Economic Outlook

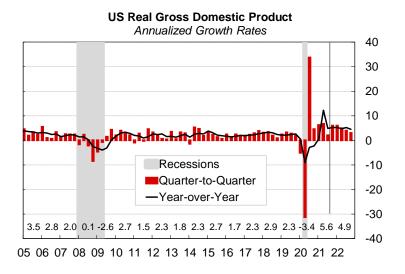
Robert C. Fry, Jr., Ph.D.

November 5, 2021

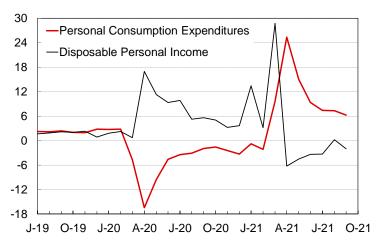
- The pace of global economic growth, both over time and across countries, continues to be driven largely by the
 rise and fall of COVID-19 cases. Growth in China and the United States, which led the recovery from the 2020
 recession, slowed in the third quarter, due to a resurgence in COVID-19 cases. Meanwhile, growth remained
 strong in much of Europe.
- U.S. Real Gross Domestic Product, which exceeded its pre-recession peak in the second quarter, rose at just a 2.0% annual rate in the third quarter after growing at a 6.5% rate in the first half of the year. Growth slowed in the third quarter as the COVID-19 case count rose, exports declined, and shortages of labor and semiconductors curtailed residential construction and motor vehicle sales. I expect growth to reaccelerate in the fourth quarter, then to gradually decelerate through 2022. Industrial production in U.S. manufacturing fell 0.7% in September after a 0.4% decline in August. Most of the September decline was attributable to a decline in motor vehicle production caused by the global shortage of semiconductors.
- Economic growth in China has slowed sharply in 2021, and its manufacturing sector is probably contracting. Real GDP was up 4.9% year-over-year in the third quarter, the lowest in a year, but that understates the magnitude of the slowdown. GDP, seasonally adjusted, grew just 0.2% in the third quarter. Value Added of Industry, China's official measure of industrial production, was up 3.1% year-over-year in September, also the lowest in a year, but the median year-over-year growth rate of 100 industrial products went negative, falling to -2.2%. Growth in China is being impeded by heavy reliance on lockdowns rather than effective vaccines to fight the pandemic, by energy shortages, and by the economic policies being pursued by President Xi Jinping.
- Real GDP in the European Union, which no longer includes the United Kingdom, rose 2.1% (8.6% annual rate) in the third quarter after rising 2.0% in the second quarter. That left GDP up 3.9% year-over-year and just 0.2% below its pre-recession peak. Industrial production in EU manufacturing fell 29.5% from February 2020 to April 2020. It had fully recovered from that decline by April 2021 and rose to a new post-recession high in July. Production slipped in August but was still up 5.8% year-over-year.
- Industrial production in Japanese manufacturing had fully recovered from the 2020 recession by April 2021 but has declined significantly since then. Production fell 5.3% in September, leaving it down 2.2% year-over-year.
- Global real Gross Domestic Product (based on market exchange rates, not purchasing power parity) is expected to rise by 5.5% in 2021 and 4.5% in 2022 after declining 3.6% in 2020. The 2020 decline was the largest since the Great Depression. Global industrial production is expected to grow 7.5% in 2021 and 4.0% in 2022 after shrinking 4.4% in 2020. The 2020 decline in GDP was larger than the decline during the 2008-2009 Great Recession, but the decline in industrial production was smaller. This reflects the fact that the 2020 recession mostly affected the production and consumption of services, whereas previous recessions disproportionately affected the production and consumption of goods.
- The pandemic has restricted supply, through lockdowns and health concerns that have kept potential workers out of the labor force. The fiscal and monetary policy response to the pandemic has boosted demand, especially for goods. The result has been higher prices. Measured inflation in the United States has risen well above the Federal Reserve's 2% target. The Fed's hope that this increase would be "transitory" and that inflation would recede quickly has not been realized. Consequently, the Fed and other central banks will have to tighten monetary policy sooner, faster, and more than they expected to. In many countries, including the United States, a recession will probably be required to get inflation back down to 2%.

