

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM
DIVISION OF RESEARCH AND STATISTICS



For release at 4:00pm EST

December 18, 2015

Industrial Production and Capacity Utilization: Addendum to the 2015 Annual Revision

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Industrial Production and Capacity Utilization: Addendum to the 2015 Annual Revision

Kim Bayard, David Byrne, Charles Gilbert, and Justin Pierce, of the Board's Division of Research and Statistics, prepared this article.

On July 21, 2015, the Federal Reserve published revisions to its index of industrial production (IP) and the related measures of capacity utilization. The press release that accompanied the revised estimates described both the results and the technical aspects of the revision.¹ This addendum provides (1) additional information on the revised capacity utilization estimates for the printing and support industry, (2) an overview of the methodological changes to the IP estimates for selected high-technology industries, (3) a description of the change in source data for capacity for the fertilizer industry, (4) an elaboration on the conversion of the IP indexes to the 2012 North American Industry Classification System (NAICS) and the effects of that conversion on the benchmarking process for some industries, and (5) a table of mappings between the pre-revision and post-revision IP and capacity indexes for those industries affected by the incorporation of the 2012 NAICS.

Revision to Capacity Utilization Rates for Printing and Support

The incorporation of newly available and revised source data into the IP and capacity indexes for the printing and support industry led to sizable downward revisions to utilization rates for recent years. For IP, the new information included measures of gross output from the Census Bureau's 2012 Census of Manufactures (COM) and its 2013 Annual Survey of Manufactures (ASM). The production index also incorporated revised data on production worker hours from the Bureau of Labor Statistics (BLS). For capacity, the Federal Reserve incorporated data on capacity utilization rates through the end of 2014 from the Census Bureau's Quarterly Survey of Plant Capacity (QSPC).

After incorporating the most recent data from these sources, the revisions to the IP index for printing and support were fairly small, but the revisions to capacity were much larger. With the most recent revision, capacity was estimated to have increased about $\frac{1}{2}$ percent per year, on average, from 2011 through 2014; previously, capacity had been estimated to have fallen $2\frac{3}{4}$ percent per year, on average, over that period. As a result, the downward revisions to the rates of capacity utilization over that period cumulate to nearly 10 percentage points by the fourth quarter of 2014.² The revised utilization rates for the printing and support industry for the period from 2011 to 2014 are now closer to the levels published by the Census Bureau, which had been lower than those published by the Federal Reserve prior to the annual revision.³

¹ See Board of Governors of the Federal Reserve System (2015), "Annual Revision," press release, July 21, www.federalreserve.gov/releases/g17/revisions/Current/DefaultRev.htm.

² See table 6 of the annual revision press release, which is available on the Board's website at www.federalreserve.gov/releases/g17/revisions/Current/table6_rev.htm.

³ The QSPC utilization rate data are publicly available on the Census Bureau's website: at www.census.gov/manufacturing/capacity/historical_data/index.html.

Changes to IP Estimates for Selected High-Technology Industries

For the past several years, the price deflators used in the benchmark IP indexes for selected high-technology industries, including semiconductors and communications equipment, have been based on research by the staff of the Federal Reserve Board; these price deflators were updated in the most recent annual revision. In addition, the most recent revision incorporated a new price index for computer storage devices.

Update to annual benchmark index for microprocessor units

The 2013 annual revision to IP introduced an annual price index for microprocessor units (MPUs), which covered the period from 2007 through 2011 and was based on a hedonic regression of model-level list prices for MPUs on measures of their performance on benchmark tasks.⁴ The price index was updated based on further research and was extended through 2013.⁵

Update to annual benchmarks and quarterly frequency price indexes for communications equipment

Annual benchmark price indexes for the communications equipment industry are based on data from an array of sources, including private consultancies, trade groups, and the BLS producer prices program. These sources and the methods used to construct product-level price indexes and to aggregate them to industry-level benchmarks are discussed in a recent research paper co-authored by Federal Reserve staff.⁶ Quarterly frequency price indexes for four components of the communications equipment industry—wireless (cellular) networking equipment; data networking equipment; transmission, local loop, and legacy central office equipment; and enterprise and home voice equipment—have been updated and posted to the Federal Reserve Board’s website.⁷

Changes to annual benchmark index for computer storage devices

For the 2002 through 2014 period, the annual benchmark price index for computer storage equipment is now based on quarterly data from IDC, a company specializing in information technology industries, for factory unit shipments and revenues for individual models. Shipments were further distinguished by customization to suit particular installation characteristics, such as whether the device is used for network-attached storage or for a storage area network. Prices per unit of capacity for each model-installation item were constructed by dividing total revenue by total terabytes shipped. Price changes were chain-weighted to create a quarterly frequency matched-model aggregate price index, the annual average of which was used

⁴ More information on the price index is available on the Board’s website at www.federalreserve.gov/releases/g17/MpuPriceIndex.htm.

