

How did the COVID-19 pandemic affect input costs for U.S. producers? A review based on BLS input cost indexes

By Ryan Ogden

The coronavirus disease 2019 (COVID-19) pandemic was announced by the World Health Organization on March 11, 2020.¹ The pandemic resulted in unexpected economic shocks that affected a wide range of industries worldwide, leading to supply-chain disruptions, increased unemployment, and shifting demand, that taken together resulted in price volatility. Understanding how policymaker decisions made during the pandemic affected prices of goods and services is crucial to better prepare for future global disruptions. In 2020, the Bureau of Labor Statistics (BLS) began publishing experimental indexes (satellite net input to industry indexes) to help measure changing input costs to businesses. These input cost indexes can help provide insight on business decision-making when

viewed in the context of Producer Price Index (PPI) output indexes. By using these indexes, we can learn about business’ ability to absorb or pass on price increases.²

This **Beyond the Numbers** article will define satellite net input to industry indexes and use data from December 2018 through April 2021 to examine shifts in input costs for both goods and services consumed by domestic producers. Satellite net input indexes measure the average change in prices industries pay for inputs, including imports, but exclude capital investments and labor. As such, these satellite net input to industry indexes identify the types of purchases that are impacting the costs of doing business. With satellite net input to industry indexes, data users are able to deconstruct inflationary cost pressures among purchases of domestically produced goods, services, and imports. The number of satellite net input indexes that are increasing, decreasing, and remaining unchanged will be analyzed to pinpoint supply constraints, economic demand, and to identify overall input cost trends. A comparison of price movements for inputs to goods, services, and construction industries, as well as a more detailed examination of input costs changes faced by specific North American Industry Classification System (NAICS) industry groups, will be provided.

Satellite net input to industries indexes

In September 2020, BLS began publishing experimental satellite net input to industry indexes for most three-digit NAICS industry groups.³ Historical data going back to December 2018 also were included. Satellite net input indexes measure the changes in prices for goods, services, and maintenance and repair construction typically purchased by specific NAICS-based industry groups. These input indexes include imports, but exclude capital investment purchases and labor inputs. Beginning in the 1980s, BLS published net input indexes for a limited number of construction industries, using only PPIs for domestically produced inputs. The new satellite net input to industry indexes improve upon previous input price indexes by expanding coverage to a substantial number of manufacturing and services NAICS groups (79 as of late 2021), as well as adding input prices for imported goods. The addition of input prices for imported goods allows data users to better understand input price pressures facing an industry group, which is especially important for industries that rely heavily on imported goods for production.

An example of the publication structure of satellite net input to industry indexes is shown in exhibit 1.

Exhibit 1. Example of a publication structure for satellite input price indexes for apparel manufacturing (NAICS 315)

Industry title	Industry code
Inputs to 315, apparel manufacturing, excluding capital investment and labor	IN315
Inputs to 315, domestically produced products	IN3151
Inputs to 315, domestically produced goods	IN31511
Inputs to 315, domestically produced services	IN31512
Inputs to 315, imported goods	IN3152

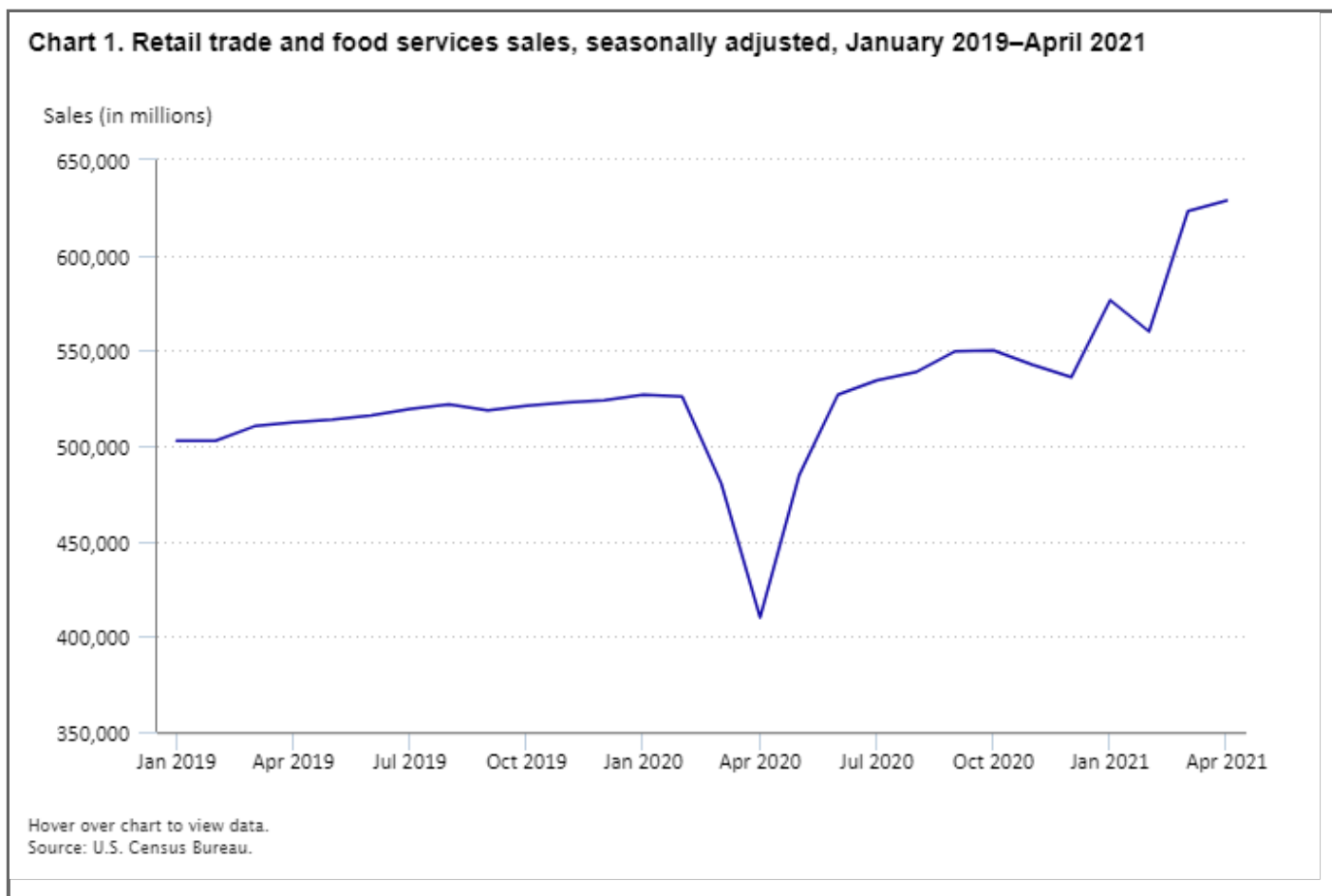
Note: NAICS = North American Industry Classification System.
Source: U.S. Bureau of Labor Statistics.