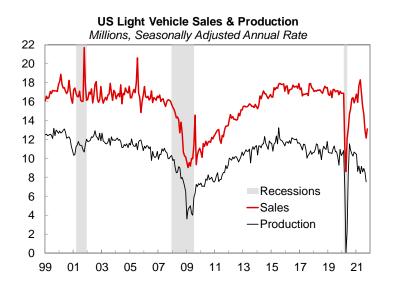
US Macroeconomic Overview

- U.S. Real Gross Domestic Product, which exceeded its pre-recession peak in the second quarter, rose at just a 2.0% annual rate in the third quarter after growing at a 6.5% rate in the first half of the year.
- Growth slowed in the third quarter as the COVID-19 case count rose, exports declined, and shortages of labor and semiconductors curtailed residential construction and motor vehicle sales.
- With COVID cases declining, I expect growth to reaccelerate in the fourth quarter, then to gradually decelerate through 2022.
- Real disposable personal income declined 1.6% in September, leaving it down 2.0% year-over-year. The decline "primarily reflected the winding down of pandemicrelated assistance programs," which more than offset a big increase in wage and salary income.
- Real personal consumption expenditures rose 0.3% in September, leaving them up 6.2% year-over-year.
- Rising wages and savings accumulated during the pandemic will allow consumer spending to remain strong into 2022.
- Motor vehicle production has been constrained by a global shortage of semiconductors. Production will recover gradually as semiconductor producers catch up with demand. Manufacturers have scheduled a big increase in motor vehicle production in the fourth quarter.
- Because of the decline in production and resulting lack of vehicles to sell, light vehicle sales fell from an 18.3 million seasonally adjusted rate in April – a 16-year high – to a 12.2 million rate in September. Sales rose to a 13.1 million rate in October.



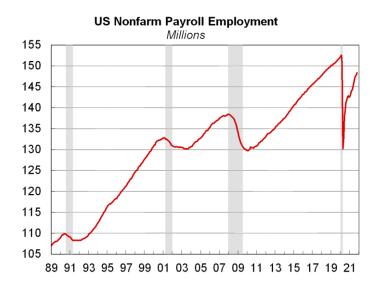
US Real Consumer Spending & Disposable Income Percent Change from Year Ago, Chained 2012 Dollars

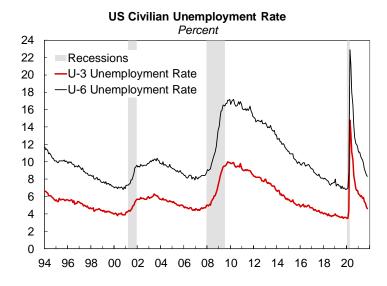


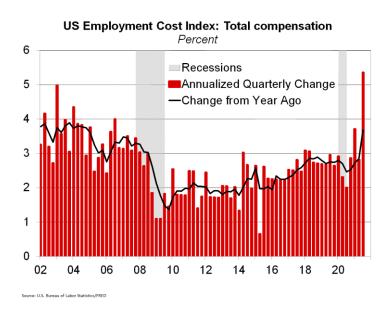


US Labor Market

- Nonfarm payrolls rose by 531,000 in October, and gains in the prior two months were revised up by a total of 235,000. The end of enhanced unemployment benefits, the reopening of schools, and a decline in COVID-19 cases are contributing to job growth. The recent decline in new claims for unemployment insurance, to a postrecession low, suggests another big increase in employment in November.
- Payroll employment has increased by 18.2 million from its April 2020 trough but remains 4.2 million below its February 2020 peak.
- The civilian unemployment rate, which peaked at 14.7% in April 2020, declined to 4.6% in October. It remains above its February 2020 level of 3.5%, a 51-year low.
- Unemployed people who haven't looked for a job in the last four weeks are not included as part of the labor force and therefore not counted as unemployed in the calculation of the headline (U-3) unemployment rate. If the labor force were not 3.1 million smaller than it was at its peak in December 2019, the unemployment rate would be higher than 4.6%.
- Even though employment is well below its pre-recession peak, and the unemployment rate still above its pre-recession peak, there were 10.4 million job openings at the end of August, down just slightly from the record 11.1 million in July. This means that labor markets are much tighter than employment and the unemployment rate suggest.
- Tight labor markets mean that wages and salaries must rise more rapidly than prices.
- The Employment Cost Index, the best measure of U.S. labor costs, rose 1.3% in the third quarter, the biggest increase since the series began in 2002.

