D Investment for Business and for Government, 2002¹
[Billions of dollars]

	2002
Business R&D investment (2006 vintage)	170.8
+ Import adjustment	-4.0
+ Adjustment to R&D purchases by business: From cost basis to imputed purchase price	3.9
+ Purchases of nonscientific R&D	4.0
+ Reallocation of Federal/nonfederal split ²	9.5
+ Other	2.7
= Business R&D investment (2007 vintage)	186.9
Government R&D investment (2006 vintage)	98.3
+ Reallocation of Federal/nonfederal split	-9.5
+ Adjustment to federal purchases of R&D from business: From cost basis to imputed purchase price	2.3
+ Other	-0.3
= Government R&D investment (2007 vintage)	90.8

Note 1: The double count is not included in this table because it was taken out of software investment rather than R&D investment.

Note 2: The reallocation of Federal and nonfederal R&D from a BEA estimate to an NSF survey-based split was made to provide better internal consistency for the industry estimates, the largest component of R&D performance and investment.

To illustrate the differences between the 2006 and 2007 vintage estimates, the table above provides a crosswalk for 2002. The adjustments shown in the table were made to improve the accuracy of the purchases of R&D investment and to expand the boundary of capitalized R&D to include non-scientific R&D and international trade.

As shown in table C for the period 1959-2002, the 2006 vintage estimates of real GDP growth are similar to the 2007 vintage estimates. However, in the 2007 vintage estimates, the growth rate was slightly higher in the years 1959 to 1973. In part the difference in vintage estimates is due to the use of an improved R&D output price index. Chart 2 shows the difference in the indexes in the earlier years.

5. Industry Impacts of Treating R&D as Investment

Estimates for R&D as investment in the industry satellite account are based on the framework developed for the recognition of software as investment in the 1999 comprehensive benchmark revision of the NIPAs. Investment in R&D consists of both R&D performed internally for a business's own use, and purchased R&D.

The impact is measured in terms of gross output, intermediate inputs (expenses) and value added. Value added, which is measured as gross output less intermediate inputs, is the contribution of an industry or sector to GDP. Gross output measures an industry's sales, other operating income, commodity taxes, and inventory change. Treating R&D as investment adds the value of the own account R&D investment to gross output. Intermediate-inputs measure an industry's use of secondary factors of production, such as materials, supplies, and purchased services; treating own account R&D as investment does not change the industry purchases of intermediate inputs. Since

value added is gross output less intermediate inputs, own-account investment adds to both gross output and value added. Business purchases of R&D do not affect gross output, but do change intermediate inputs because these purchases are reclassified as investment. The value of intermediate inputs falls by the value of the R&D investment and value added increases by the same amount.

Recognizing R&D as investment changes the relative importance of the thirteen industries as contributors to the economic growth. Table F compares each industry's share of private industry value added before and after the adjustment for R&D investment as well as its contribution to the growth rate of private industry value added. The average annual growth in private industry value added (unadjusted for the impact of R&D) between 1995-2004 was 3.24 percent; when R&D is treated as investment, private industry value added grows by 3.35 percent, a tenth of a percentage point faster.⁶ The rows of the table show each industry's share of the growth. For example, compared with current national economic accounting standards, the contribution of pharmaceutical and medicine manufacturing to the growth in private industry real value added is three times larger when R&D is treated as investment (0.5 percent before and 1.8 percent after). The scientific R&D services industry also triples its contribution; this is because BEA's industry classification structure is establishment-based rather than company-based, and much R&D output is produced in dedicated R&D establishments. The contributions of the software publishing industry and the computer services industry both increase when R&D is treated as investment. The slight reduction in the share of growth in private industry value added attributed to the computer and peripheral equipment manufacturing

⁶ This growth rate differs from that of GDP first because there is a statistical discrepancy between the sum of industry value added and GDP, and second because the scope of measurement here is only the value added of private industries, not the government and non-profit sector.

industry (NAICS 3341) is due to the slower growth of real R&D investment relative to the industry's other real output.

Another way to look at each industry's impact on growth in value added after recognizing R&D as investment is to decompose the growth in private value added due directly to R&D. When R&D is treated as investment, private business R&D accounts for 2.6 percent of the average growth in real GDP (table D) between 1959 and 2004; the contribution is greater in recent years, 4.6 percent between 1995-2004. Chart 3 shows the impact of the information, communication, and technology producing (ICT) sector and the biotechnology sector, which contains pharmaceutical and medicine manufacturing and scientific R&D services. Together they account for more than half of the average contribution to growth attributed to recognizing R&D as investment between 1995 and 2004.

Estimates of current-dollar and real investment for business are also provided for these detailed industries for 1987-2004. Real investment is estimated using the same price indexes used in the NIPA-based satellite account--the aggregate R&D output price index and the input price index. The investment estimates are used to show the impact of recognizing R&D as investment on private industry value added for the thirteen detailed industries, providing estimates of gross output and value added in nominal dollars and inflation-adjusted terms using the two price indexes.

The primary source for the R&D data used in the industry satellite account is the National Science Foundation's Survey of Industrial R&D (SIRD), which provides industry detail on expenditures for the performance of R&D. The SIRD data are supplemented with BEA data on international services trade, Economic Census data on

receipts for the R&D services industry, and unpublished data from BEA, Census, and NSF that are used to allocate R&D performance and investment to industries.

6. Capitalizing R&D and the Regional Accounts Estimates

Because national account regional statistics are calculated consistently with the GDP-by-state statistics, treatment of R&D as investment at the state level is consistent with the main definitions and conventions developed for the national accounts. However, one issue that is particularly challenging to the GDP-by-state accounts is the appropriate geographical allocation of R&D investment. That is, should R&D investment be allocated to the location where the R&D is performed, or should the allocation of R&D investment cross state borders if it is used (and affects output) in multiple states? R&D funded and performed in a company's headquarters in one state can be shared with the company's operations throughout the country. Locating the R&D entirely in the state in which the R&D is performed and funded is conceptually problematic when the investment is shared with locations in other states. This cross-border issue is similar to the one noted below regarding the capitalization of R&D in the international accounts.

Capitalizing R&D means that purchased R&D output will be reclassified from an expense to investment, thus lowering intermediate expenditures and raising GDP by the same amount. To allocate this addition to GDP to the proper state, the location of industries that purchase the R&D output is necessary. The Economic Census can be used to allocate national estimates of R&D output to states for the Economic Census years. For other years, state shares of employment or wages from other establishment-based data, such as the Quarterly Census of Employment and Wages data from BLS, could be

used to allocate the national estimates. However, there is no information on the location of the industries which purchase R&D output. Consequently, a choice between assumptions is required: R&D investment occurs in the state in which it is performed, or R&D investment is proportional to industry output. In the latter case, R&D investment would be allocated to states based on states' shares of R&D using industries. BEA is studying the merits of each assumption.