To calculate an overall satellite net input index regardless of the country of origin of the inputs, commodity indexes covering domestic goods and services from the BLS PPI are aggregated with BLS Import Price Indexes (MXP) for products consumed by the industry group. As with all PPIs, the potential uses for these new indexes are varied. They can be employed for contract price adjustment, and as deflators to adjust nominal sales dollars for inflation.

In addition, satellite net input to industry indexes can be used to identify overall input price shocks and trends, as well as to conduct industry cost and price transmission analyses.

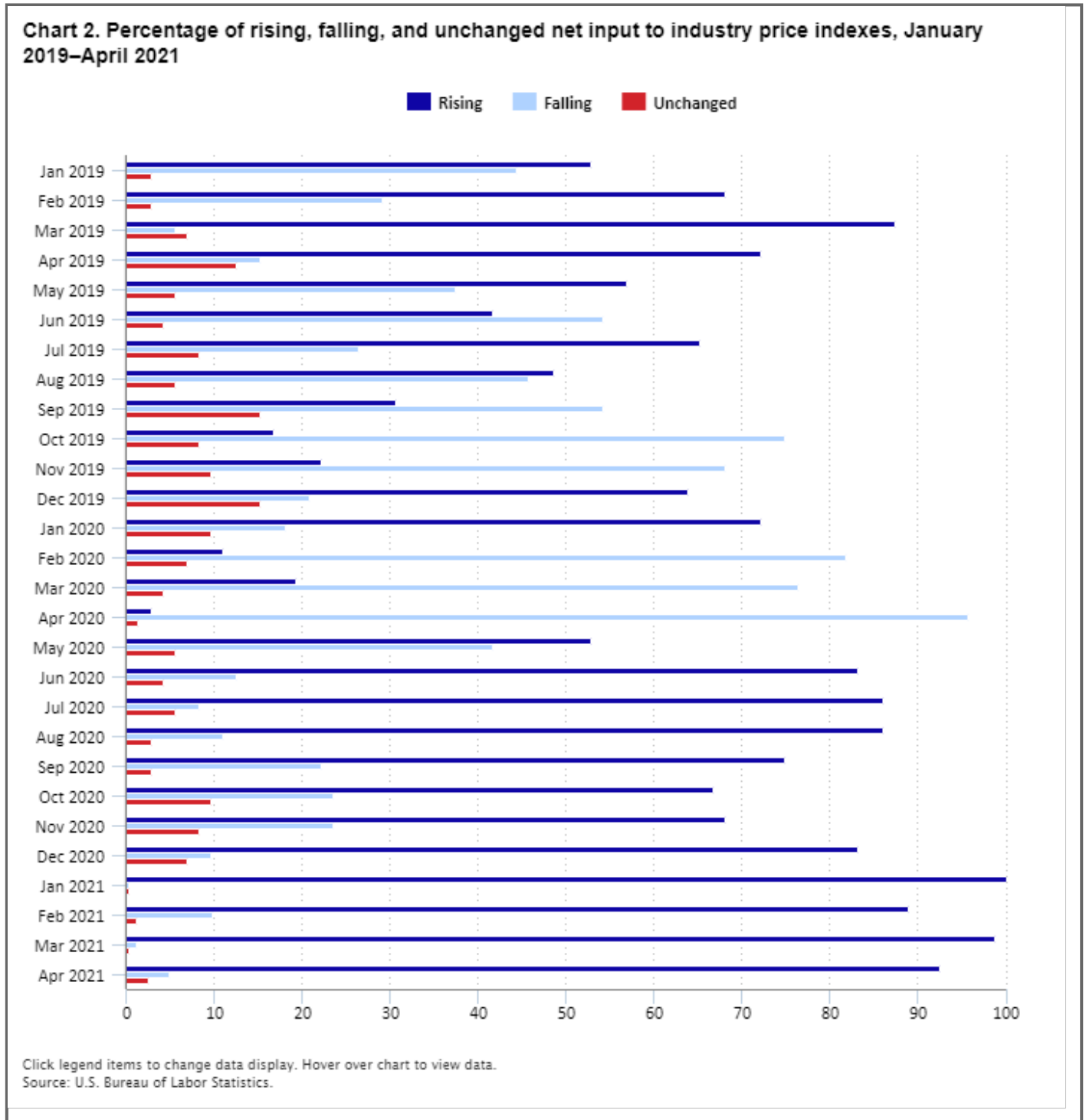
Shocks and satellite net input price trends