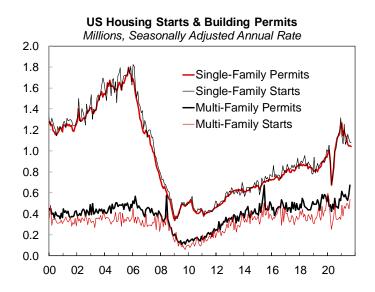


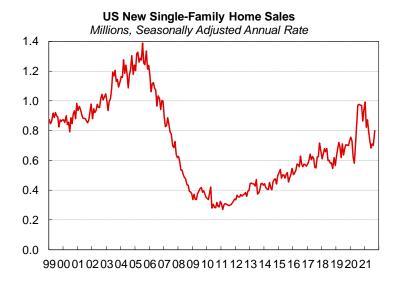


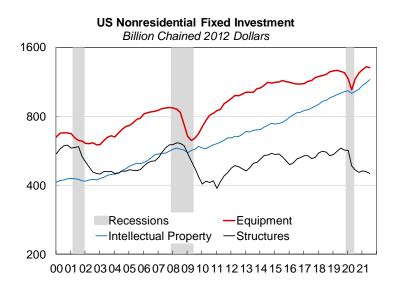


US Housing & Business Investment

- The seasonally adjusted annual rate of building permits for single-family homes, the most important number in the monthly residential construction report, has been declining since it peaked in January. (Permits are a better indicator of housing market activity than starts because they are less sensitive to weather.)
- The decline in single-family permits and starts reflects the combined impact of supply constraints caused by shortages of labor, materials, and lots and a seasonaladjustment process that boosts permits in winter and reduces them in summer.
- New home sales (seasonally-adjusted) declined from January to June but have risen since. This pattern also reflects the interaction of supply constraints and the seasonal-adjustment process.
- Existing-home sales (not shown) hit a 14year high in October 2020, then declined through June 2021. They have risen since but were still down 2.3% year-over-year in September.
- The lean inventory of existing homes for sale continues to restrict sales. It equaled just 2.4 months of sales in September.
- Investment in business equipment declined in the third quarter after reaching a record high in the second quarter.
- Investment in business structures, which includes oil and gas wells as well as commercial and industrial structures, continued to decline in the third quarter.
- Investment in intellectual property products, which includes software, rose strongly for a fifth consecutive quarter. It has been the most consistent contributor to GDP growth during the recovery from the 2020 recession.

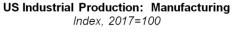






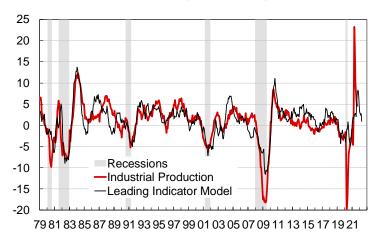
Industrial Production & Leading Indicators

- Industrial production in U.S. manufacturing fell 0.7% in September after a 0.4% decline in August. Most of the September decline was attributable to a decline in motor vehicle production caused by a shortage of semiconductors.
- Before the recent declines, production had fully recovered from its 19.6% decline during the 2020 recession. However, it has still not recovered from the 2018-2019 decline caused by the trade war with China and remains about 10% below the all-time high reached in December 2007.
- Industrial production for manufacturing (excluding computers, communication equipment, and semiconductors) was up 4.6% year-over-year in September.
- My leading indicator model suggests that year-over-year growth will decline towards its long-term trend over the next six months. However, the model's forecast is being held down by this year's decline in housing permits, which I think will be reversed going forward. It also does not account for the inventory rebuilding that is likely to boost industrial production next year.
- The Organization for Economic Cooperation and Development (OECD) publishes leading indicators for OECD members and six non-member developing countries. Their broadest leading indicator is highly correlated with year-over-year growth in global industrial production.
- The OECD "leading" indicator doesn't lead by much, if at all, but because it doesn't change direction often, it can confirm whether an apparent turning point in growth in industrial production is a true turning point or just statistical "noise". The indicator is consistent with decelerating (but still slightly above trend) growth.