Own-account R&D will be estimated and added to the total gross output of the industries performing own-account R&D. In general, NSF data on business funded R&D will be used to allocate BEA's national estimates of industry-funded R&D to states, and the NSF data on government-funded R&D will be used to allocate BEA's national estimates of consumption of fixed capital (CFC) and net returns for government funded R&D. To account for this correctly, the location of the industries performing own-account R&D is necessary. For the case of single establishment firms, the R&D investment will be allocated to the state in which the R&D is performed. For firms with establishments in multiple states, the location of investment could be determined by assigning the value of investment proportionately to the firm's establishments.

In addition, the GDP-by-state accounts will use the same R&D price indexes used in the national and industry components of the satellite account when calculating real R&D investment. It will also use national depreciation rates to calculate the net stock of R&D assets.

Table G provides rough estimates of how the new treatment of R&D might affect GDP-by-state for the years 1998 to 2002.⁷ This table shows the largest impacts are for

⁷ These GDP-by-State impact estimates differ from those in table A because the GDP-by-State estimates incorporated parameters from the 2006 vintage R&D satellite account.

New Mexico, Maryland, and Rhode Island. For New Mexico, GDP-by state would rise by an average 8.2 percent. For most states, however, the impact on GDP-by-state would likely be within 1.0 percentage point of the estimated U.S. impact of 2.8 percent. Impacts would exceed 1.0 percentage point above the U.S. impact for 10 states, and would be more than 1.0 percentage point below in 19 states.

6. Capitalizing R&D and International Accounts Estimates

The capitalization of MNC R&D raises several practical and conceptual issues. These issues do not preclude the estimation of R&D capital stocks but they affect their precision. Many of these issues also arise in the context of the capitalization of domestic R&D, but two are particularly notable because of their specific relevance to MNC R&D capital. The first is conceptual. R&D—like some other intangible assets, but unlike conventional physical capital—can be shared without cost. A parent company that shares R&D results with an overseas affiliate neither increases the MNC-wide stock of R&D capital nor lowers its own stock of R&D capital. However, it does raise the R&D capital stock of its affiliate. The sharing of R&D capital among different parts of an MNC—which may be regarded as a form of joint ownership—becomes a problem for economic accounting when the boundaries of MNCs do not stop at the boundaries of the countries for which estimates are made. Whether and how to measure such sharing is a problem without a clear resolution.

The second issue arises because of data limitations. In contrast to the domestic stock of R&D capital, the stock of MNC R&D capital can increase not only through R&D investment, but also through the entry into the MNC population of firms that hold

preexisting R&D stocks. The result is that computing changes in MNC capital stocks becomes more complicated than simply summing up investment and subtracting off depreciation. Conceptually the solution is quite obvious—simply estimate the R&D stocks of entering firms and acquisitions by existing firms—but existing data allow for only very rough estimates of “entry effects.”⁸

Table H provides illustrative order of magnitude estimates of the impact of R&D as investment on several components of the international accounts. The International Transactions Accounts—which summarize economic transactions between the United States and the rest of the world—consist of the current account, the capital account, and the financial account. The first two balances shown—on direct investment income and international investment income—are components of the current account balance, which reflects the combined balances on trade in goods and services (exports less imports), income (receipts less payments), and unilateral current transfers (transfers received less transfers made). The net international investment position is the cumulative end-of-year value of U.S.-owned assets abroad (outward investment) less foreign-owned assets in the United States (inward investment).

In the international transactions accounts in 2004, the current-account deficit falls by \$1.3 billion, or 0.2 percent. The \$1.3 billion change generates larger relative effects for other, lower-level balances: the surplus on direct investment income rises by 0.9 percent, and the surplus on total international investment income rises by 2.3 percent. In the international investment position accounts, when R&D is capitalized the outward direct investment position rises in 2004 by \$125.0 billion, or 5.1 percent, and the inward

⁸ In practice, estimates of “entry effects” must net the R&D capital stocks held by exiting firms against stocks held by entering firms.

direct investment position rises by \$149.2 billion, or 8.6 percent. The net (outward minus inward) direct investment position—currently estimated to be a positive value—falls by \$24.2 billion, or 3.2 percent. The \$24.2 billion change causes the net international investment position—which includes both direct and other types of investment, and is currently estimated to be a negative value—to rise (i.e., become more negative) by 1.1 percent.

Rough, aggregate-level estimates suggest that the effects of capitalizing R&D data on total capital stocks and value added of MNCs would not be inconsequential. Value added is the portion of a firm's output that reflects the production of the firm itself. In these estimates, it is measured as the sum of costs incurred (except for intermediate inputs) and profits earned in production. Relatively smaller effects would be seen for the series entering the other international accounts. For 2004, estimates of R&D capital stocks are \$125.0 billion for majority-owned foreign affiliates of U.S. MNCs, \$817.5 billion for U.S. parent companies, and \$149.2 billion for majority-owned U.S. affiliates of foreign MNCs.

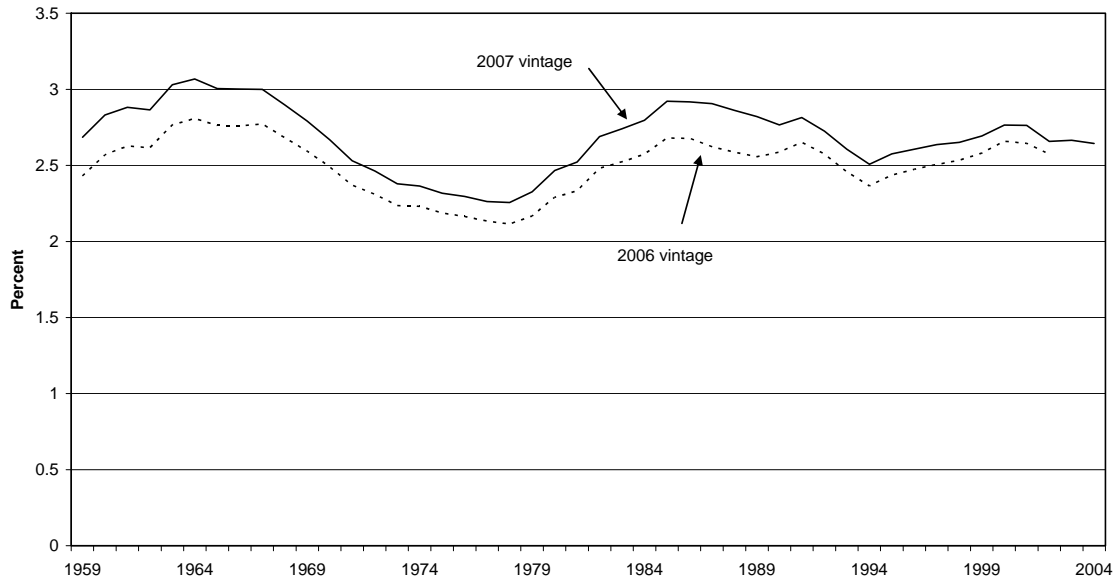
In the MNC operations data, the value added of majority-owned foreign affiliates of U.S. MNCs rises by \$25.9 billion, or 3.1 percent, with R&D capitalization. The value added of majority-owned U.S. affiliates of foreign MNCs rises by \$28.1 billion, or 5.5 percent. For U.S. parent companies, value added rises by \$148.2 billion, or 6.7 percent.