The nationwide lockdown that started in March 2020 led to businesses shuttering and a rapid increase in unemployment, resulting in a severe demand shock. Retail sales declined sharply in March 2020, eventually rebounded in May 2020, and gradually increased throughout the summer of 2020.⁴ This increase in consumer spending was aided by the late-March 2020 enactment of the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which provided more than \$2 trillion of economic relief to consumers and businesses affected by the pandemic.⁵ In March 2021, Congress enacted the American Rescue Plan, injecting an additional \$1.9 trillion into the economy. A substantial portion of the rescue plan was in the form of direct checks to taxpayers, which contributed to a further increase in consumer spending. Chart 1 reflects U.S. Census data for retail trade and food services sales.⁶



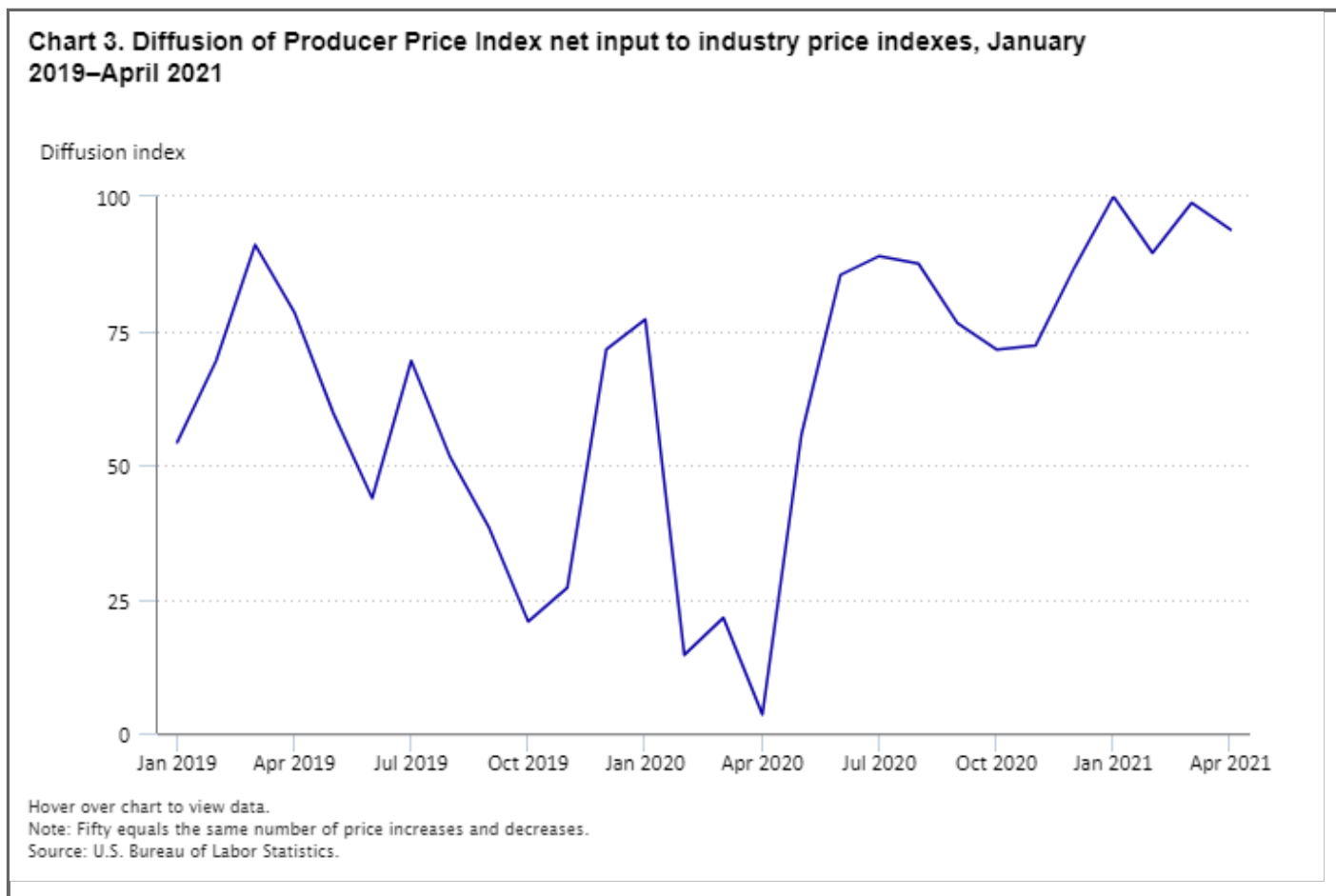
The impact of the initial demand shock, followed by a gradually escalating recovery, can be seen in the satellite net input to industry price indexes. Chart 2 shows the percentage of NAICS industry groups with rising, falling, and unchanged satellite net input to industry indexes from January 2019 through April 2021. From February to April 2020, the vast majority of satellite net input to industry indexes decreased, but this trend reversed course by May

2020. Throughout the summer of 2020 and continuing into 2021, on average over 80 percent of satellite net input to industry indexes increased each month. In January 2021, every satellite net input to industry index increased.

