

# Updated and Revised Estimates of the U.S. Space Economy, 2012–2019

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On December 17, 2020, the U.S. Bureau of Economic Analysis (BEA) released [preliminary estimates](#) of 2012–2018 gross output, value added, employment, and compensation for the U.S. space economy for the first time. This article describes updated and revised space economy statistics for 2012–2019 that build on the preliminary estimates by incorporating new source data and improved methods. These updated statistics now include improved measures of depreciation and inventories, along with new statistics that show the price-adjusted estimates (also referred to as “chained-dollar” or “real” estimates) of gross output and gross domestic product (GDP). Specifically, the updated space economy statistics provide estimates of the space economy’s contribution to overall U.S. current-dollar and chained-dollar gross output and GDP by industry, as well as private employment and compensation statistics. The updated and revised statistics show that, in 2019, the U.S. space economy accounted for \$194.4 billion of real gross output, \$125.9 billion of real GDP (translating to 0.6 percent of U.S. GDP), \$42.4 billion of private industry compensation, and 354,000 private sector jobs. See the appendix to this report or BEA’s [space economy website](#) for the detailed data tables.

The U.S. space economy statistics were built using BEA’s comprehensive supply-use tables, which provide insight into the internal workings of the U.S. economy and detail the contribution of specific industries and commodities to GDP. The supply-use data detail the flows of goods and services purchased by each industry, the incomes earned from production in each industry, and the distribution of sales for each commodity. The goal of the space economy statistics is to highlight the space-related production and spending that is already present in the supply-use tables. In practice, these data represent a rearrangement of the current supply-use data to isolate space economy spending and production. A detailed description of the basic methodology, including background information on BEA concepts and general national accounting methods, is available in the [December 2020 Survey of Current Business](#).

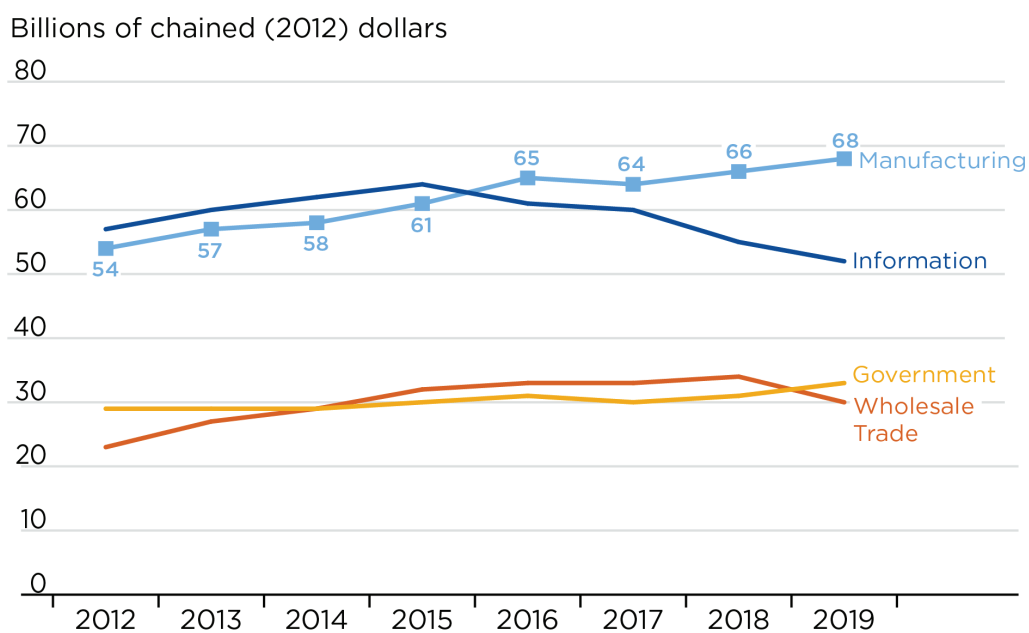
This report begins with a short summary of the major findings from the updated statistics, focusing on the chained-dollar estimates of gross output by industry. We then describe the revisions made to the 2012–2018 preliminary estimates arising from updated source data and methodological improvements. We follow with a discussion of trends in the U.S. space economy to help provide context to the estimates and conclude with a summary of possible next steps for the project.

## Real Gross Output

The gross output of an industry is the market value of the goods and services produced by an industry. Real or constant-dollar estimates hold prices constant such that growth rates for real estimates reflect changes in quantities produced, removing the impact of inflation.<sup>1</sup> Real gross output growth for the space economy was strong and positive for 2012–2015, averaging 4.3 percent. Growth then slowed from 2015–2016, down to 0.6 percent, and since 2016 growth has been negative. Average annual growth over the full 2012–2019 period was 1.6 percent, slightly slower than the overall U.S. growth rate of 2.3 percent for those years.<sup>2</sup> The industries with the largest contributions to real gross output growth between 2012 and 2015 were **manufacturing**, **wholesale trade**, and **information**. For 2015–2019, **manufacturing** remained a large contributor to growth, while **wholesale trade** experienced slower growth over those years, eventually contracting in 2019. **Information** experienced declines for the entire 2015–2019 period, dragging down the overall space economy due to its relative importance.