⁵ The updated price index and additional detail on the data sources and estimation methods are available on the Board’s website at www.federalreserve.gov/releases/g17/download.htm#related_data.

⁶ See David M. Byrne and Carol A. Corrado (2015), “Prices for Communications Equipment: Rewriting the Record,” Finance and Economics Discussion Series 2015–069 (Washington: Board of Governors of the Federal Reserve System, September), <http://dx.doi.org/10.17016/FEDS.2015.069>.

⁷ The price indexes are available on the Board’s website at www.federalreserve.gov/releases/g17/commequip_price_indexes.htm.

for benchmarking. Data on small-scale systems (devices with fewer than three disks) were excluded to better match the composition of domestic production.⁸ Additional detail is available in an article by Federal Reserve staff, and the price indexes for computer storage equipment are available on the Federal Reserve's website.⁹

Change in Source Data for Fertilizer Capacity

With the most recent annual revision, the capacity index for fertilizer (NAICS 32531) beginning in 1997 is derived from semiannual data on production (in short tons) and capacity utilization from The Fertilizer Institute (TFI). TFI publishes product-level data for anhydrous ammonia, ammonium nitrate, ammonium sulfate, nitrogen solutions, phosphoric acid, and urea.

Calculation of an end-of-year capacity measure for fertilizer proceeds in three steps. First, semiannual capacity for each of the products listed above is calculated as the ratio of production to capacity utilization. Second, end-of-year capacity for each product for a particular year is calculated as the average of second-half capacity for that year and first-half capacity for the following year. Third, total capacity for the industry is calculated as a weighted sum of the product-level end-of-year capacity figures, for which the weights for each product are the same as those used for aggregating the products in the monthly production index.

For the period prior to 1997, the capacity index is still based on fourth-quarter utilization rates from the Census Bureau's annual Survey of Plant Capacity, which was conducted for the fourth quarters of each year through 2006.

Conversion of the IP Indexes to the 2012 NAICS

Since 2002, the IP indexes have been structured to follow the NAICS for the period from 1972 forward. Previously, the indexes had been structured to follow the Standard Industrial Classification system for their entire history, and they still do for the period prior to 1972.

The first issuance of the IP indexes based on NAICS reflected the 1997 version of the codes, and as NAICS was updated in 2002, 2007, and 2012, the IP structure was updated to reflect the changes inherent in each new NAICS release. For the industrial sector, the changes in the 2002 and 2007 versions of NAICS only affected a few industries, whereas the changes to the 2012 NAICS were more extensive. In particular, within manufacturing, the 2007 NAICS delineated 472 six-digit industries, but the 2012 version reduced that count to only 364 by creating 66 new six-digit industries that combined anywhere from 2 to 8 six-digit industries as defined by the 2007 NAICS.

Because the most detailed IP indexes often group multiple six-digit industries, the effects on the IP structure were smaller than the changes to the NAICS structure (before the annual

⁸ For further details, see David Byrne (2015), "Prices for Data Storage Equipment and the State of IT Innovation," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, July 1), www.federalreserve.gov/econresdata/notes/feds-notes/default.html; the data are available for download on the Board's website at www.federalreserve.gov/releases/g17/ComputerStoragePriceIndex.htm.

⁹ For the article, see Byrne, "Prices for Data Storage Equipment," in note 8; for the price indexes, see the previously cited information about their availability, also in note 8.

revision, the IP system was based on 312 individual indexes; the number is now 299). A significant number of the new 2012 NAICS industries resulted from merging multiple 2007 NAICS industries that were already entirely within a single IP index. The following table shows the detailed IP indexes that were modified with the revision. Many indexes have the same coverage as the previous versions, but the NAICS industry that contained them disappeared as a result of the conversion to the 2012 NAICS. The new indexes formed from multiple indexes typically used the same high-frequency indicator for each of the previously separate indexes, at least for recent years, so little high-frequency information was lost as a result of the revision.

The redefinition of the IP indexes to the 2012 NAICS did have one material effect on the index values. The production indexes are constructed so that their annual levels are equal to benchmark production indexes, which are defined for each six-digit NAICS industry as the deflated gross output of the industry. These six-digit benchmark production indexes are then aggregated to a higher level using value-added weights. The benchmark production index for a single 2012 NAICS industry that corresponds to multiple 2007 NAICS industries will not necessarily be identical to the value-added weighted aggregate of the indexes for the component 2007 NAICS industries. One instance where the benchmark for an industry revised notably was primary smelting and refining of nonferrous metals (NAICS 33141). Under the 2012 NAICS, a single six-digit industry (NAICS 331410) covers all nonferrous smelting and refining. Under the 2007 NAICS, however, copper smelting and refining was a separate six-digit industry (NAICS 331411) from other nonferrous smelting and refining (NAICS 331419). Using the gross output measure instead of aggregating the component gross-value-based indexes with value-added weights resulted in the new benchmark index for NAICS 33141 increasing more slowly, on balance, than the previous index over the period from the mid-1990s forward.