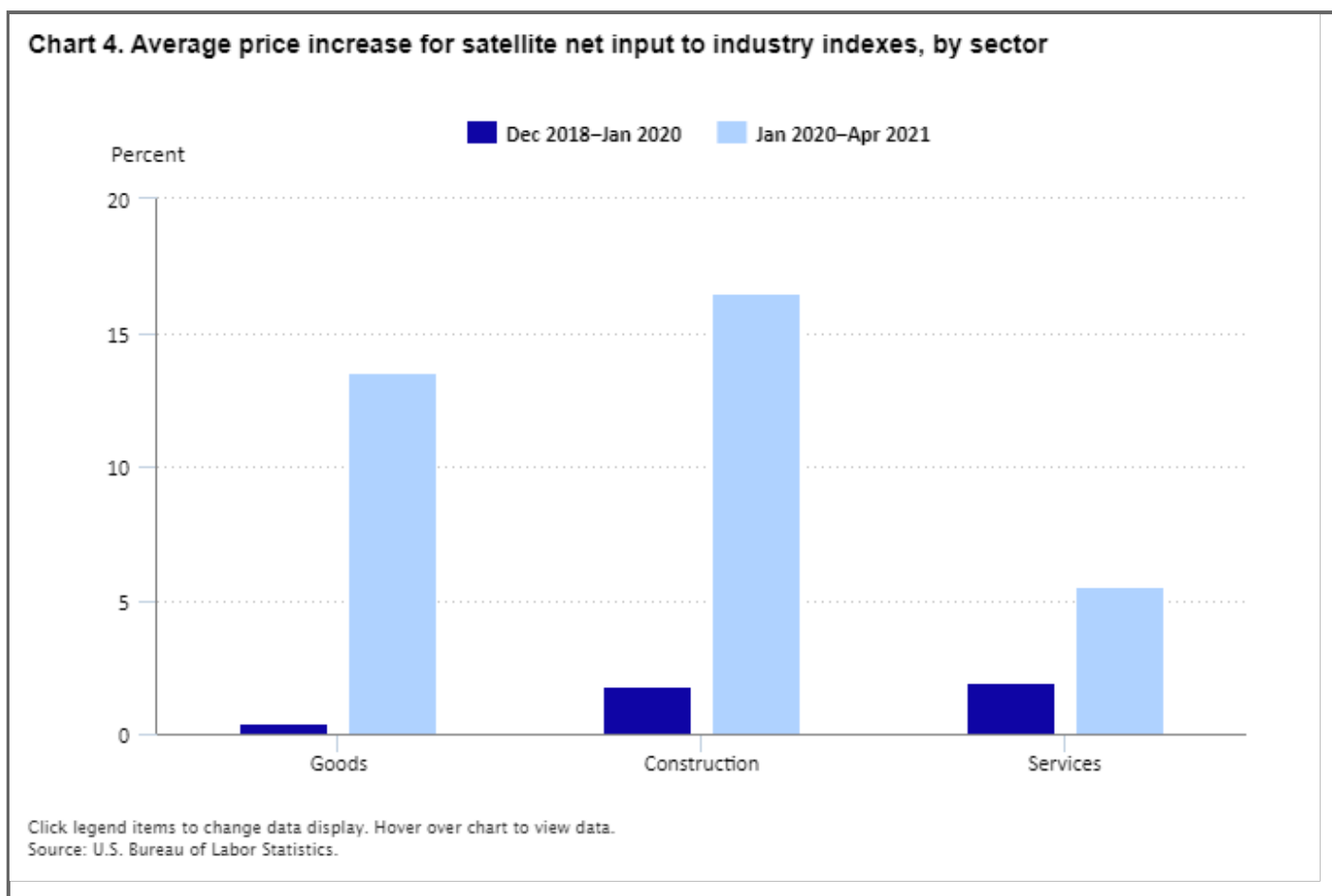


A diffusion index is another tool for viewing price change trends in the satellite net input to industry indexes. A diffusion index value of 50 means there were an equal number of satellite net input to industry index increases and decreases. A value over 50 means more indexes are increasing than decreasing for a given month, while a value below 50 indicates more indexes are decreasing than increasing.

Chart 3 illustrates the satellite net inputs to industries diffusion index between January 2019 and April 2021. The drop in prices resulting from the initial pandemic demand shock can be seen from February to April of 2020, and a recovery in prices is clear beginning in May 2020. From that point forward, the chart shows a distinct trend in the number of satellite net input to industry indexes increasing per month, relative to those decreasing.



The impact of the pandemic did not affect all sectors of the economy equally. Price increases for inputs to construction and goods industries were much larger during the pandemic than were price increases for inputs to services industries. Chart 4 shows average price increases for satellite net input to industry indexes for two time periods: December 2018 to January 2020, and January 2020 to April 2021. These two periods compare the time leading up to COVID-19 with a time period covering COVID-19. The latter period includes the initial steep drop in input prices from February to April of 2020, as well as the substantial acceleration in input prices that followed. These data show that once COVID-19 took hold, through April 2021, price increases for inputs to goods and construction industries were much larger than the increase in inputs to services industries.