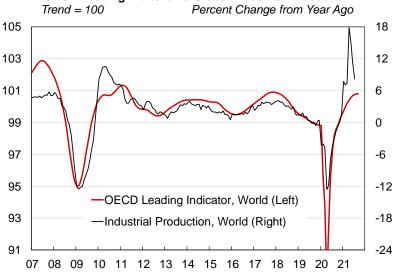




US Industrial Production: Manufacturing ex high-tech Percent Change from Year Ago

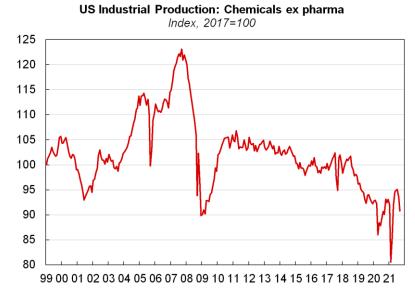


OECD Leading Indicator & Global Industrial Production Trend = 100 Percent Change from Year Ago



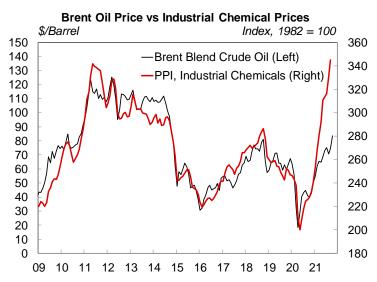
US Industrial Production

- Industrial production of chemicals (excluding pharmaceuticals), which had fully recovered from the 2020 recession by October 2020 and from the February freeze in Texas by May 2021, fell 4.6% from July to September, leaving it up just 0.8% yearover-year.
- Many industrial production indexes are based on hours worked rather than on actual physical production. Data on actual production, where available, paint a much less negative picture of chemical production than the index shown in the chart, especially over the last three years.
- U.S. industrial production of plastic and rubber products has still not fully recovered from the 2020 recession.
- While production in September was up 3.8% from a year earlier, it was down 0.4% from August, down 1.7% from February 2020, and down 5.0% from July 2018.
- Production has been restrained by supply constraints in the chemical industry, its main source of raw materials, and semiconductor-related production cuts in the auto industry, its biggest market.
- Even though natural gas liquids are the primary feedstock for the North American chemical industry, industrial chemical prices are more highly correlated with global oil prices than with natural gas prices because oil-based imports are the marginal source of supply. However, that correlation broke down after the February freeze; chemical prices have risen much more than can be explained by higher oil prices.
- The Producer Price Index for industrial chemicals rose 72.6% from May 2020 to September 2021. This was the biggest 16month increase since 1975 and left the index at a record high.



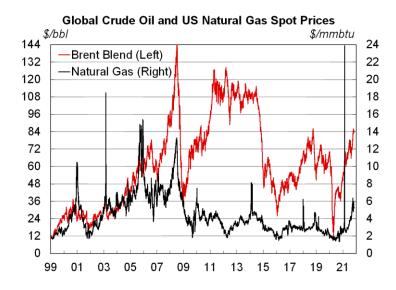
US Industrial Production: Plastic & Rubber Products Index, 2017=100