Chart 1 shows real gross output for the top four industries over the 2012–2019 period. In 2016, **manufacturing** overtook **information** as the largest industry in the U.S. space economy in terms of real gross output due to the decline in the **information** sector over the second half of the period, coupled with strong overall growth in the **manufacturing** sector.

**Chart 1. U.S. Space Economy Real Gross Output for Top 4 Industries**



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1. Chained-dollar estimates are calculated by taking the current-dollar level of a series in the reference period and multiplying it by the change in a chained-type quantity index number for the series since the reference period. Chained-dollar estimates correctly show growth rates for a series, but are not additive in periods other than the reference period.
2. Table “Real Gross Output by Industry,” published December 22, 2021.

Industry highlights include:

- **Manufacturing** experienced strong annual growth between 2012 and 2019, 3.5 percent on average. This growth was mostly driven by the **computer and electronic products** industry, which includes satellite and Global Positioning System (GPS) and positioning, navigation, and timing (PNT) equipment manufacturing, where annual growth rates averaged 6.7 percent for 2012–2019. Most of that growth is concentrated in 2012–2018, as estimates slowed to 1.5 percent in 2019.
- **Wholesale trade** had the largest negative contribution to growth in 2018–2019, declining by 11.6 percent. **Wholesale trade** had strong positive growth in the first half of the time series, averaging 9.1 percent between 2012 and 2016, but started to slow beginning in 2017. The **wholesale trade** sector consists of the margins or markups charged by wholesale distributors for space-related items, such as GPS transceivers and antennae. Wholesale distributors typically sell items to other businesses for use as intermediate inputs into other goods.
- **Information** declined by 4.5 percent for 2018–2019, following the same trend of negative growth that began in 2016. **Wired telecommunications carriers**, which includes direct-to-home (DTH) satellite television, is by far the largest industry in this sector and also one of the larger industries in the overall space economy. Annual declines in the **wired telecommunications carriers** industry of 5 percent or more per year starting in 2016 drove down growth in the **information** sector and overall.
- **Government** was the largest contributor to growth for 2018–2019, growing by 9 percent, driven almost entirely by federal spending (which includes many space-related government agencies, though chiefly NASA and Department of Defense<sup>3</sup>). For 2012–2018, average annual growth for **government** was 0.7 percent.
- **Retail trade** estimates grew steadily over the 8-year period, at an average annual growth rate of 33.9 percent. The overall levels remained a small percentage of the space economy, however, representing \$2.2 billion or less per year. The **retail trade** sector consists of the margins or markups charged by retail stores for space-related items, such as satellite dishes and GPS units.

## Real Value Added

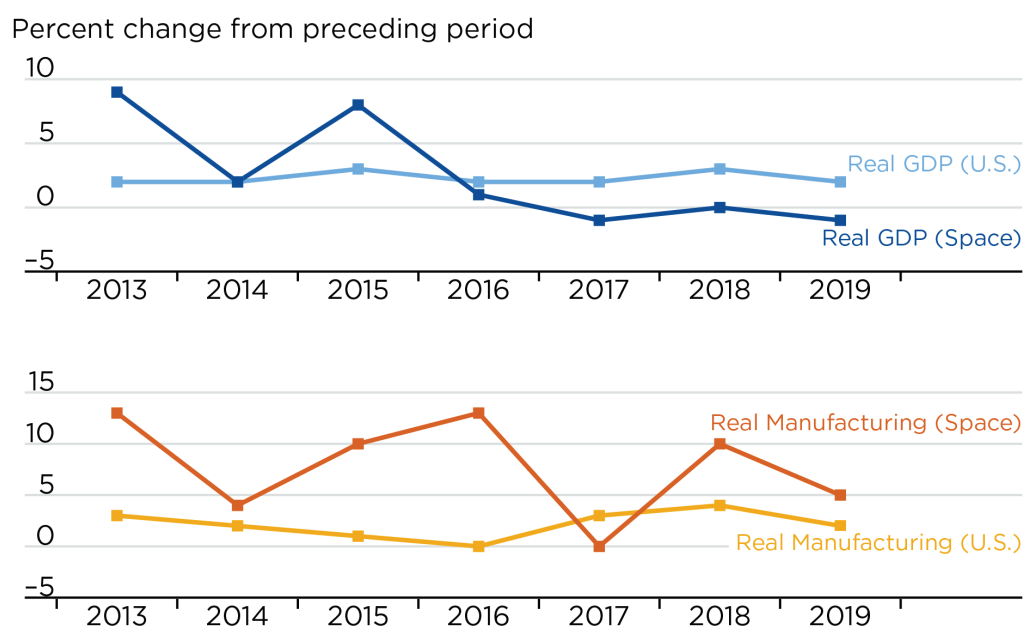
The GDP or value added for an industry represents the market value it adds in production, or the difference between an industry’s gross output and the cost of its intermediate inputs. As with real gross output, real value-added holds prices constant. Trends for overall real value added were similar to real gross output in that growth was positive and strong for 2012–2015 (averaging 6.5 percent annually) and then started to slow and decline between 2015 and 2019 (averaging –0.1 percent annually). Like real gross output, much of the declines for 2015–2019 were driven by the **wired telecommunications carriers** industry within the **information** sector, which contracted by 12 percent on average over the four years.