Final Note

As was the case with the 2006 vintage satellite account, the estimates provided in this release include only the direct impact of R&D investment from 1959–2004, the direct benefit realized by the investor. These estimates do not separately identify spillovers or

unpaid benefits of R&D to other firms. However, the Bureau of Labor Statistics produces measures of the impact of technological change on productivity through their estimates of multifactor productivity for the business sector. These estimates do incorporate spillovers, and the BLS estimates that approximately one fifth of the multifactor productivity residual can be attributed to R&D in recent years. These BLS estimates of the spillovers are consistent with BEA estimates of the direct impact of R&D (see BEA's 2006 Research and Development Satellite Account, Survey of Current Business, December, 2006, page 23).

Chart 1. R&D Investment as a Percent of Adjusted GDP, 1959–2004



GDP Gross domestic product
R&D Research and development
Note: Adjusted GDP includes the treatment of R&D as investment and the removal of the double count of capitalized software

U.S. Bureau of Economic Analysis

Chart 2. R&D output price indexes, 2007 compared to 2006 vintage

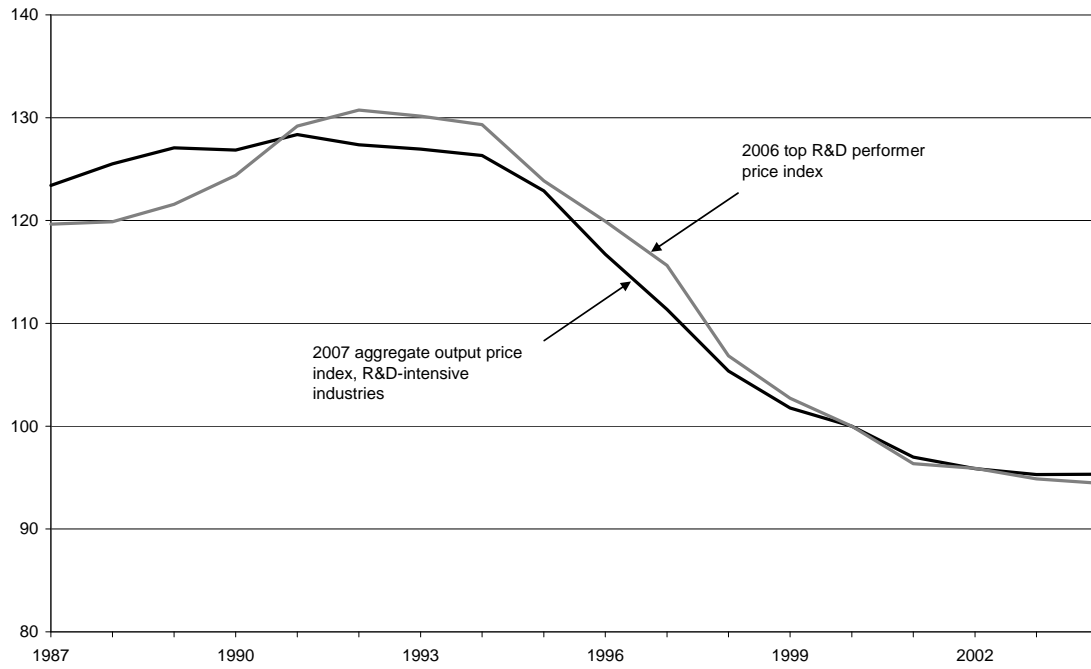
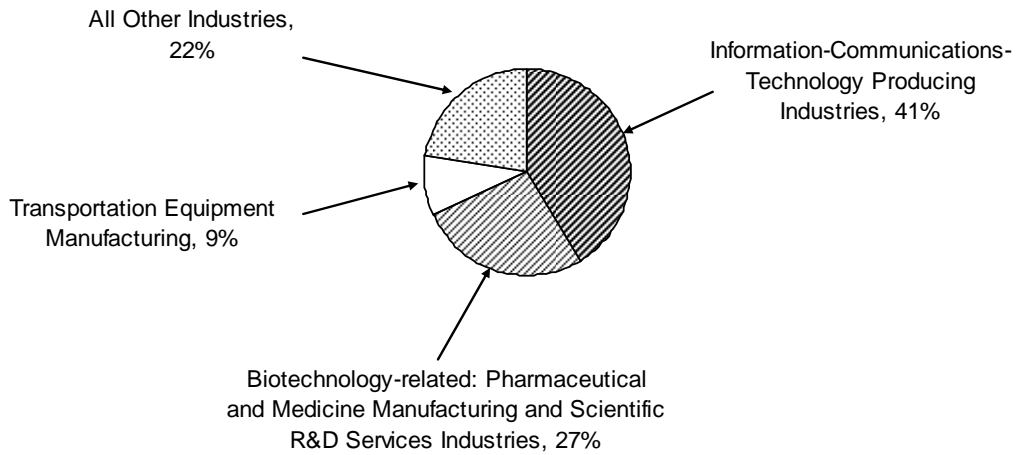


Chart 3. Sources of Business R&D's Contribution to Real GDP Growth, 1995-2004



GDP Gross domestic product
R&D Research and development
0.16 percentage points of 3.3 percent average growth rate

U.S. Bureau of Economic Analysis

Table A. GDP and the Decomposition of the Adjustments to GDP with R&D Treated as Investment—Continues

[Billions of dollars]