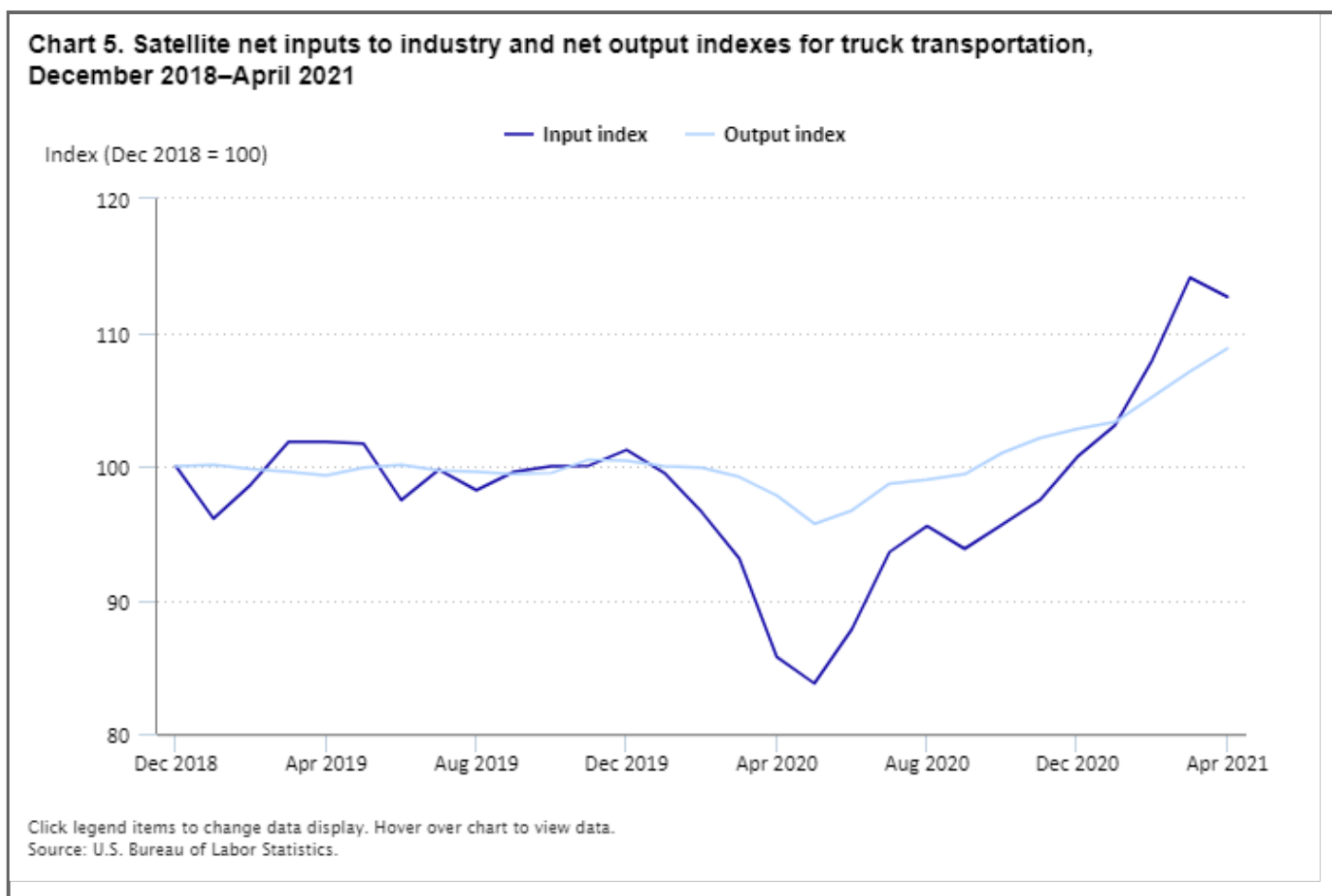


Further uses of satellite net input price indexes

One way to use satellite net input to industry indexes is to perform an industry cost analysis, where the change in an industry’s input costs over time is examined. Another use of the satellite input to industry indexes is price transmission analysis. Third, satellite net inputs to industry indexes also can be used to compare changes in input costs with changes in output selling prices for industries. The following sections provide illustrative examples of various methods of using these indexes. The industry groups for review are truck transportation and wood products manufacturing.