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3. See Table 7 from “[Preliminary Estimates of the U.S. Space Economy, 2012–2018](#)” for a list of space-related government agencies. This table does not reflect space-related agencies founded in 2019, such as U.S. Space Force and Space Development Agency, that are included in the new 2019 estimates.

Average annual growth of real value added over the 2012–2019 period was 2.7 percent, higher than the 2.3 percent growth in the overall U.S. economy.<sup>4</sup> The relatively faster growth in real value added compared to real gross output is mostly due to growth in space-related **manufacturing** value added, which grew by an average of 7.8 percent annually. Chart 2 shows real value-added growth rates for the space economy and overall U.S. economy, along with a comparison of corresponding growth rates for **manufacturing** value added. For all but one year (2017), **manufacturing** growth in the space economy was faster than the overall U.S. economy.

**Chart 2. Real Value Added for the U.S. Space Economy and Overall U.S. Economy**



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Most of this growth was in **computer and electronic products** manufacturing, which experienced an average annual growth rate of 11.7 percent from 2012–2019, much higher than the overall U.S. growth rate of 2.1 percent for that industry. The U.S. **computer and electronic products** manufacturing industry produces a plethora of products aside from space-related items, including cell phones, televisions, and computers. Still, space-related manufacturing represented 8.3 percent of overall value added in the U.S. **computer and electronic products** manufacturing industry, mainly due to satellite equipment and GPS/PNT equipment manufacturing. It is important to note the prices used in the calculation of real gross output and real value added are adjusted for changes in quality over time. In the case of satellite equipment manufacturing, for example, prices are adjusted for changes in capacity over the period, among other quality indicators, as estimated by the Federal Reserve.<sup>5</sup>

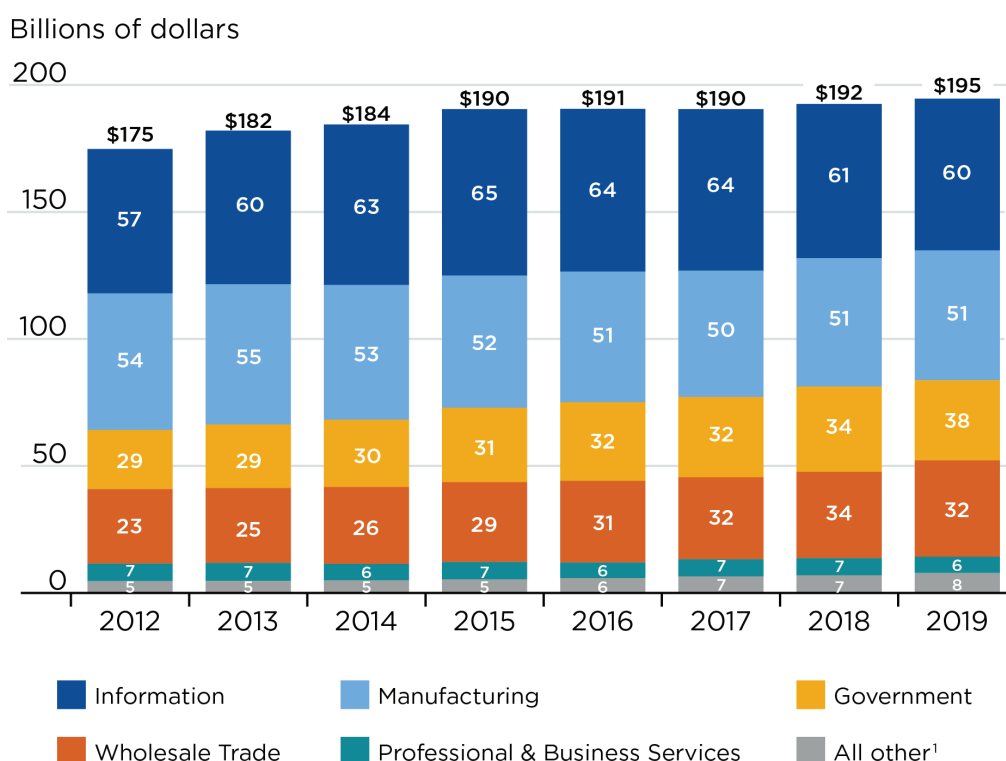
4. Table “Real Value Added by Industry,” published December 22, 2021.