	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
GDP (from the NIPAs)	506.6	526.4	544.7	585.6	617.7	663.6	719.1	787.8	832.6	910.0
2006 R&D satellite account:										
Total adjustments to GDP from R&D investment.....	10.8	11.6	12.0	12.9	14.3	16.1	18.2	20.9	23.3	26.5
Business	5.8	5.8	5.3	4.8	4.8	5.0	5.2	6.0	6.7	8.2
Government	4.8	5.6	6.6	7.9	9.2	10.9	12.8	14.7	16.3	17.9
Nonprofit institutions serving households	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3
GDP with R&D treated as investment	517.4	538.0	556.8	598.5	632.0	679.8	737.3	808.7	855.9	936.5
Percent change in the level of GDP	2.1	2.2	2.2	2.2	2.3	2.4	2.5	2.7	2.8	2.9
2007 R&D satellite account:										
Total adjustments to GDP from R&D investment.....	11.1	12.5	13.8	15.4	17.0	19.1	21.5	23.9	26.1	28.6
Business	4.2	4.6	4.9	5.2	5.6	6.1	6.7	7.5	8.4	9.3
Government	6.8	7.7	8.8	10.0	11.2	12.8	14.5	16.1	17.4	19.0
Nonprofit institutions serving households	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3
GDP with R&D treated as investment	517.7	538.9	558.5	601.1	634.8	682.7	740.6	811.7	858.7	938.6
Percent change in the level of GDP	2.2	2.4	2.5	2.6	2.8	2.9	3.0	3.0	3.1	3.1
GDP with R&D and software adjustments ¹	517.7	538.9	558.5	601.1	634.8	682.7	740.6	811.7	858.7	938.6
Percent change in the level of GDP	2.2	2.4	2.5	2.6	2.8	2.9	3.0	3.0	3.1	3.1
Addenda:										
R&D investment (2007 vintage) ²	13.9	15.3	16.1	17.2	19.2	20.9	22.3	24.4	25.8	27.2
	1969	1970	1971	1972	1973	1974	1975	1976	1977	
GDP (from the NIPAs)	984.6	1,038.5	1,127.1	1,238.3	1,382.7	1,500.0	1,638.3	1,825.3	2,030.9	
2006 R&D satellite account:										
Total adjustments to GDP from R&D investment.....	29.3	30.5	32.0	34.0	36.6	38.9	42.2	46.7	50.9	
Business	10.0	10.4	10.6	11.7	13.2	14.7	15.6	17.6	19.5	
Government	18.9	19.8	21.0	21.9	22.8	23.7	26.0	28.4	30.6	
Nonprofit institutions serving households	0.4	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.8	
GDP with R&D treated as investment	1,013.9	1,069.1	1,159.1	1,272.3	1,419.3	1,538.9	1,680.6	1,872.0	2,081.8	
Percent change in the level of GDP	3.0	2.9	2.8	2.7	2.6	2.6	2.6	2.6	2.5	
2007 R&D satellite account:										
Total adjustments to GDP from R&D investment.....	30.7	31.9	33.8	35.9	38.7	43.4	48.4	52.3	56.7	
Business	10.3	10.8	11.2	12.1	13.8	15.5	16.6	18.6	20.6	
Government	20.0	20.7	22.2	23.3	24.4	27.2	31.1	32.9	35.3	
Nonprofit institutions serving households	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.9	
GDP with R&D treated as investment	1,015.3	1,070.5	1,161.0	1,274.2	1,421.4	1,543.3	1,686.7	1,877.5	2,087.7	
Percent change in the level of GDP	3.1	3.1	3.0	2.9	2.8	2.9	3.0	2.9	2.8	
GDP with R&D and software adjustments ¹	1,015.3	1,070.5	1,161.0	1,274.2	1,421.4	1,543.3	1,686.7	1,877.5	2,087.7	
Percent change in the level of GDP	3.1	3.1	3.0	2.9	2.8	2.9	3.0	2.9	2.8	
Addenda:										
R&D investment (2007 vintage) ²	28.4	28.6	29.4	31.4	33.8	36.5	39.1	43.1	47.2	
	1978	1979	1980	1981	1982	1983	1984	1985	1986	
GDP (from the NIPAs)	2,294.7	2,563.3	2,789.5	3,128.4	3,255.0	3,536.7	3,933.2	4,220.3	4,462.8	
2006 R&D satellite account:										
Total adjustments to GDP from R&D investment.....	55.3	61.4	68.0	77.6	87.1	96.1	107.5	116.5	120.2	
Business	22.5	27.0	31.7	37.7	43.4	49.7	57.7	64.1	64.3	
Government	32.0	33.5	35.2	38.7	42.3	44.9	48.2	50.7	53.9	
Nonprofit institutions serving households	0.9	1.0	1.1	1.2	1.4	1.5	1.7	1.8	2.0	
GDP with R&D treated as investment	2,350.1	2,624.8	2,857.5	3,206.0	3,342.1	3,632.8	4,040.7	4,336.8	4,583.0	
Percent change in the level of GDP	2.4	2.4	2.4	2.5	2.7	2.7	2.7	2.8	2.7	
2007 R&D satellite account:										
Total adjustments to GDP from R&D investment.....	62.9	70.6	80.6	93.3	102.1	111.4	125.4	135.8	143.4	
Business	23.9	28.3	33.8	39.5	44.7	49.8	57.4	63.5	67.4	
Government	38.1	41.2	45.6	52.3	55.8	59.8	66.0	70.1	73.7	
Nonprofit institutions serving households	1.0	1.1	1.3	1.5	1.6	1.8	2.0	2.2	2.3	
GDP with R&D treated as investment	2,357.7	2,633.9	2,870.1	3,221.7	3,357.1	3,648.1	4,058.6	4,356.0	4,606.2	
Percent change in the level of GDP	2.7	2.8	2.9	3.0	3.1	3.2	3.2	3.2	3.2	
GDP with R&D and software adjustments ¹	2,357.3	2,633.1	2,868.9	3,220.2	3,355.2	3,645.7	4,055.9	4,352.9	4,602.7	
Percent change in the level of GDP	2.7	2.7	2.8	2.9	3.1	3.1	3.1	3.1	3.1	
Addenda:										
R&D investment (2007 vintage) ²	53.2	61.3	70.8	81.2	90.3	99.9	113.4	127.2	134.3	

1. GDP with R&D treated as investment and with the double-counting of R&D software investment removed.

2. R&D investment includes spending on R&D by government and nonprofit institutions

serving households, whereas the adjustment to GDP for this spending consists only of the consumption of fixed capital charges and net returns to R&D investment.

NOTE. Implemented using the aggregate output price index.

Table A. GDP and the Decomposition of the Adjustments to GDP with R&D Treated as Investment—Table Ends

[Billions of dollars]