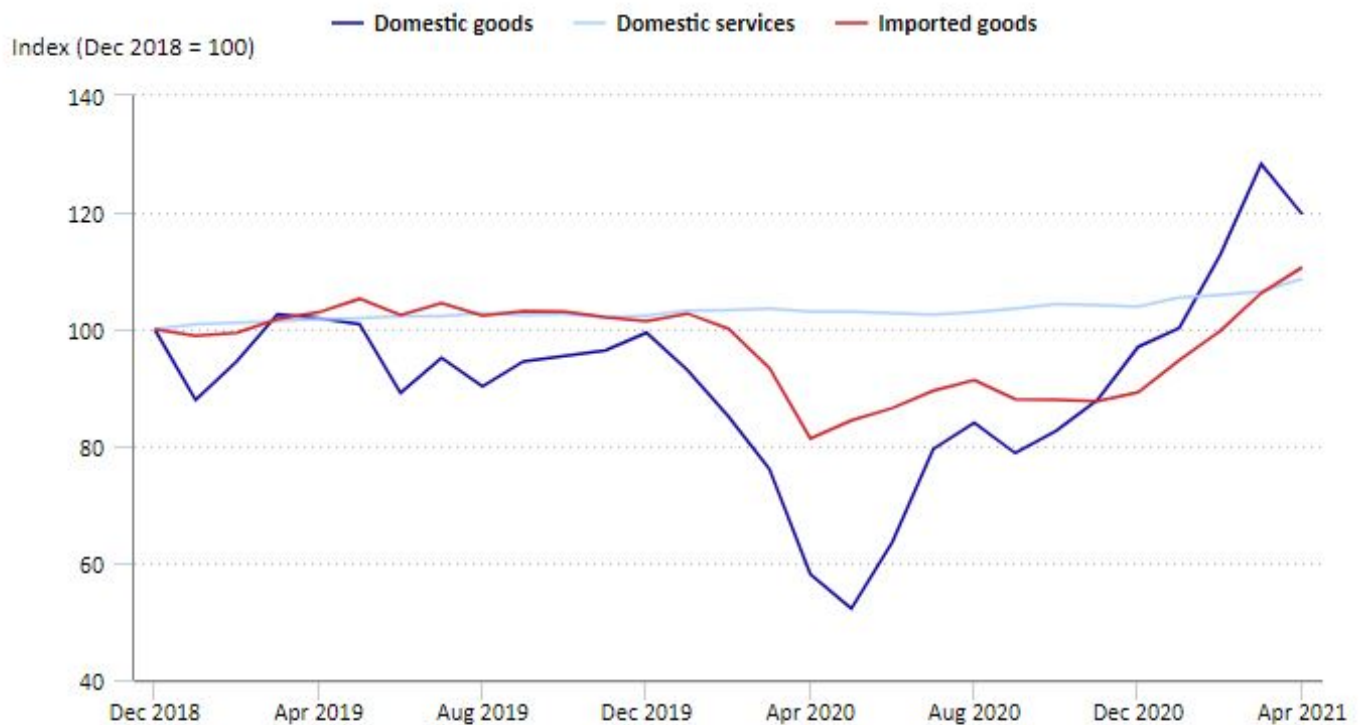
Truck transportation

As can be seen in chart 5, while the satellite net input index for truck transportation (NAICS 484) is more volatile than its output index, there does appear to be a relationship between input costs and output prices. Input prices showed a steep decline in early 2020, decreasing 17.3 percent from December 2019 to May 2020. Over the same period, the output index for truck transportation fell 4.7 percent. From the low point in May 2020 through April 2021, the satellite input index climbed 34.5 percent, while the output price index for truck transportation rose 13.7 percent. Both the period of decline and advance can be traced to energy price volatility; in particular, volatility in diesel fuel prices.



Further context regarding the movement of input prices can be gleaned by comparing the movements of domestically produced goods, services, and imported goods. Chart 6 illustrates the substantial impact of price movements for domestically produced goods. Prices for domestically produced services were much more stable over the period, declining less than domestically produced goods during the downturn and rising less during the period of increasing inflation. The most heavily weighted input good consumed by the truck transportation industry group is diesel fuel. Price movements for this product explain much of the volatility in the domestically produced goods input index beginning in early 2020. From December 2019 to May 2020, diesel fuel prices fell over 50 percent. From May 2020 to April 2021, diesel prices surged 160 percent.⁷ Overall, price movements for imported goods were similar, though less volatile, compared with price movements for domestically produced goods. This divergence can be traced to differences in index composition. The index for imported goods includes petroleum refinery products other than diesel fuel, as well as a relatively larger proportion of import price data for motor vehicle parts and components.

Chart 6. Satellite net inputs to industry indexes for truck transportation, December 2018–April 2021

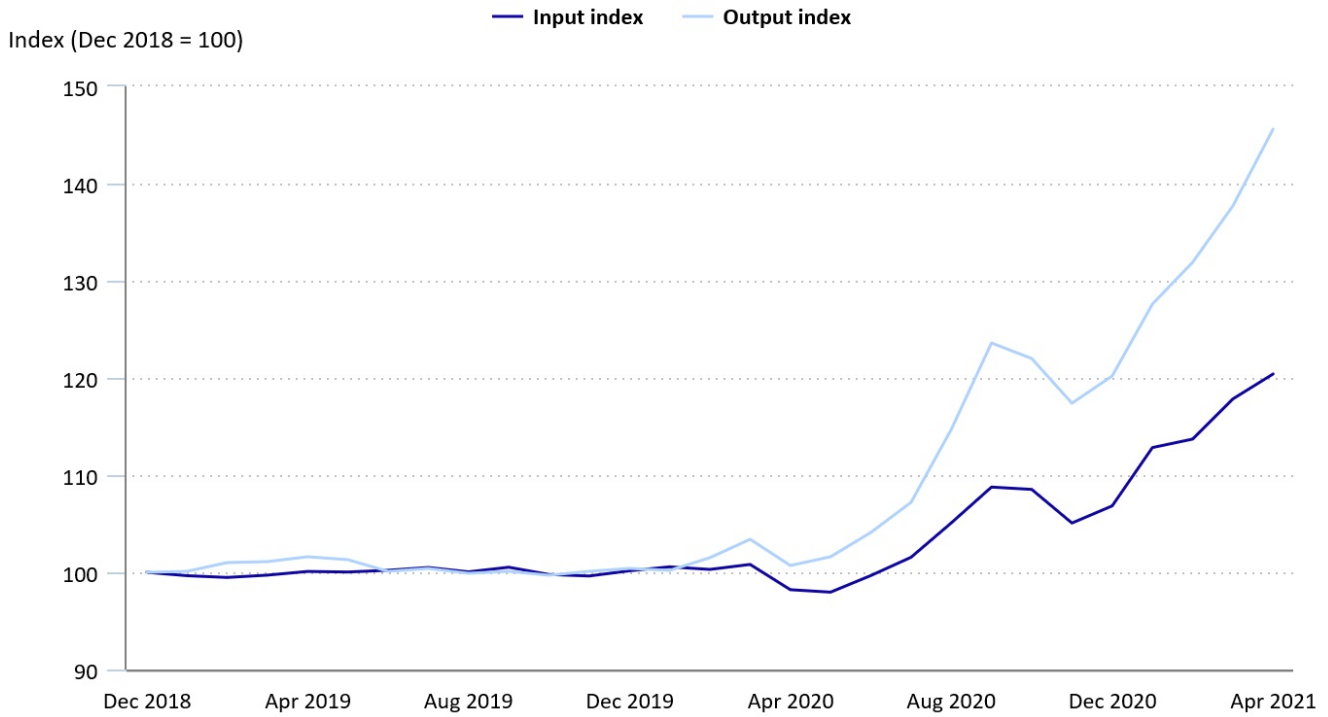


Click legend items to change data display. Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