5. See, “Prices for Communications Equipment: Rewriting the Record” by David Byrne and Carol Corrado (2015) for details on methodology. The Federal Reserve’s quality-adjusted price indexes for communications equipment, as of January 2021, are found at [https://www.federalreserve.gov/releases/g17/commequip\\_price\\_indexes.htm](https://www.federalreserve.gov/releases/g17/commequip_price_indexes.htm).

## Nominal Gross Output and Value Added

Nominal or current-dollar estimates reflect both prices and quantities, unlike the real (constant-dollar) estimates that hold prices constant over the time series. Overall trends for the nominal estimates were mostly similar to the real estimates, with the exception of **manufacturing**. While real gross output growth for **manufacturing** averaged 3.5 percent between 2012 and 2019, nominal growth was negative over the period, averaging  $-0.7$  percent. Chart 3 shows the industry distribution of nominal gross output for 2012–2019, where **manufacturing** values are declining for most of the period. This story is similar for the value-added estimates, where real **manufacturing** growth averaged 7.8 percent, but nominal growth averaged only 1.2 percent. Strong growth in real gross output and real value added in the **computer and electronic products** industry is driving this trend. The dichotomy of slow or negative growth in nominal values and gains in real values indicate quality-adjusted prices were declining for space-related manufactured products over the period while quantities produced were increasing.

**Chart 3. U.S. Space Economy Gross Output by Industry Group**



1. Smaller industry groups in grey include: construction; retail trade; educational services; utilities; transportation and warehousing; agriculture, forestry, fishing, and mining; finance, insurance, real estate, rental, and leasing; health care and social assistance; other services, except government; arts, entertainment, recreation, accommodation, and food services.

Note: Industry group levels may not add to total levels due to rounding.

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Comparing real and nominal estimates for **information** also sheds light on the effect of prices in this important sector. Average annual growth rates for real gross output and real value added (–1.1 percent and –2.6 percent, respectively) were slower than growth in the nominal gross output and value-added estimates (0.8 percent and –0.1 percent, respectively). This indicates prices were increasing in this sector even as quantities produced declined,<sup>6</sup> the opposite of what was happening in the space-related manufacturing sector over the period.

## Other Statistics

Private sector employment for the space economy totaled 354,000 in 2019. The largest contributor to overall employment growth in 2019 was from **manufacturing**, which grew by 7.6 percent. In previous years, **manufacturing** employment growth was either negative or slow, averaging –1.5 percent over the 2012–2018 period. Conversely, the largest drag on growth for 2019 was from **information**, which contracted by 5.9 percent, close to the previous year’s decline of 7.4 percent. This parallels decreases in gross output and value added in the **wired telecommunications carriers** industry within the **information** sector.

Corresponding private sector compensation grew modestly between 2012 and 2019, from \$40.3 billion to \$42.4 billion, or 0.8 percent on average. Growth in 2019 was 2 percent, driven by growth of 6.7 percent in **manufacturing**. Conversely, the largest drag on 2019 growth came from **wholesale trade**, which declined by 4.1 percent, the first year of a recorded decline between 2012 and 2019 (**wholesale trade** growth averaged 6.1 percent for 2012–2018). The next largest drag on growth for 2019 came from **information**, which declined by 2.4 percent, less than the 2018 decline of 6.5 percent.

An addendum to the gross output and value-added statistics shows the value of the space economy without the following components: DTH satellite television, satellite radio, and educational services. This value represents a narrower definition of the “Space Economy”<sup>7</sup> suggested by data users interested in understanding what the U.S. space economy would look like without the effect of these three components. Removing these factors resulted in faster growth rates over the period for both real gross output (3 percent) and real value added (5 percent), almost a doubling of growth in both cases. The faster growth is mostly due to the removal of DTH satellite television and its outsized impact on the overall space economy.

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6. See [DISH Network Corporation's SEC 10-K filing](#) (2019).

7. In BEA's estimates, the space economy consists of space-related goods and services, both public and private. This includes goods and services that are used in space, or directly support those used in space; require direct input from space to function, or directly support those that do; and are associated with studying space. This definition is derived from previous research and feedback from subject matter experts and data users. See BEA's [original report](#) for additional details about the definition and general methodology.

## Revisions Summary

Revisions to the 2012–2018 preliminary space economy estimates fall into two categories: methodological improvements and updated source data.<sup>8</sup> The first methodological improvement relates to better measures of government consumption of fixed capital (CFC), also known as depreciation, which is part of gross output. CFC is a measure of capital used up in production and reflects the decline in the value of the stock of fixed assets due to physical deterioration, normal obsolescence, and accidental damage. Consider a simplified example where NASA purchases a satellite for \$100 million from a private manufacturer in 2010, the satellite is launched into orbit in 2010, and has an expected service life of 15 years. The CFC in this scenario is the value of the satellite spread over 15 years using a geometric pattern (beginning in 2010). This means that the rate of depreciation is the same year after year, but the dollar amount will change each year because the rate is applied to a different amount of net stocks each year. And since NASA owns the satellite, the CFC is attributed to the federal government. The preliminary estimates did not account for the full extent of CFC and as a result, gross output levels for 2012–2018 were revised up by more than \$10 billion per year, mostly due to CFC. This relatively large value reflects the high-cost space-related assets owned by NASA and other federal government agencies. These CFC values were taken from the “Space” function CFC estimates found in NIPA table 3.15.5. Government Consumption Expenditures and Gross Investment by Function.