	1987	1988	1989	1990	1991	1992	1993	1994	1995
GDP (from the NIPAs)	4,739.5	5,103.8	5,484.4	5,803.1	5,995.9	6,337.7	6,657.4	7,072.2	7,397.7
2006 R&D satellite account:									
Total adjustments to GDP from R&D investment	126.6	136.1	145.4	158.8	173.8	179.5	181.2	186.4	200.2
Business.....	66.3	70.4	73.7	81.0	89.6	90.7	88.7	90.2	104.2
Government.....	58.1	63.3	68.8	74.6	80.6	84.8	88.1	91.4	91.0
Nonprofit institutions serving households.....	2.2	2.5	2.8	3.2	3.6	4.0	4.4	4.7	4.9
GDP with R&D treated as investment.....	4,866.0	5,239.9	5,629.7	5,961.9	6,169.7	6,517.3	6,838.6	7,258.6	7,597.8
Percent change in the level of GDP.....	2.7	2.7	2.7	2.7	2.9	2.8	2.7	2.6	2.7
2007 R&D satellite account:									
Total adjustments to GDP from R&D investment	150.4	162.2	173.6	179.3	190.8	196.2	198.8	203.9	215.9
Business.....	69.5	75.7	83.4	87.3	96.5	100.6	101.4	104.3	116.1
Government.....	78.4	83.7	87.2	88.7	90.7	91.7	93.2	95.1	95.0
Nonprofit institutions serving households.....	2.5	2.8	3.1	3.3	3.6	3.9	4.2	4.6	4.8
GDP with R&D treated as investment.....	4,889.9	5,266.0	5,658.0	5,982.4	6,186.7	6,533.9	6,856.2	7,276.1	7,613.6
Percent change in the level of GDP.....	3.2	3.2	3.2	3.1	3.2	3.1	3.0	2.9	2.9
GDP with R&D and software adjustments ¹	4,886.0	5,261.7	5,653.3	5,977.3	6,181.3	6,528.1	6,850.0	7,269.5	7,606.6
Percent change in the level of GDP.....	3.1	3.1	3.1	3.0	3.1	3.0	2.9	2.8	2.8
Addenda:									
R&D investment (2007 vintage) ²	142.0	150.6	159.4	165.3	173.9	177.9	178.6	182.3	195.9
	1996	1997	1998	1999	2000	2001	2002	2003	2004
GDP (from the NIPAs)	7,816.9	8,304.3	8,747.0	9,268.4	9,817.0	10,128.0	10,469.6	10,960.8	11,685.9
2006 R&D satellite account:									
Total adjustments to GDP from R&D investment	213.7	228.1	238.6	257.9	281.2	282.3	277.7	n.a.	n.a.
Business.....	116.3	128.5	140.8	157.8	179.2	179.3	170.8	n.a.	n.a.
Government.....	92.2	94.2	92.2	94.1	95.6	96.3	99.8	n.a.	n.a.
Nonprofit institutions serving households.....	5.1	5.5	5.6	6.0	6.4	6.7	7.1	n.a.	n.a.
GDP with R&D treated as investment.....	8,030.5	8,532.5	8,985.6	9,526.3	10,098.1	10,410.3	10,747.3	n.a.	n.a.
Percent change in the level of GDP.....	2.7	2.7	2.7	2.8	2.9	2.8	2.7	n.a.	n.a.
2007 R&D satellite account:									
Total adjustments to GDP from R&D investment	227.4	240.8	250.3	268.3	292.0	293.4	288.6	301.3	318.1
Business.....	128.9	142.5	154.0	171.4	193.6	195.8	186.9	192.5	200.9
Government.....	93.6	93.2	91.0	91.2	92.4	91.3	94.9	101.3	109.1
Nonprofit institutions serving households.....	4.9	5.2	5.3	5.6	6.0	6.3	6.8	7.4	8.1
GDP with R&D treated as investment.....	8,044.3	8,545.2	8,997.3	9,536.7	10,109.0	10,421.4	10,758.2	11,262.0	12,004.0
Percent change in the level of GDP.....	2.9	2.9	2.9	2.9	3.0	2.9	2.8	2.7	2.7
GDP with R&D and software adjustments ¹	8,036.9	8,537.4	8,988.8	9,524.4	10,093.9	10,405.8	10,734.2	11,234.9	11,969.4
Percent change in the level of GDP.....	2.8	2.8	2.8	2.8	2.8	2.7	2.5	2.5	2.4
Addenda:									
R&D investment (2007 vintage) ²	209.4	225.0	238.3	256.5	279.1	287.4	285.3	299.6	316.6

n.a. Not available. The 2006 R&D satellite account only presents estimates for 1959–2002.

1. GDP with R&D treated as investment and with the double-counting of R&D software investment removed.

2. R&D investment includes spending on R&D by government and nonprofit institutions

serving households, whereas the adjustment to GDP for this spending consists only of the consumption of fixed capital charges and net returns to R&D investment.

NOTE. Implemented using the aggregate output price index.

Table B. Effect on Gross Private Domestic Investment and the Saving Rate With R&D Treated as Investment

	Gross private domestic investment (GDPi)					National saving rate		
	Unadjusted, from the NIPAs (billions of dollars)	Unadjusted, less R&D software double-count (billions of dollars)	Adjusted for R&D and for R&D software double-count (billions of dollars)	Effect of R&D and software adjustments		Unadjusted ¹ (percent)	Adjusted (percent)	Impact (percentage points)
				On unadjusted GDPi (percent)	On GDPi less R&D software double-count (percent)			
	(a)	(b)	(c)	(c/a-1)	(c/b-1)			
1960	78.9	78.9	83.5	5.9	5.9	21.0	23.9	2.9
1970	152.4	152.4	163.2	7.1	7.1	18.6	21.3	2.8
1980	479.3	478.1	511.8	7.0	7.1	19.8	22.3	2.5
1990	861.0	855.9	943.2	10.1	10.2	16.3	19.2	2.9
2000	1,735.5	1,720.4	1,913.9	11.2	11.3	17.7	20.5	2.8
2004	1,888.6	1,854.0	2,054.9	10.6	10.8	13.8	16.5	2.7

1. As published in the national income and product accounts.
 NOTE: Implemented using the aggregate output price index.

Table C. Comparison of Changes in Average Real GDP Growth Rates

	Unadjusted ¹ (percent)	Adjusted, 2007 vintage ² (percent)	Adjusted, 2006 vintage ³ (percent)
	(a)	(b)	(c)
1959-1973	4.20	4.33	4.28
1974-1994	3.02	3.03	3.08
1995-2002	3.25	3.40	3.39
1995-2004	3.21	3.33	n.a.
1959-2002	3.35	3.42	3.42
1959-2004	3.33	3.40	n.a.

n.a. Not available. The 2006 R&D satellite account only presents estimates for 1959-2002.

1. As published in the national income and product accounts.

2. Real GDP with R&D treated as invest-

ment using the aggregate output price index.

3. Real GDP with R&D treated as investment and the double-counting of R&D software removed.

NOTE: Implemented using the aggregate output price index.

Table D. Contributions to the Annual Growth Rate of Real GDP With R&D Treated as Investment, 1960–2004

	1960	1961	1962	1963	1964	1965	1966	1967	1968
Percent change at annual rate:									
Real GDP ¹	2.73	2.55	6.30	4.47	6.03	6.61	6.63	2.69	4.93
Percentage points at annual rates:									
Effect of R&D as investment ²	0.30	0.28	0.38	0.21	0.37	0.37	0.30	0.25	0.25
Business.....	0.09	0.05	0.07	0.06	0.07	0.09	0.10	0.08	0.08
Government.....	0.21	0.23	0.30	0.14	0.30	0.27	0.19	0.17	0.17
Nonprofit institutions serving households.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1969	1970	1971	1972	1973	1974	1975	1976	1977
Percent change at annual rate:									
Real GDP ¹	3.21	0.20	3.35	5.32	5.79	-0.56	-0.30	5.24	4.56
Percentage points at annual rates:									
Effect of R&D as investment ²	0.22	0.03	0.08	0.18	0.18	-0.07	-0.12	0.06	0.07
Business.....	0.09	0.01	0.00	0.06	0.11	0.00	-0.07	0.06	0.05
Government.....	0.12	0.02	0.08	0.12	0.08	-0.07	-0.05	0.00	0.02
Nonprofit institutions serving households.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1978	1979	1980	1981	1982	1983	1984	1985	1986
Percent change at annual rate:									
Real GDP ¹	5.50	3.12	-0.20	2.50	-1.83	4.52	7.19	4.16	3.45
Percentage points at annual rates:									
Effect of R&D as investment ²	0.10	0.06	0.03	0.06	0.06	0.15	0.23	0.16	0.10
Business.....	0.09	0.09	0.07	0.05	0.07	0.09	0.14	0.11	0.05
Government.....	0.01	-0.03	-0.04	0.00	-0.01	0.05	0.08	0.05	0.04
Nonprofit institutions serving households.....	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1987	1988	1989	1990	1991	1992	1993	1994	1995
Percent change at annual rate:									
Real GDP ¹	3.35	4.18	3.62	1.95	-0.01	3.36	2.65	4.01	2.71
Percentage points at annual rates:									
Effect of R&D as investment ²	0.08	0.18	0.19	0.13	0.16	0.14	0.06	0.10	0.27
Business.....	0.02	0.10	0.12	0.07	0.13	0.08	0.02	0.05	0.20
Government.....	0.06	0.07	0.06	0.05	0.02	0.06	0.04	0.05	0.06
Nonprofit institutions serving households.....	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00
	1996	1997	1998	1999	2000	2001	2002	2003	2004
Percent change at annual rate:									
Real GDP ¹	3.94	4.72	4.37	4.62	3.86	0.86	1.48	2.57	3.65
Percentage points at annual rates:									
Effect of R&D as investment ²	0.34	0.35	0.31	0.32	0.32	0.13	0.00	0.15	0.17
Business.....	0.25	0.25	0.23	0.26	0.26	0.08	-0.06	0.06	0.07
Government.....	0.09	0.09	0.08	0.06	0.05	0.04	0.06	0.08	0.09
Nonprofit institutions serving households.....	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01