Wood product manufacturing

The wood product manufacturing industry group (NAICS 321) manufactures lumber, plywood, veneer, wood containers, wood flooring, wood trusses, manufactured homes (such as mobile homes), and prefabricated wood buildings.⁸ This industry group has been substantially impacted by the COVID-19 pandemic. Following a period of stable input costs and output selling prices in 2019, both input costs and output prices for wood product manufacturing increased dramatically, beginning in May of 2020. Input costs climbed 22.6 percent through April 2021, while output prices surged 44.6 percent. Output prices were affected by strong demand, coupled with limitations in the ability to increase production to meet this demand.⁹ Throughout the pandemic, an increase in home improvement projects and new housing construction pushed demand for wood products to much higher levels than the industry expected. Low timber supplies, delays in truck transportation, and worker shortages hindered sawmills and wood preservation companies, contributing to price pressures from the supply side.¹⁰ Chart 7 shows a general trend of increasing prices for both inputs and outputs from mid-2020 through April 2021.

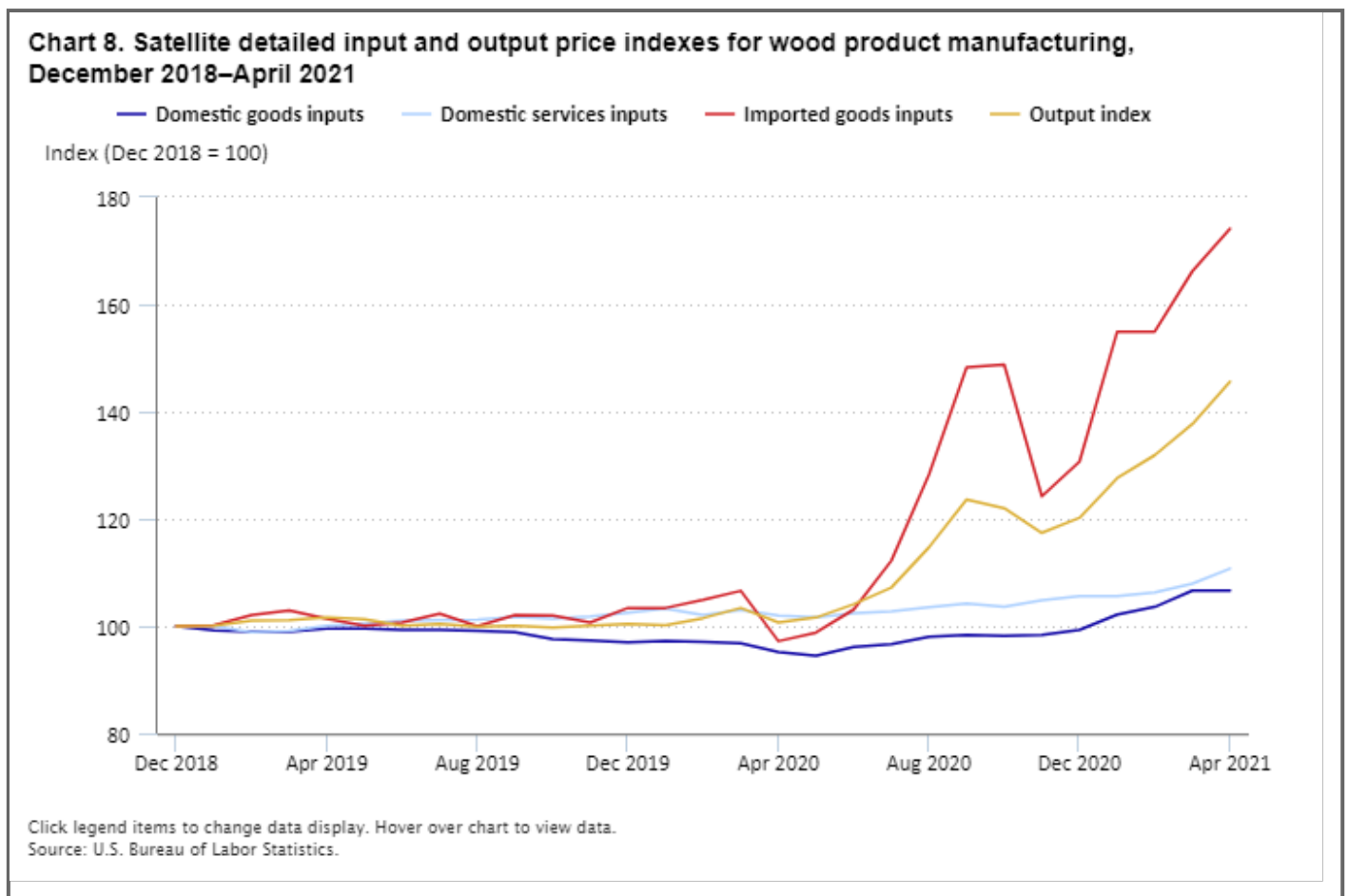
Chart 7. Satellite aggregate input and output price indexes for wood product manufacturing, December 2018–April 2021



Click legend items to change data display. Hover over chart to view data.
 Source: U.S. Bureau of Labor Statistics.



From an input cost perspective, wood product manufacturing relies on inputs of imported goods more than other industry groups, with imported goods accounting for nearly 25 percent of all inputs to the industry group.¹¹ Chart 8 shows that from the April 2020 low-point through April 2021, output selling prices received by wood product manufacturers corresponded more closely with changes in prices for imported-good inputs than with price changes for domestically produced inputs. Most imported-good inputs to wood products manufacturing are sawmill products and preserved wood products, and import prices for these goods were at record highs by April 2021.