The second methodological improvement relates to the addition of inventory change. Inventories consist of (1) materials and supplies held for use in the production of goods for sale or in the provision of a service, (2) “work-in-progress” products that are partly processed and that require further processing prior to sale, (3) finished goods held for sale, and (4) products purchased for resale, generally held by wholesalers and retailers. With this update, space economic activity is more accurately captured by better inclusion of inventory change within industries that produce space-related products. To capture space-related inventory change, a ratio of an industry’s total output to its in-scope space output was found and applied to that industry’s inventory change for the year. This methodology rests on the assumption that the space-related share of an industry’s inventory change is equal to the share of its overall output that is space related. The addition of inventories mostly impacted the **manufacturing** estimates and were not large. The revisions were valued at less than \$1 billion of nominal gross output per year, averaging less than \$248 million over the period.

Revisions from source data reflect updated gross output by industry values from BEA’s supply-use table, which are mostly derived from new or updated receipts and shipments values from the U.S. Census Bureau and Internal Revenue Service. Revisions varied by industry but tended to mostly be minor (under \$1 billion). Additionally, new research and development (R&D) spending data from the National Science Foundation’s 2018 Business R&D Survey were integrated, resulting in negligible changes. Lastly, updated information about federal defense spending on space weapons systems and other space-related investment were incorporated, also resulting in relatively small changes over the time period.

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8. National Income and Product Account [Handbook](#).



## Discussion

Updated and revised estimates of the U.S. space economy for 2012–2019 show inconsistent growth across industries and years for all four estimates (gross output, value added, private employment, and private compensation). **Information** and **wholesale trade**, two of the four largest industries in the U.S. space economy in terms of gross output, both experienced a wide range of growth between 2012 and 2019. **Wired telecommunications carriers**, which includes DTH satellite television, drove gross output and value-added growth in the **information** sector for the first part of the period (2012–2015) before declining for the rest of the period, aligning with the peak and decline of DTH satellite television subscribers and revenue.<sup>9</sup> **Wholesale trade** experienced strong growth for all years except 2019. Since **wholesale trade** growth reflects changes in margins earned on the distribution of space-related goods, it is not clear if the decline in 2019 represents a decline in margins, a decline in sales, or both.

The two other dominant industries in the space economy, **manufacturing** and **government**, were consistent positive contributors to real gross output and real GDP growth over most of the period. The fast growth in real gross output and real GDP for **manufacturing**, driven by gains in satellite and GPS/PNT equipment manufacturing, aligns with private-industry reports of significant increases in satellite capacity and capabilities over the period.<sup>10</sup> The **government** values, which represent space-related spending on federal, state, and local government employee personnel, operations, and maintenance, increased for much of the period. However, 2019 represented the largest increase in real gross output and real GDP driven by increases in spending by NASA and the Department of Defense, especially in R&D. Additionally, new government agencies were established in 2019, such as the Space Development Agency and U.S. Space Force (though Space Force was only founded in December 2019), and state and local governments increased spending on space ports in 2019 as well.

These inflation-adjusted statistics are the first to shed light on the effect of prices on growth in the U.S. space economy, though additional research and resources are needed to develop an official time series of estimates. For example, although government production values are included in the gross output and value-added estimates, additional research is needed to estimate space-related government employment and compensation. Also, more detailed information about each industry would help provide a better understanding of the source of space economic activity. For example, separately identifying production specific to satellite tracking stations, which are currently included with other satellite services in the satellite telecommunications industry, or splitting federal government estimates into defense and nondefense categories. Finally, estimating space economic activity by categories that are more salient to space community users, such as launch and earth observation, could provide an additional layer of understanding about the U.S. space economy. Currently, these activities are spread across multiple industries because they include production from manufacturing, government, wholesale trade, and others. BEA will endeavor to implement these changes and other extensions to this satellite account subject to time, data, resources, and funding constraints. We ask for feedback from data users and other stakeholders regarding the definitions and commodities included in these estimates and any other comments users think may be relevant to the development of this satellite account. Please send comments to [SpaceEconomy@bea.gov](mailto:SpaceEconomy@bea.gov).

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9. See [AT&T's SEC 10-K filing](#) (2019).

10. See [Satellite Capacity Pricing Index, 7th Edition \(2021\)](#) by Northern Sky Research (NSR).



## **Acknowledgements**

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Additionally, we thank David Byrne at the Federal Reserve and Carlos Placido at Northern Sky Research for their advice and feedback on this project.