Average Annual Contributions and Shares for Selected Periods

	1959–2004	1959–1973	1974–2004	1995–2004
Percent change at annual rate:				
Real GDP ¹	3.42	4.34	2.87	3.34
Percentage points at annual rates:³				
GDP excluding R&D investment.....	3.25	4.10	2.77	3.11
Effect of R&D as investment ²	0.17	0.24	0.10	0.23
Business.....	0.09	0.07	0.07	0.16
Government.....	0.08	0.17	0.02	0.07
Nonprofit institutions serving households.....	0.00	0.00	0.00	0.01
Percent of average annual growth:⁴				
GDP excluding R&D investment.....	95.00	94.40	96.50	93.04
Effect of R&D as investment ²	5.00	5.60	3.50	6.96
Business.....	2.57	1.60	2.53	4.64
Government.....	2.33	3.94	0.87	2.16
Nonprofit institutions serving households.....	0.10	0.06	0.11	0.16

1. GDP with R&D treated as investment and the double-counting of R&D software investment removed.

2. Includes business investment, consumption of fixed capital charges for government and nonprofit institutions serving households, and a net return to government and these nonprofit institutions.

3. Average annual contributions to GDP growth

including R&D are computed as the arithmetic average of annual contributions to growth.

4. Percent of total is computed as the ratio of average annual contributions to growth over the average growth of GDP including R&D.

NOTE. Implemented using the aggregate output price index.

Table E. Private Business Investment in R&D by Industry, 1987–2004

[Millions of dollars]

NAICS code	Industry	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	All for-profit industries	69,494	75,718	83,376	87,345	96,495	100,589	101,398	104,311	116,139	128,880	142,502	153,976	171,426	193,562	195,789	186,919	192,542	200,897
	Own account	53,232	57,784	63,773	65,801	72,968	75,937	75,787	77,581	85,851	96,376	107,037	116,046	126,949	140,267	147,749	138,662	136,911	139,272
	Purchased R&D	16,262	17,933	19,603	21,544	23,526	24,652	25,611	26,730	30,289	32,505	35,465	37,930	44,477	53,295	48,040	48,257	55,631	61,625
325	Chemical manufacturing	10,635	12,074	13,118	14,410	15,777	16,603	18,180	18,403	19,559	20,162	21,615	24,243	26,924	31,148	32,430	34,273	41,555	48,911
	Own account	4,577	5,193	5,614	6,123	6,628	6,819	7,486	7,281	7,294	7,438	7,588	9,307	9,174	9,667	12,482	12,012	13,567	15,991
	Purchased R&D	6,058	6,880	7,505	8,287	9,149	9,784	10,694	11,122	12,265	12,724	14,027	14,936	17,749	21,481	19,947	22,260	27,989	32,920
3254	Pharmaceutical and medicine manufacturing	5,569	6,443	7,101	7,694	8,793	9,784	11,082	11,735	12,835	12,805	14,815	14,374	18,425	22,136	20,800	25,338	33,050	40,597
	Own account	1,192	1,434	1,602	1,663	1,986	2,305	2,783	2,901	2,922	2,659	3,242	2,852	3,758	4,005	4,836	6,289	8,282	10,891
	Purchased R&D	4,377	5,009	5,499	6,031	6,806	7,479	8,299	8,834	9,913	10,146	11,572	11,522	14,666	18,131	15,964	19,050	24,769	29,706
3251–53, 3255–56, 3259	Chemicals minus pharmaceutical and medicine manufacturing	5,067	5,630	6,017	6,716	6,985	6,819	7,098	6,668	6,725	7,357	6,801	9,869	8,499	9,011	11,629	8,934	8,505	8,313
	Own account	3,385	3,759	4,012	4,460	4,642	4,514	4,703	4,380	4,373	4,779	4,346	6,455	5,662	7,646	5,724	5,285	5,100	
	Purchased R&D	1,681	1,871	2,006	2,256	2,343	2,305	2,396	2,287	2,352	2,578	2,455	3,414	3,083	3,349	3,983	3,211	3,220	3,213
334	Computer and electronic product manufacturing	14,527	15,062	15,170	14,993	15,159	16,154	16,137	18,120	22,327	25,962	30,669	32,858	32,231	42,417	46,289	44,170	42,979	41,557
	Own account	12,766	13,231	13,326	13,025	13,135	14,017	14,003	15,739	19,328	22,506	26,667	27,956	27,225	35,223	38,906	37,576	36,273	35,041
	Purchased R&D	1,761	1,831	1,844	1,968	2,025	2,137	2,134	2,381	2,999	3,456	4,002	4,902	5,006	7,194	7,383	6,594	6,707	6,515
3341	Computer and peripheral equipment manufacturing	3,796	3,940	3,979	3,882	3,925	4,188	4,183	4,712	5,783	6,719	7,943	8,415	4,204	5,153	3,266	3,929	3,347	5,725
	Own account	3,403	3,534	3,571	3,452	3,488	3,724	3,723	4,192	5,140	5,975	7,071	7,486	3,670	4,468	2,827	3,409	2,880	4,997
	Purchased R&D	392	406	408	430	437	464	461	519	643	744	873	929	534	685	439	520	466	728
3342	Communications equipment manufacturing	1,504	1,563	1,572	1,313	1,319	1,398	1,394	1,554	1,956	2,286	2,715	8,421	7,183	13,319	18,647	12,453	11,690	8,549
	Own account	1,198	1,246	1,258	971	964	1,026	1,025	1,139	1,415	1,663	1,990	6,575	5,484	10,271	14,744	9,766	9,082	6,499
	Purchased R&D	306	318	314	341	355	372	370	415	542	624	725	1,846	1,699	3,048	3,903	2,688	2,609	2,050
3344	Semiconductor and other electronic component manufacturing	6,567	6,797	6,835	7,016	7,094	7,568	7,554	8,494	10,438	12,137	14,346	9,469	10,906	12,900	14,980	15,689	16,576	17,700
	Own account	5,929	6,137	6,171	6,315	6,379	6,810	6,801	7,649	9,384	10,919	12,924	8,453	9,697	11,389	13,421	14,076	14,797	15,753
	Purchased R&D	638	660	664	701	715	758	754	846	1,054	1,218	1,422	1,016	1,209	1,512	1,560	1,613	1,779	1,947
3345	Navigational, measuring, electromedical, and control instruments manufacturing	2,404	2,496	2,517	2,515	2,551	2,712	2,717	3,034	3,750	4,355	5,115	5,975	9,194	10,739	8,308	11,523	10,659	8,470
	Own account	2,006	2,076	2,087	2,049	2,064	2,201	2,199	2,470	3,036	3,537	4,194	4,929	7,716	8,837	6,941	9,820	8,897	6,812
	Purchased R&D	398	419	429	466	487	511	518	564	715	818	921	1,046	1,478	1,901	1,367	1,703	1,762	1,659
3343, 3346	Other computer and electronic products manufacturing	257	266	267	268	270	288	288	325	400	464	550	578	744	306	1,089	576	708	1,113
	Own account	230	238	239	238	240	256	256	289	354	412	489	513	659	257	974	506	617	981
	Purchased R&D	27	28	28	30	30	32	32	36	45	52	61	65	85	48	115	71	91	132
336	Transportation equipment manufacturing	15,965	16,400	16,987	16,331	16,938	18,804	18,835	19,848	21,501	23,035	22,454	21,389	24,794	24,312	22,050	22,510	27,204	27,553
	Own account	12,476	12,766	13,150	12,536	12,988	14,591	14,413	15,057	16,011	17,104	16,633	15,749	17,744	16,448	15,744	16,275	19,588	19,487
	Purchased R&D	3,488	3,634	3,837	3,794	3,951	4,213	4,422	4,791	5,490	5,931	5,821	5,640	7,050	7,864	6,306	6,235	7,615	8,066
3361–63	Motor vehicles, bodies and trailers, and parts manufacturing	7,903	8,492	9,399	9,066	9,522	9,719	11,218	12,547	14,236	15,423	14,853	14,268	18,667	19,403	16,923	16,098	18,166	16,625
	Own account	5,552	5,981	6,642	6,347	6,661	6,802	7,904	8,838	9,905	10,713	10,271	9,793	12,712	12,709	11,559	10,938	12,067	10,804
	Purchased R&D	2,351	2,511	2,756	2,719	2,861	2,917	3,313	3,709	4,331	4,710	4,582	4,476	5,955	6,694	5,364	5,159	6,099	5,821
3364	Aerospace product and parts manufacturing	7,651	7,507	7,203	6,908	7,051	8,632	7,205	6,905	6,879	7,209	7,203	6,726	5,523	4,222	4,272	5,487	7,981	9,772
	Own account	6,558	6,427	6,164	5,874	6,004	7,387	6,143	5,868	5,768	6,039	6,014	5,612	4,499	3,155	3,444	4,512	6,583	7,678
	Purchased R&D	1,093	1,080	1,039	1,034	1,047	1,245	1,062	1,037	1,111	1,170	1,188	1,114	1,024	1,067	829	976	1,397	2,094
3365–66, 3369	Other transportation equipment manufacturing	410	402	385	357	366	452	413	397	386	404	399	395	604	688	855	925	1,057	1,156
	Own account	366	358	343	315	323	401	366	351	338	353	348	344	533	584	741	825	938	1,005
	Purchased R&D	44	44	42	42	43	51	47	46	48	50	51	51	71	104	114	100	119	151
5112	Software publishers	1,588	1,961	2,263	2,214	2,321	2,952	3,066	3,531	6,255	7,175	9,143	10,742	12,233	13,215	13,452	15,951	16,258	
	Own account	1,521	1,885	2,185	1,566	2,108	2,212	2,834	2,941	3,368	6,054	6,949	8,881	10,412	11,790	12,870	13,092	15,488	15,736
	Purchased R&D	66	75	78	93	106	109	117	125	162	201	226	262	330	443	345	359	463	522
5415	Computer systems design and related services	1,141	1,530	1,811	1,142	1,637	1,679	1,866	1,786	1,973	2,437	3,049	2,913	4,038	5,756	11,666	15,817	14,319	11,196
	Own account	1,075	1,437	1,702	997	1,451	1,488	1,659	1,579	1,727	2,145	2,701	2,563	3,565	5,079	10,641	14,470	13,033	10,108
	Purchased R&D	66	93	108	145	187	192	207	207	246	292	349	350	473	677	1,024	1,347	1,286	1,088
5417	Scientific R&D services	570	542	1,029	1,970	2,916	2,979	3,047	3,065	3,114	3,611	4,539	6,276	6,920	8,4				