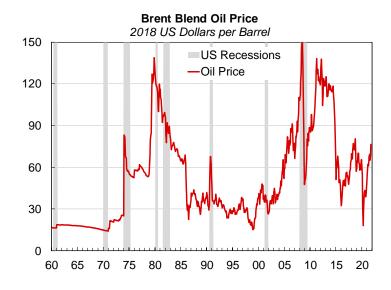


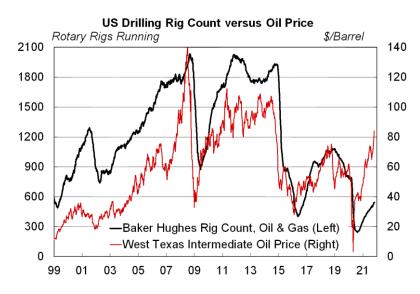


Oil & Gas Prices

- The price of Brent Blend crude oil, which is tied to what U.S. consumers pay for petroleum products, has risen this year to its highest level since 2014. Brent is currently trading near \$84/barrel, well above where it was before the pandemic.
- Natural gas prices have risen to their highest sustained levels since 2008, due to reductions in U.S. drilling and production and strong demand for liquified natural gas in the rest of the world.
- Higher prices for natural gas and natural gas liquids, relative to oil prices, reduce the competitive advantage of North American chemical producers, which use natural gas liquids as their primary feedstock, vis-à-vis foreign competitors, which rely on naphtha, a crude oil derivative.
- Real (inflation-adjusted) oil prices, which neared all-time lows in April 2020, have risen well above their 50-year average.
- Historically, the U.S. economy has grown faster when oil prices were low than when oil prices were high. That relationship was weakened by growth in U.S. oil production after 2008 but will reassert itself unless drilling activity responds to higher prices.
- The price of West Texas Intermediate crude oil, which is tied to what U.S. oil producers are paid for their oil, has recently risen above \$82/barrel.
- Oil and gas drilling has risen in response to higher prices but is still well below where it has been for most of the last two decades.
- U.S. production of crude oil, natural gas, and natural gas liquids fell sharply in 2020. Production has partially recovered but is unlikely to return to its pre-recession peak before the end of 2022 and might never return to those levels.



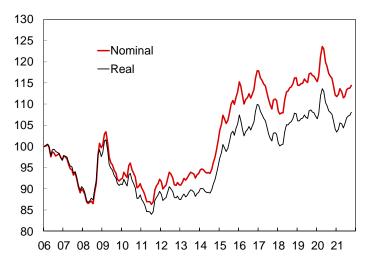




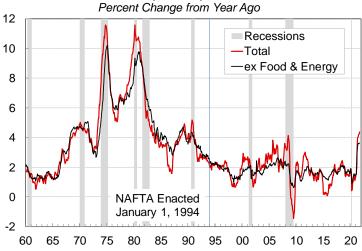
Exchange Rates, Inflation, and Interest Rates

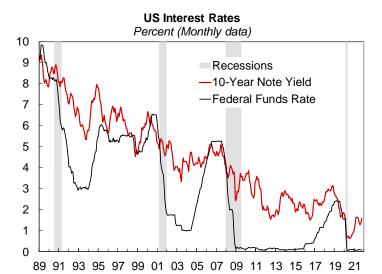
- The trade-weighted foreign exchange value of the U.S. dollar has stabilized after declining in 2020. Despite the 2020 decline, the value of the dollar remains relatively high by historical standards in both nominal and real (inflation-adjusted) terms.
- A "strong" dollar reduces the global competitiveness of U.S.-produced goods, especially in agriculture, manufacturing, and mining. Further declines in the value of the dollar would help those industries but at the cost of higher inflation.
- The U.S. Federal Reserve seeks to keep inflation, as measured by the year-overyear change in the Personal Consumption Expenditure Price Index averaged over a period of years, near 2%.
- The total PCE Price Index was up 4.4% year-over-year in September, marking the highest inflation rate since 1991. The "core" (excluding food and energy) index was up 3.6% year-over-year, but the rate of increase has eased for five straight months.
- Inflation is expected to decline next year but is likely to remain above the Fed's 2% target until the next recession.
- In response to the collapse in economic activity in 2020, the Federal Reserve cut its federal funds rate target to a range of 0-0.25%. It remains there despite inflation that is well above the Fed's target.
- Stubbornly high inflation is likely to force the Fed to raise interest rates sooner and faster than it intended, starting in 2022.
- The closing yield on 10-year Treasury notes rose from a record low of 0.54% on March 9, 2020 to 1.74% on March 19, 2021. It has remained below that level since then. Bond yields would have to rise much further to threaten the economic expansion.