## Appendix

**Table 1. Space Economy Gross Output by Industry**  
[Millions of current dollars]

	2012	2013	2014	2015	2016	2017	2018	2019
1 Space Economy <sup>1</sup>	174,784	181,996	184,405	190,493	190,583	190,481	192,498	194,596
2 Agriculture, forestry, fishing, hunting, and mining	10	9	7	20	17	13	7	7
3 Utilities	2	2	1	4	3	3	2	2
4 Construction	364	329	509	606	607	893	566	980
5 Manufacturing	53,778	55,222	53,047	52,084	51,400	49,728	50,568	51,158
Of which:								
6 Computer and electronic products <sup>2</sup>	32,300	32,560	29,582	29,859	30,556	30,170	30,631	30,030
7 Other transportation equipment <sup>3</sup>	17,708	18,313	19,390	19,788	18,267	16,981	16,970	18,224
8 Wholesale trade	23,312	25,032	26,455	29,335	31,005	31,676	33,577	31,587
9 Retail trade	307	497	645	826	1,390	1,569	1,743	2,280
10 Transportation and warehousing	1,685	1,536	1,380	1,331	1,343	1,359	1,675	1,329
11 Information	56,847	60,476	63,185	65,500	64,062	63,577	60,681	59,704
Of which:								
12 Wired telecommunications carriers <sup>4</sup>	40,127	42,986	45,172	46,258	44,187	43,428	39,858	38,284
13 Satellite telecommunications	6,661	6,763	6,569	6,817	6,832	6,343	6,453	6,461
14 Finance, insurance, real estate, rental, and leasing	37	80	100	148	140	331	262	349
15 Professional and business services	6,845	7,062	6,496	6,864	6,133	6,720	6,677	6,370
16 Educational services	2,058	2,046	2,048	2,133	2,091	2,110	2,465	2,701
17 Health care and social assistance	94	100	88	101	104	98	109	87
18 Arts, entertainment, recreation, accommodation, and food services	114	120	126	120	121	130	137	140
19 Other services, except government	3	3	4	4	6	7	7	8
20 Government <sup>5</sup>	29,328	29,484	30,315	31,420	32,161	32,268	34,023	37,894
21 Federal	26,744	27,021	27,885	28,928	29,697	29,838	31,226	34,771
22 State and local	2,584	2,463	2,430	2,492	2,464	2,430	2,797	3,124
Addenda:								
23 Private industries	145,455	152,512	154,090	159,073	158,422	158,213	158,475	156,701
24 Space Economy excluding satellite television, satellite radio, and educational services <sup>6</sup>	129,938	134,137	134,105	138,759	140,259	140,174	145,494	148,683

1. The space economy consists of space-related goods and services, both public and private. This includes goods and services that:
  1. Are used in space, or directly support those used in space
  2. Require direct input from space to function, or directly support those that do
  3. Are associated with studying space
2. Includes manufacturing of satellites; ground equipment; search, detection, navigation, and guidance systems (GPS/PNT equipment)
3. Includes manufacturing of space vehicles and space weapons systems (intercontinental ballistic missiles)
4. Includes direct-to-home satellite television services
5. Includes spending on personnel, operations, and maintenance. Government spending on private-sector investment (structures, equipment, intellectual property) is included within the individual industries
6. This value represents a narrower interpretation of the “Space Economy” definition. These commodities are primarily produced by the Information (line 11) and Educational services (line 16) industries

**Table 2. Space Economy Real Gross Output by Industry**  
[Millions of chained (2012) dollars]

	2012	2013	2014	2015	2016	2017	2018	2019
1 Space Economy <sup>1</sup>	174,784	183,726	189,170	198,426	199,546	197,962	196,148	194,350
2 Agriculture, forestry, fishing, hunting, and mining	10	8	7	19	16	13	7	6
3 Utilities	2	2	1	3	3	3	2	2
4 Construction	364	322	488	574	568	809	491	813
5 Manufacturing	53,778	56,747	57,948	60,992	64,500	64,012	66,291	68,271
Of which:								
6 Computer and electronic products <sup>2</sup>	32,300	34,161	34,531	39,508	45,242	46,662	49,617	50,370
7 Other transportation equipment <sup>3</sup>	17,708	18,244	19,346	19,722	18,380	17,114	16,672	17,826
8 Wholesale trade	23,312	26,565	28,843	31,626	32,906	32,809	33,987	30,038
9 Retail trade	307	467	609	789	1,362	1,482	1,639	2,182
10 Transportation and warehousing	1,685	1,532	1,356	1,338	1,368	1,360	1,601	1,233
11 Information	56,847	59,820	62,172	64,206	61,010	59,723	54,785	52,345
Of which:								
12 Wired telecommunications carriers <sup>4</sup>	40,127	42,494	44,169	44,261	40,461	38,406	33,215	30,766
13 Satellite telecommunications	6,661	6,834	6,850	7,721	8,399	8,397	8,849	8,873
14 Finance, insurance, real estate, rental, and leasing	37	79	97	141	133	312	243	317
15 Professional and business services	6,845	6,974	6,340	6,547	5,879	6,295	6,082	5,695
16 Educational services	2,058	2,016	1,986	2,108	2,041	2,018	2,301	2,475
17 Health care and social assistance	94	99	86	96	101	92	99	78
18 Arts, entertainment, recreation, accommodation, and food services	114	119	122	114	113	118	122	122
19 Other services, except government	3	3	4	4	6	7	7	8
20 Government <sup>5</sup>	29,328	29,046	29,277	30,194	30,612	29,994	30,582	33,343
21 Federal	26,744	26,624	26,911	27,679	28,112	27,570	27,888	30,364
22 State and local	2,584	2,422	2,366	2,517	2,499	2,422	2,709	3,000
Addenda:								
23 Private industries	145,455	154,705	159,951	168,337	169,012	168,094	165,559	160,508
24 Space Economy excluding satellite television, satellite radio, and educational services <sup>6</sup>	129,938	136,554	140,067	148,759	154,005	153,841	158,294	159,351