Although some aggregate benchmark indexes were changed as a result of the redefinition of NAICS industries, the annual benchmark information for the 2007 NAICS industries was not entirely discarded for those IP indexes that now cover only a portion of a 2012 NAICS industry. In these cases, the benchmark indexes under the 2007 NAICS were calculated through 2011, and, where possible, were extended through 2013 based on product shipments from the ASM. These “sub-benchmark” indexes were then adjusted so that they aggregated to the higher-level benchmark indexes based on the 2012 NAICS. Each of the component indexes was then constructed so that its annual levels were equal to the sub-benchmark index over the history of the index. Consequently, the detailed indexes that are just portions of a 2012 NAICS industry better reflect the comprehensive annual data compiled using earlier versions of NAICS.

One example of an industry for which sub-benchmarks were used is tobacco products (NAICS 3122). Under the 2012 NAICS, all tobacco products are covered by a single NAICS six-digit industry (NAICS 312230). Thus, its benchmark index is computed as gross output for tobacco products divided by a deflator for industry shipments. Under the 2007 NAICS, separate six-digit industries existed for tobacco stemming and drying (NAICS 312210), cigarettes (NAICS 312221), and other tobacco products (NAICS 312229). Using data from the ASM and the COM, benchmark output indexes had been constructed through 2011 for each of the three six-digit industries under the 2007 NAICS. Data on product shipments for these three categories, which continued to be compiled by the ASM and COM even after they adopted the 2012 NAICS in

2012, were used to extend these sub-benchmark indexes (under the 2012 NAICS) through 2013.¹⁰ An aggregate index for tobacco products was then computed from the sub-benchmark indexes for its components, and if the aggregate did not equal the benchmark index for overall tobacco products, the sub-benchmark indexes were adjusted so that it would. The component IP indexes were then constructed so that their annual averages equaled these sub-benchmark indexes.

¹⁰ Similarly, the value-added estimates for the three categories were extended through 2013 using the product shipments.

2015 Annual Revision Industry Code Changes

Revised (2012 NAICS)		Revised (2007 NAICS)	
Publication code	Index description	Publication code	Index description
N221112A4T8	Fossil fuel and other electric power generation NAICS=221112,4-8	N221112A9	Fossil fuel and other electric power generation NAICS=221112,9
Unpublished	Soybean and other oilseed processing NAICS=311224	Unpublished	Soybean and other oilseed processing NAICS=311222,3
Unpublished	Chocolate and confectionery NAICS=31134,5	Unpublished	Chocolate and confectionery NAICS=31132-4
Unpublished	Cigarette NAICS=3122pt.	Unpublished	Cigarette NAICS=312221
Unpublished	Cigars NAICS=3122pt.	Unpublished	Cigars NAICS=312229pt.
Unpublished	Snuff and chewing tobacco NAICS=312230pt.	Unpublished	Snuff and chewing tobacco NAICS=312229pt
Unpublished	Tobacco stemming and redrying NAICS=3122pt.	Unpublished	Tobacco stemming and redrying NAICS=31221
G3149	Other textile product mills NAICS=3149	Unpublished	Tire cord and tire fabric mills NAICS=314992
		Unpublished	Other textile products except tire cord and fabrics NAICS=31491,314991,9
Unpublished	Women's, girls', infants', and other cut and sew apparel NAICS=31524,8	Unpublished	Women's and girls' cut and sew apparel NAICS=31523
		Unpublished	Other cut and sew apparel NAICS=31529
Unpublished	Coated and laminated paper and plastics film NAICS=32222pt.	Unpublished	Coated and laminated paper and plastics film NAICS=322221,2
Unpublished	Paper bag and coated and treated paper NAICS=32222pt.	Unpublished	Plastics, foil, and paper bag, laminated aluminum foil, surface-coated paperboard NAICS=322223-6
N32518C	Alkalies and chlorine NAICS=32518pt.	N325181	Alkalies and chlorine NAICS=325181
Unpublished	Nuclear materials NAICS=32518pt.	Unpublished	Nuclear materials NAICS=325188pt.
Unpublished	Misc. other basic inorganic chemicals NAICS=32518pt.	G325188A	Acids, phosphates, and sulfates NAICS=325188pt.
		G325188Z	Other inorganic chemicals NAICS=325188pt.
		Unpublished	Carbon black NAICS=325182
G32551	Paint and coating NAICS=32551	Unpublished	Construction paints NAICS=32551pt.
		Unpublished	Industrial paints NAICS=32551pt.