Federal Reserve Broad Dollar Index



US Personal Consumption Expenditures Price Index

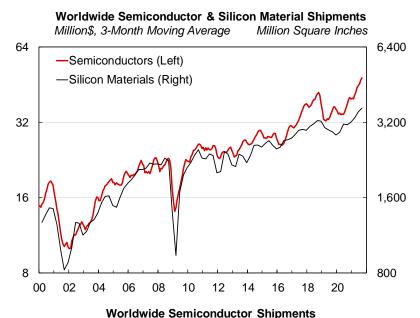




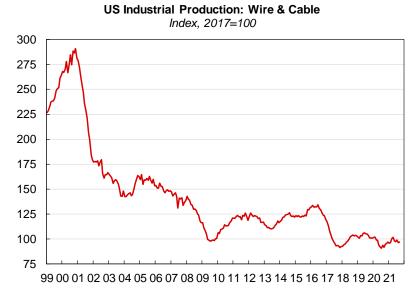
Electronics & Communication

- Shipments of silicon materials are a good indicator of global demand for products going into the electronics industry.
- Data on silicon material shipments (from SEMI®) are only reported quarterly back to 2000, but silicon wafer area (in square inches) has been strongly correlated with semiconductor shipments (in dollars), which are reported monthly back to 1976.
- Worldwide semiconductor shipments and silicon material shipments both rose to record highs in the third quarter. The global semiconductor shortage is due primarily to strong demand, not to a reduction in supply.
- Semiconductor shipments, which grew in 2020 despite the pandemic and recession, were up 27.6% year-over-year in the third quarter. Silicon material shipments were up 16.4%.
- Further strong growth will be needed to eliminate the global semiconductor shortage.

- Industrial production of wire and cable used in communication and energy applications fell by two-thirds from its 2000 peak to its 2009 trough. The recovery from 2009 to 2016, while significant in percentage terms, erased little of the 2001-2009 decline.
- Wire and cable production fell 10.9% from February 2020 to July 2020. By April 2021, it had recouped nearly 100% of that decline, but production has declined since then.
- Demand for wire and cable has been hurt by office closures and the decline in nonresidential construction.

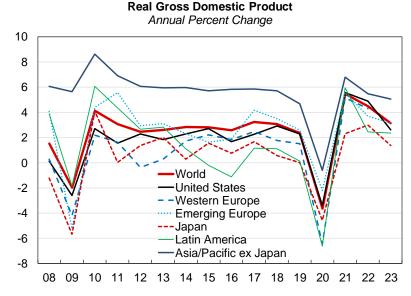


Percent Change from Year Ago, 3-Month Moving Average 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20

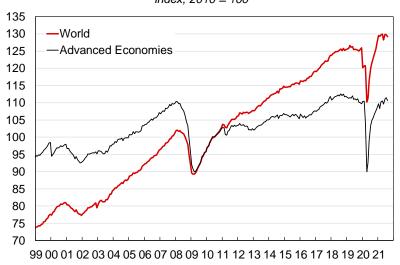


Global Macroeconomic Overview

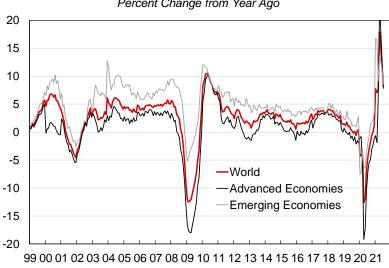
- Global real Gross Domestic Product (based on market exchange rates, not purchasing power parity) fell 3.6% in 2020. It was the biggest decline since the Great Depression.
- GDP is expected to rise 5.5% in 2021 and 4.5% in 2022.
- The initial recovery from the global recession was led by China and the United States. During the second and third quarters of 2021, growth leadership shifted, temporarily, to Western Europe
- Global industrial production, as measured by the CPB Netherlands Bureau for Economic Policy Analysis, declined 12.5% from December 2019 to April 2020.
- By December 2020, production had risen above its pre-recession peak, but it has remained essentially flat since January.
- Further expansion has been restrained by recurrent waves of the pandemic.
- Industrial production in the Advanced Economies has fully recovered from the recession but not from its 2018-19 decline.
- Global industrial production was up 6.3% year-over-year in August. It had been down as much as 12.6% year-over-year in April 2020 and up as much as 17.9% year-over-year in April 2021.
- Industrial production in Emerging Economies was up 7.0% year-over-year in August.
- Industrial production in Advanced Economies was up 5.6%.



Industrial Production ex Construction Index, 2010 = 100



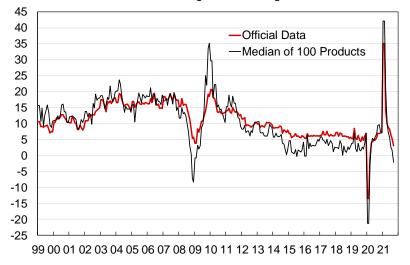
Industrial Production ex Construction Percent Change from Year Ago