1. The space economy consists of space-related goods and services, both public and private. This includes goods and services that:

1. Are used in space, or directly support those used in space
2. Require direct input from space to function, or directly support those that do
3. Are associated with studying space

2. Includes manufacturing of satellites; ground equipment; search, detection, navigation, and guidance systems (GPS/PNT equipment)

3. Includes manufacturing of space vehicles and space weapons systems (intercontinental ballistic missiles)

4. Includes direct-to-home satellite television services

5. Includes spending on personnel, operations, and maintenance. Government spending on private-sector investment (structures, equipment, intellectual property) is included within the individual industries

6. This value represents a narrower interpretation of the "Space Economy" definition. These commodities are primarily produced by the Information (line 11) and Educational services (line 16) industries

Note: Chained-dollar estimates are calculated by taking the current-dollar level of a series in the reference period and multiplying it by the change in a chained-type quantity index number for the series since the reference period. Chained-dollar estimates correctly show growth rates for a series, but are not additive in periods other than the reference period.

**Table 3. Space Economy Value Added by Industry**  
[Millions of current dollars]

	2012	2013	2014	2015	2016	2017	2018	2019
1 Space Economy <sup>1</sup>	105,035	111,968	111,280	118,750	116,923	116,818	119,115	120,339
2 Agriculture, forestry, fishing, hunting, and mining	7	6	5	15	12	9	5	5
3 Utilities	2	1	1	2	2	2	2	2
4 Construction	240	228	351	423	397	618	387	691
5 Manufacturing	34,683	36,604	35,649	36,813	35,720	34,854	37,306	37,459
Of which:								
6 Computer and electronic products <sup>2</sup>	23,260	23,853	22,741	24,186	24,075	25,062	26,280	25,419
7 Other transportation equipment <sup>3</sup>	8,743	9,626	9,958	10,742	9,711	7,891	8,942	9,966
8 Wholesale trade	12,705	13,608	14,299	16,533	17,498	17,699	18,199	17,468
9 Retail trade	219	351	445	569	940	1,050	1,146	1,496
10 Transportation and warehousing	826	767	698	731	781	755	883	686
11 Information	30,037	33,551	32,580	35,165	33,287	32,837	30,762	29,482
Of which:								
12 Wired telecommunications carriers <sup>4</sup>	22,466	25,701	24,962	26,866	25,205	24,495	22,567	20,882
13 Satellite telecommunications	2,838	2,974	2,772	2,870	2,541	2,523	2,439	2,621
14 Finance, insurance, real estate, rental, and leasing	34	52	63	103	109	192	149	183
15 Professional and business services	3,947	4,085	3,793	4,131	3,552	3,748	3,749	3,559
16 Educational services	1,583	1,554	1,551	1,644	1,567	1,570	1,872	2,038
17 Health care and social assistance	74	78	68	79	80	75	84	67
18 Arts, entertainment, recreation, accommodation, and food services	70	71	75	63	70	73	79	79
19 Other services, except government	3	3	4	4	6	7	6	8
20 Government <sup>5</sup>	20,606	21,009	21,698	22,473	22,903	23,330	24,487	27,119
21 Federal	18,589	19,118	19,836	20,527	21,039	21,498	22,345	24,743
22 State and local	2,017	1,892	1,861	1,946	1,864	1,833	2,142	2,376
Addenda:								
23 Private industries	84,429	90,959	89,582	96,277	94,020	93,487	94,628	93,220
24 Space Economy excluding satellite television, satellite radio, and educational services <sup>6</sup>	80,300	84,082	84,186	89,726	89,328	89,696	94,150	96,798