Conclusion

The COVID-19 pandemic resulted in a severe economic downturn, causing disruptions in supply chains, increased unemployment, and dramatic shifts in demand for goods and services. The impact of the initial shock of the pandemic, related lockdowns, and other public safety measures resulted in a substantial drop in the satellite net input to industry price indexes from February to April 2020. As the domestic economy slowly began to reopen and retail sales recovered, prices increased from May 2020 to April 2021. In every month from May 2020 through the first quarter of 2021, a majority of the satellite net input to industry indexes increased. On average, over 80 percent rose per month. However, inflationary pressures throughout the pandemic varied across sectors.

Construction and goods-producing industries experienced much larger input price fluctuations than did services industries. NAICS industry groups also faced varying input price pressures based on the types of inputs consumed. Truck transportation (NAICS 484) saw substantial price movements in domestically produced goods inputs, driven by volatile diesel fuel prices. These changes were partially offset by prices for domestic services inputs, which were much less volatile. Wood product manufacturing (NAICS 321) experienced both strong demand and increased input prices. However, output prices for wood product manufacturing increased at a much faster rate than input prices. Wood product manufacturing relies more heavily on imported goods than most industry

groups, and price movements in the output index appear to have tracked more closely with the imported-goods input index than with the input indexes for domestically produced goods and services.

With the PPI expansion of industry group coverage to include imported input prices in the calculation of changes to input costs, the new satellite net input to industry indexes should continue to be a valuable tool in understanding underlying price pressures faced by domestic producers.

This **Beyond the Numbers** article was prepared by Ryan Ogden, an economist in the Office of Prices and Living Conditions, U.S. Bureau of Labor Statistics. Email: ogden.ryan@bls.gov. Telephone: (202) 691-7873.

Information in this article will be made available upon request to individuals with sensory impairments. Voice phone: (202) 691-5200. Federal Relay Service: 1-800-877-8339. This article is in the public domain and may be reproduced without permission.

RELATED ARTICLES

- [A new BLS satellite series of net inputs to industry price indexes: methodology and uses](#)
- [The impact of the COVID-19 pandemic on the input and output prices of the airline and hotel industries: Insights from new BLS data](#)

NOTES

¹ “The global economic outlook during the Covid-19 pandemic: a changed world,” *The World Bank*, June 8, 2020, <https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changed-world>.

² For more information about the satellite net input-to-industry indexes, see “A new BLS satellite series: inputs to industry price indexes,” (U.S. Bureau of Labor Statistics, February 2021), <https://www.bls.gov/ppi/input-indexes/home.htm>.

³ Jayson Pollock and Jonathan C. Weinhagen, “A new BLS satellite series of net inputs to industry price indexes: methodology and uses,” *Monthly Labor Review*, U.S. Bureau of Labor Statistics, September 2020, <https://doi.org/10.21916/mlr.2020.22>.

⁴ For more information about the Coronavirus Aid, Relief, and Economic Security Act (CARES), see Kelsey Snell, “What’s inside the Senate’s \$2 trillion coronavirus aid package,” *NPR*, March 26, 2020, <https://www.npr.org/2020/03/26/821457551/whats-inside-the-senate-s-2-trillion-coronavirus-aid-package>.

⁵ For more information about the American Rescue Plan, see Barbara Sprunt, “Here’s what’s in the American Rescue Plan,” *NPR*, March 11, 2021, <https://www.npr.org/sections/coronavirus-live-updates/2021/03/09/974841565/heres-whats-in-the-american-rescue-plan-as-it-heads-toward-final-passage>.

⁶ For retail sales data from U.S. Census Bureau Advance Monthly Retail Trade Report, see “Monthly Retail Trade,” (U.S. Census Bureau), <https://www.census.gov/retail/marts/www/timeseries.html>.

⁷ For a list of Input index components and their relative weights, see “Input Index Relative Importance Table,” (U.S. Bureau of Labor Statistics), <https://www.bls.gov/ppi/tables/input-price-index-relative-importance-table-2021.xlsx>.

⁸ For a definition of NAICS industry group 321, Wood Product Manufacturing, see “Industries at a glance,” (U.S. Bureau of Labor Statistics), <https://www.bls.gov/iag/tgs/iag321.htm>

⁹ Marcy Nicholson and Daniela Sirtori-Cortina, “The U.S. lumber market is out of control,” *Los Angeles Times*, May 12, 2021, <https://www.latimes.com/business/story/2021-05-12/lumber-prices-rising>.

¹⁰ Marcy Nicholson, “Lumber frenzy drives up home prices as suppliers can’t keep up,” *Bloomberg*, April 13, 2021, <https://www.bloomberg.com/news/articles/2021-04-13/lumber-frenzy-drives-up-home-prices-as-suppliers-can-t-keep-up>

¹¹ For proportions of inputs to specific industries, see “Input Index Relative Importance Table,” (U.S. Bureau of Labor Statistics), <https://www.bls.gov/ppi/tables/input-price-index-relative-importance-table-2021.xlsx>.

SUGGESTED CITATION

Ryan Ogden, “How did the COVID-19 pandemic affect input costs for U.S. producers? A review based on BLS input cost indexes,” *Beyond the Numbers: Prices and Spending*, vol. 10, no. 15 (U.S. Bureau of Labor Statistics, December 2021), <https://www.bls.gov/opub/btn/volume-10/how-did-the-covid-19-pandemic-affect-input-costs-for-us-producers.htm>