Asia

- China's economy rebounded quickly from the sharp decline in the first two months of 2020. Growth has slowed sharply in 2021.
- Value Added of Industry, China's official measure of industrial production, was up just 3.1% year-over-year in September. That was the lowest growth rate since March 2020.
- My preferred measure of growth in industrial production, the median yearover-year growth rate of 100 industrial products, turned **negative** in September, falling to -2.2%.
- Industrial production in Japanese manufacturing had fully recovered from the 2020 recession (but not from the 2018-19 decline) by April 2021, but production has declined significantly since then.
- Production fell 5.3% in September, leaving it down 2.2% year-over-year.
- Japanese manufacturing, which is heavily dependent on exports, has been hurt by shortages of ships and shipping containers, by the global semiconductor shortage, and by recurrent waves of the pandemic.
- India has been hit very hard by the COVID-19 pandemic. Industrial production in manufacturing collapsed in March and April 2020, leaving it down 67% year-over-year.
- Production rebounded strongly thereafter and had fully recovered by January 2021.
- Production fell sharply in April because of a resurgence in COVID cases but was still up 9.7% year-over-year in August.
- The International Monetary Fund forecasts GDP growth of 9.5% in 2021 after a 7.3% decline in 2020. Growth of 8.5% is expected for 2022.

Value Added of Industry (Industrial Production): China Percent Change from Year Ago



Industrial Production, Manufacturing: Japan Index, 2015 = 100



Industrial Production, Manufacturing: India Percent Change from Year Ago, Smoothed

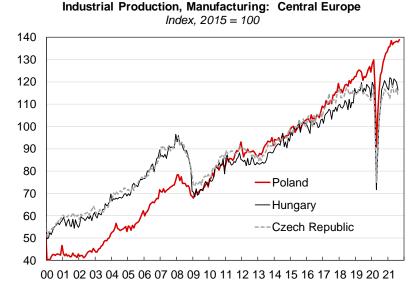


Europe

- Real GDP in the European Union, which no longer includes the United Kingdom, rose 2.1% (8.6% annual rate) in the third quarter after rising 2.0% in the second quarter. That left GDP up 3.9% year-over-year and just 0.2% below its pre-recession peak.
- Industrial production in EU manufacturing fell 29.5% from February 2020 to April 2020. It had fully recovered from that decline by April 2021 and rose to a new post-recession high in July. Production slipped in August but was still up 5.8% year-over-year.
- The 12-month change in the German IFO manufacturing business climate index has historically led year-over-year growth in EU manufacturing production by three months and is reported in a timelier manner.
- The IFO index plummeted in March and April 2020 to its lowest level since March 2009. By June 2021, it had risen to its highest level since 2018. Its 12-month change rose to its highest level ever in April. The index suggests that year-overyear growth in industrial production will continue to slow but will remain positive.
- Industrial production in manufacturing has risen to new record highs in Poland and Hungary this year but is still below its 2019 peak in the Czech Republic.
- Production rebounded strongly from the 2020 recession, but growth has stalled in Hungary and the Czech Republic in 2021.
- Production set another new record high in Poland in September and was up 7.9% year-over-year.



Industrial Production, Manufacturing: European Union Change/Percent Change from Year Ago 100 25 IFO Mfg Business Climate (Left) 80 20 Industrial Production (Right) 60 15 40 10 20 5 0 0 -20 -5 -40 -10 -60 -15 -80 -20 -100 -25 -120 -30 95 97 99 03 05 07 09 11 13 15 17 19 21 01



Americas

- By September 2020, industrial production in Brazilian manufacturing had more than fully recovered from the 29.8% decline from January 2020 to April 2020. But production peaked in December 2020 and has declined in 2021, leaving it about 20% below the peak reached in 2011.
- The decline in the first half of 2021 coincided with a surge in new COVID-19 cases, but cases peaked in late June, yet industrial production had not begun to recover by August, when it was down 1.4% year-over-year.
- As of December 2020, industrial production in Mexican manufacturing had almost fully recovered from the 34.1% decline from January to April but not from the decline in the second half of 2019.
- Production has remained essentially flat since December 2020 but was still up 6.1% year-over-year in August.
- Real Gross Domestic Product grew 1.4% (6.0% annual rate) in the second quarter of 2021, its fourth straight quarter of growth, but was still 3.1% lower than in the third quarter of 2019.
- Unlike most countries, Canada reports Gross Domestic Product monthly rather than quarterly and for various sectors of the economy.
- Real GDP in manufacturing, which is comparable to industrial production in other countries, fell 28.3% in March and April 2020. By January 2021, it had recouped 92% of its losses, but it has declined since then. This reflects Canada's heavy reliance on motor vehicle manufacturing.
- Real GDP in manufacturing was up 1.1% year-over-year in August.