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  3. Are associated with studying space
2. Includes manufacturing of satellites; ground equipment; search, detection, navigation, and guidance systems (GPS/PNT equipment)
3. Includes manufacturing of space vehicles and space weapons systems (intercontinental ballistic missiles)
4. Includes direct-to-home satellite television services
5. Includes spending on personnel, operations, and maintenance. Government spending on private-sector investment (structures, equipment, intellectual property) is included within the individual industries
6. This value represents a narrower interpretation of the “Space Economy” definition. These commodities are primarily produced by the Information (line 11) and Educational services (line 16) industries

**Table 4. Space Economy Real Value Added by Industry**  
[Millions of chained (2012) dollars]

	2012	2013	2014	2015	2016	2017	2018	2019
1 Space Economy <sup>1</sup>	105,035	114,952	116,944	126,522	128,130	127,040	127,327	125,906
2 Agriculture, forestry, fishing, hunting, and mining	7	6	5	14	12	9	5	4
3 Utilities	2	1	1	2	2	2	2	2
4 Construction	240	222	332	389	353	535	324	546
5 Manufacturing	34,683	39,045	40,583	44,531	50,181	50,344	55,580	58,214
Of which:								
6 Computer and electronic products <sup>2</sup>	23,260	26,334	27,741	32,415	40,419	43,757	48,331	49,801
7 Other transportation equipment <sup>3</sup>	8,743	9,578	9,940	10,722	9,800	8,016	8,894	9,912
8 Wholesale trade	12,705	15,361	17,214	19,673	20,368	20,020	20,141	17,480
9 Retail trade	219	323	416	544	936	1,000	1,099	1,485
10 Transportation and warehousing	826	758	666	646	681	666	758	561
11 Information	30,037	32,957	31,922	34,373	31,229	30,230	26,841	24,379
Of which:								
12 Wired telecommunications carriers <sup>4</sup>	22,466	25,268	24,266	25,312	22,251	20,547	17,360	15,162
13 Satellite telecommunications	2,838	3,065	3,079	3,851	4,109	4,955	5,396	5,851
14 Finance, insurance, real estate, rental, and leasing	34	51	61	98	104	182	141	168
15 Professional and business services	3,947	4,036	3,713	3,910	3,410	3,513	3,412	3,171
16 Educational services	1,583	1,528	1,501	1,634	1,537	1,510	1,756	1,877
17 Health care and social assistance	74	77	67	75	77	71	77	60
18 Arts, entertainment, recreation, accommodation, and food services	70	70	73	59	64	65	69	67
19 Other services, except government	3	3	4	4	6	6	6	8
20 Government <sup>5</sup>	20,606	20,665	20,877	21,408	21,574	21,437	21,716	23,519
21 Federal	18,589	18,808	19,067	19,427	19,656	19,577	19,632	21,224
22 State and local	2,017	1,857	1,809	1,986	1,917	1,853	2,100	2,317
Addenda:								
23 Private industries	84,429	94,349	96,143	105,341	106,804	105,839	105,790	102,024
24 Space Economy excluding satellite television, satellite radio, and educational services <sup>6</sup>	80,300	87,728	90,913	99,289	104,789	105,514	110,651	112,606

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Note: Chained-dollar estimates are calculated by taking the current-dollar level of a series in the reference period and multiplying it by the change in a chained-type quantity index number for the series since the reference period. Chained-dollar estimates correctly show growth rates for a series, but are not additive in periods other than the reference period.

**Table 5. Space Economy Employment by Industry**  
[Thousands of full and part time employees]

	2012	2013	2014	2015	2016	2017	2018	2019
1 Space Economy, <sup>1a</sup> Private <sup>1b</sup>	354	362	357	359	359	360	352	354
2 Manufacturing	126	126	119	115	118	116	115	124
3 Wholesale trade	56	58	59	65	70	71	70	67
4 Information	116	121	123	120	111	111	103	97
5 Professional and business services	27	28	26	27	23	23	22	21
6 Educational services	17	16	16	16	16	15	17	19
7 All other private industries	12	13	14	16	22	24	24	27

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1b. Excludes government employees

**Table 6. Space Economy Compensation by Industry**  
[Millions of current dollars]

	2012	2013	2014	2015	2016	2017	2018	2019
1 Space Economy, <sup>1a</sup> Private <sup>1b</sup>	40,314	41,369	41,613	43,215	42,413	41,680	41,609	42,442
2 Manufacturing	18,706	18,898	18,578	18,921	18,789	17,244	17,576	18,749
3 Wholesale trade	5,989	6,253	6,530	7,351	7,953	8,392	8,517	8,172
4 Information	10,599	11,027	11,425	11,401	10,483	10,470	9,788	9,550
5 Professional and business services	3,172	3,310	3,095	3,396	2,868	3,033	2,989	2,851
6 Educational services	1,114	1,109	1,132	1,172	1,165	1,157	1,379	1,551
7 All other private industries	734	771	853	975	1,156	1,384	1,361	1,568

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1b. Excludes government employees