Note: The following abbreviations are used: pt. = part; misc. = miscellaneous.

2015 Annual Revision Industry Code Changes - Continued

Revised (2012 NAICS)		Revised (2007 NAICS)	
Publication code	Index description	Publication code	Index description
G32711	Pottery, ceramics, and plumbing fixture NAICS=32711	Unpublished	Vitreous china plumbing fixture and china and earthenware bathroom accessories NAICS=327111
		Unpublished	Vitreous china, fine earthenware, and other pottery product NAICS=327112
		Unpublished	Porcelain electrical supply NAICS=327113
Unpublished	Brick and structural clay tile NAICS=32712pt.	Unpublished	Brick and structural clay tile NAICS=327121
Unpublished	Ceramic tile and refractory, and other structural clay product NAICS=32712pt.	Unpublished	Ceramic tile and refractory NAICS=327122,4,5
		Unpublished	Other structural clay product NAICS=327123
N331313P	Primary aluminum production NAICS=331313pt.	N331312	Primary aluminum production NAICS=331312
Unpublished	Alumina refining NAICS=331313pt.	Unpublished	Alumina refining NAICS=331311
N331315A8M	Misc. aluminum materials NAICS=331315,8pt.	N331315A9	Misc. aluminum materials NAICS=331315,9
N331318E	Aluminum extruded product NAICS=331318pt.	N331316	Aluminum extruded product NAICS=331316
N33141N	Primary smelting and refining of nonferrous metal (except copper and aluminum) NAICS=33141pt.	N331419	Primary smelting and refining of nonferrous metal (except copper and aluminum) NAICS=331419
Unpublished	Copper refining NAICS=33141pt.	Unpublished	Copper refining NAICS=331411pt.
Unpublished	Copper smelting NAICS=33141pt.	Unpublished	Copper smelting NAICS=331411pt.
Unpublished	Nonferrous metal foundries NAICS=33152	Unpublished	Aluminum foundries NAICS=331521,4
		Unpublished	Nonferrous foundries except aluminum NAICS=331522,5,8
Unpublished	Ammunition, small arms, ordnance, and ordnance accessories NAICS=332992-4	Unpublished	Ordnance NAICS=332992-5
Unpublished	Semiconductor machinery NAICS=333242	Unpublished	Semiconductor machinery NAICS=333295
Unpublished	Industrial machinery ex. semiconductor fabrication NAICS=333241,3-9	Unpublished	Industrial machinery ex. semiconductor fabrication NAICS=33321,2,91-4,8
Unpublished	Air purification equip., fans, and blowers NAICS=333413	Unpublished	Air purification equip., fans, and blowers NAICS=333411,2

Note: The following abbreviations are used: pt. = part; misc. = miscellaneous.

2015 Annual Revision Industry Code Changes - Continued

Revised (2012 NAICS)		Revised (2007 NAICS)	
Publication code	Index description	Publication code	Index description
Unpublished	Other metalworking machinery NAICS=333511-4,9	Unpublished	Other metalworking machinery NAICS=333511,4-8
Unpublished	Machine tools NAICS=333517	Unpublished	Machine tools NAICS=333512,3
Unpublished	Computer storage devices, business NAICS=334112pt.	Unpublished	Computer storage and terminals, business NAICS=334112,3pt.
Unpublished	Computer storage devices, consumer NAICS=334112pt.	Unpublished	Computer storage and terminals, consumer NAICS=334112,3pt.
Unpublished	Computer terminals and other peripheral equipment, business NAICS=334118pt.	Unpublished	Computer printers, business NAICS=334119pt.
Unpublished	Computer terminals and other peripheral equipment, consumer NAICS=334118pt.	Unpublished	Computer printers, consumer NAICS=334119pt.
Unpublished	Other electronic components NAICS=334416,7,9	Unpublished	Electron tube NAICS=334411
		Unpublished	Other electronic components NAICS=334414-7,9
G33521	Small electrical appliance NAICS=33521	Unpublished	Electric housewares and household fan NAICS=335211
		Unpublished	Household vacuum cleaner NAICS=335212
Unpublished	Other motor vehicle parts, original equip. NAICS=33639pt.	Unpublished	Motor vehicle air-conditioning, original equip. NAICS=336391pt.
		Unpublished	All other motor vehicle parts, original equip. NAICS=336399pt.
Unpublished	Other motor vehicle parts, repair NAICS=33639pt.	Unpublished	Motor vehicle air-conditioning, repair NAICS=336391pt.
		Unpublished	All other motor vehicle parts, repair NAICS=336399pt.

Note: The following abbreviations are used: pt. = part; misc. = miscellaneous.