**Table F. Private Industry Value Added Unadjusted and Adjusted for R&D as Investment,
Growth Rate, Industry Share of Growth Rate, and Industry Share of Private Industry Value Added 1995–2004**
[Percent]

NAICS code		Growth rate in private industry value added		Average annual industry value added as a percent of average annual total value added	
		Unadjusted ¹	Adjusted ²		
All industries		3.24	3.35		
		Industry share of growth rate in private industry value added ³		Unadjusted	Adjusted
		Unadjusted	Adjusted		
3254	Pharmaceutical and medicine manufacturing.....	0.5	1.8	0.6	0.9
3251–53,3255–56,3259	Chemicals minus pharmaceutical and medicine manufacturing.....	1.2	1.3	1.4	1.5
3341	Computer and peripheral equipment manufacturing	5.5	5.3	0.2	0.3
3342	Communications equipment manufacturing	0.3	0.7	0.3	0.4
3344	Semiconductor and other electronic component manufacturing	8.5	8.5	0.7	0.8
3345	Navigational, measuring, electromedical, and control instruments manufacturing	-0.1	0.2	0.6	0.6
33443, 3346	Other computer and electronic products manufacturing.....	-0.1	-0.1	0.1	0.1
3361–63	Motor vehicles, bodies and trailers, and parts manufacturing	0.9	1.1	1.4	1.6
3364	Aerospace product and parts manufacturing	0.0	0.2	0.6	0.7
33665–66, 3369	Other transportation equipment manufacturing	0.1	0.1	0.2	0.2
5112	Software publishers	2.6	2.9	0.5	0.6
5415	Computer systems design and related services.....	3.4	3.5	1.3	1.3
5417	Scientific research and development services	0.4	1.3	0.5	0.6
	All other industries.....	76.6	73.2	91.6	90.4

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1. Corresponds to published values.

2. Includes adjustments for R&D treated as investment and the double-count of invest-

ment in R&D software.

3. Calculated as the average annual industry contribution to the percent change in adjusted and unadjusted chain-type quantity index of value added.

NOTE: Implemented using the aggregate output price index.

Table G. Illustrative Estimates of the Effect on the Level of GDP by State With R&D Treated As Investment

	1998	1999	2000	2001	2002	Average 1998–2002		1998	1999	2000	2001	2002	Average 1998–2002
United States	2.7	2.8	2.9	2.8	2.7	2.8	Missouri	1.3	1.3	1.6	1.6	1.4	1.5
Alabama	2.2	2.0	2.0	2.3	2.2	2.1	Montana.....	1.2	1.1	1.1	1.3	1.2	1.1
Alaska	1.8	1.1	1.0	1.4	1.2	1.3	Nebraska	0.7	0.9	5.1	1.2	1.2	1.8
Arizona	1.9	3.6	2.2	2.1	2.6	2.5	Nevada.....	1.0	0.8	0.6	0.6	0.7	0.7
Arkansas	0.6	0.7	0.8	0.8	0.7	0.7	New Hampshire	3.7	3.5	2.1	4.3	3.6	3.4
California	4.4	4.4	4.8	4.3	4.1	4.4	New Jersey	3.7	3.3	4.1	3.3	3.6	3.6
Colorado.....	3.7	3.1	2.9	2.8	2.5	3.0	New Mexico	8.1	8.3	7.8	5.9	10.8	8.2
Connecticut	2.6	3.1	3.3	3.4	4.3	3.3	New York.....	2.2	2.1	2.0	2.0	1.8	2.0
Delaware	6.9	3.4	3.9	3.1	3.0	4.1	North Carolina	2.0	2.1	2.1	2.2	1.9	2.1
District of Columbia.....	6.5	5.9	5.4	5.1	4.9	5.6	North Dakota	0.9	1.2	1.1	2.7	1.7	1.5
Florida	1.3	1.1	1.2	1.3	1.2	1.2	Ohio	2.2	2.5	2.3	2.6	2.3	2.4
Georgia	1.1	1.2	1.1	1.2	1.4	1.2	Oklahoma	0.8	0.9	0.9	1.0	0.9	0.9
Hawaii.....	0.8	0.9	1.0	1.1	1.2	1.0	Oregon.....	2.0	2.0	2.1	5.2	2.6	2.8
Idaho	4.1	4.5	4.6	2.9	4.0	4.0	Pennsylvania.....	2.6	3.0	2.8	3.0	2.5	2.8
Illinois	2.2	2.3	3.0	2.4	2.3	2.5	Rhode Island.....	6.3	6.2	5.3	5.4	5.2	5.7
Indiana	1.9	1.7	1.8	2.3	2.2	2.0	South Carolina.....	1.1	1.1	1.2	1.3	1.5	1.2
Iowa.....	1.5	1.3	1.4	1.6	1.5	1.5	South Dakota.....	0.4	0.4	0.5	0.7	0.5	0.5
Kansas	2.2	2.3	2.0	2.2	2.4	2.2	Tennessee.....	1.7	1.6	1.4	1.7	1.5	1.6
Kentucky.....	0.7	0.9	0.9	0.9	1.0	0.9	Texas.....	1.8	2.0	1.8	1.8	1.9	1.9
Louisiana.....	0.6	0.6	0.6	0.7	0.7	0.7	Utah	2.8	2.7	2.4	2.4	2.4	2.5
Maine	0.6	0.8	1.1	1.2	1.2	1.0	Vermont	1.3	2.6	3.0	2.4	2.2	2.3
Maryland	6.4	6.1	6.3	7.2	5.1	6.2	Virginia.....	2.7	2.6	2.4	2.4	2.4	2.5
Massachusetts	6.4	5.5	5.5	5.9	5.5	5.8	Washington.....	4.7	4.4	5.4	5.0	4.8	4.9
Michigan	4.7	5.8	5.9	4.9	4.5	5.2	West Virginia.....	1.3	1.3	1.4	1.3	1.3	1.3
Minnesota.....	2.5	2.4	2.5	2.8	2.8	2.6	Wisconsin	1.7	1.6	1.7	2.0	2.0	1.8
Mississippi.....	0.8	1.0	1.1	1.2	1.2	1.0	Wyoming.....	0.6	0.5	0.5	0.5	0.5	0.5

NOTES: Calculated as the ratio of the adjustment to unadjusted GDP by state.

Table H. Illustrative Estimates of the Effect on Selected International Accounts Measures Adjusted and Unadjusted for R&D as Investment

[Billions of dollars]

	International transactions balances ¹					
	Direct investment income ²		International investment income ²		Current account ³	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1995	64.9	60.6	20.9	16.6	-113.6	-117.9
1996	69.4	65.7	22.3	18.6	-124.8	-128.5
1997	72.4	68.3	12.6	8.6	-140.7	-144.8
1998	65.5	57.3	4.3	-4.0	-215.1	-223.3
1999	78.2	71.9	13.9	7.6	-301.6	-307.9
2000	94.9	89.9	21.1	16.0	-417.4	-422.5
2001	115.9	111.3	31.7	27.1	-384.7	-389.3
2002	102.3	99.2	27.7	24.5	-459.6	-462.8
2003	112.7	109.1	45.4	41.8	-522.1	-525.7
2004	139.4	140.7	56.4	57.7	-640.1	-638.8
	International investment position					
	Outward investment		Inward investment		Net position ⁴	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1995	3,486.3	3,553.7	3,944.7	4,011.0	-458.5	-457.3
1996	4,032.3	4,104.0	4,527.4	4,600.0	-495.1	-496.0
1997	4,567.9	4,642.9	5,388.6	5,467.7	-820.7	-824.8
1998	5,095.5	5,175.0	5,990.9	6,082.4	-895.4	-907.4
1999	5,974.4	6,061.1	6,740.6	6,843.5	-766.2	-782.4
2000	6,238.8	6,331.1	7,620.0	7,735.6	-1,381.2	-1,404.4
2001	6,308.7	6,406.2	8,228.1	8,353.1	-1,919.4	-1,946.8
2002	6,652.2	6,755.4	8,740.3	8,871.8	-2,088.0	-2,116.4
2003	7,643.5	7,755.3	9,783.9	9,924.6	-2,140.4	-2,169.4
2004	9,257.1	9,382.1	11,551.5	11,700.7	-2,294.4	-2,318.6
	Value added of multinational companies ⁵					
	Majority-owned foreign affiliates		U.S. parents		Majority-owned U.S. affiliates	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
1995	465.6	476.5	1,365.5	1,453.6	254.9	269.8
1996	498.3	510.2	1,480.6	1,572.8	283.4	299.1
1997	520.9	533.1	1,573.5	1,672.9	313.7	330.3
1998	506.3	518.3	1,594.5	1,702.2	353.9	375.3
1999	566.4	581.0	1,914.3	2,035.7	397.3	420.2
2000	606.6	623.7	2,141.5	2,272.0	447.3	472.2
2001	585.7	602.6	1,892.4	2,030.5	417.1	442.1
2002	601.6	620.3	1,858.8	1,991.4	460.6	486.5
2003	697.8	718.2	1,958.1	2,093.9	475.1	503.1
2004	824.3	850.2	2,215.8	2,364.0	511.5	539.6

1. The international transactions accounts summarize economic transactions between the United States and the rest of the world; they consist of the current account, the capital account, the financial account.

2. These balances are components of the current-account balance.

3. This balance reflects the combined balances on trade in goods and services (exports less imports), income (receipts less payments), and unilateral current transfers (transfers received less transfers made).

4. The net position is the cumulative end-of-year value of outward investment (of U.S.-owned assets abroad) less inward investment (of foreign-owned assets in the United States).

5. Value added is the portion of a firm's output that reflects the firm's production. In these estimates, it is measured as the sum of costs incurred (excluding intermediate inputs) and profits earned in production.

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