Global GDP Growth

	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
World	3.2	3.1	2.4	-3.6	5.5	4.5	3.1	2.8	2.4
North America	2.3	2.9	2.2	-3.6	5.5	4.8	2.6	1.9	0.7
United States	2.3	2.9	2.3	-3.4	5.6	4.9	2.6	1.9	0.6
Canada	3.0	2.4	1.9	-5.3	5.1	4.1	2.6	1.5	1.8
Mexico	2.1	2.2	-0.2	-8.3	6.1	3.0	2.2	2.0	2.0
Western Europe	2.5	1.8	1.5	-6.5	5.2	4.3	2.0	1.6	1.4
France	2.4	1.8	1.8	-8.0	6.1	3.8	1.8	1.5	1.4
Germany	2.7	1.1	1.1	-4.6	2.8	4.4	1.6	1.4	1.2
Italy	1.7	0.9	0.3	-8.9	5.9	4.3	1.6	1.0	1.0
Spain	3.0	2.3	2.1	-10.8	5.6	6.1	2.6	2.0	1.6
U.K.	1.7	1.3	1.4	-9.8	6.9	5.1	1.9	1.6	1.5
C & E Europe	4.2	3.5	2.6	-2.2	5.6	3.7	3.1	2.9	2.7
Middle East & Africa	1.7	1.7	1.4	-3.6	3.3	3.9	3.4	3.2	3.3
Asia/Pacific	4.9	4.6	3.7	-1.4	5.9	5.0	4.3	4.2	4.0
Japan	1.7	0.6	0.0	-4.6	2.3	3.0	1.4	0.8	0.6
ex Japan	5.9	5.7	4.7	-0.6	6.8	5.5	5.1	4.9	4.8
Australia	2.4	2.8	1.9	-2.4	3.6	3.6	2.6	2.6	2.6
China	6.9	6.8	6.0	2.3	8.2	5.5	5.3	5.2	5.1
India	6.8	6.5	4.0	-7.3	9.5	8.5	6.6	6.3	6.2
Indonesia	5.1	5.2	5.0	-2.1	3.2	5.9	6.4	5.6	5.3
Korea (South)	3.2	2.9	2.2	-0.9	4.1	3.2	2.8	2.6	2.5
Malaysia	5.8	4.8	4.4	-5.6	3.5	6.0	5.7	5.3	5.0
Philippines	6.9	6.3	6.1	-9.6	3.2	6.3	7.0	6.7	6.5
Singapore	4.5	3.5	1.3	-5.4	6.0	3.2	2.7	2.6	2.5
Taiwan	3.3	2.8	3.0	3.1	6.1	3.3	2.6	2.2	2.1
Thailand	4.2	4.2	2.3	-6.1	1.0	4.5	4.0	3.6	3.5
Vietnam	6.9	7.2	7.2	2.9	3.8	6.6	6.8	7.0	7.1
Latin America	0.9	8.0	0.2	-6.2	5.9	2.3	2.4	2.3	2.4
Argentina	2.8	-2.6	-2.1	-9.9	7.5	2.5	2.0	1.8	1.8
Brazil	1.3	1.8	1.4	-4.1	5.2	1.5	2.0	2.1	2.1

Global Industrial Production Growth

	<u>2019</u>	<u>2020</u>	<u>2021</u>	2022	<u>2023</u>	<u>2024</u>	<u>2025</u>
World	0.6	-4.4	7.5	4.0	3.1	2.4	2.2
Advanced economies	-0.8	-6.6	6.5	3.6	2.3	1.6	1.1
United States	-0.8	-7.2	5.6	5.1	3.1	2.1	0.9
Japan	-2.6	-10.1	7.0	3.0	2.0	1.5	1.2
Euro Area	-1.5	-8.7	7.0	3.0	2.0	1.0	1.0
Emerging economies	2.0	-2.3	8.9	4.6	4.1	3.5	3.5
China	5.8	2.0	10.0	4.0	4.0	4.0	4.0
Emerging Asia ex China	0.5	-5.3	14.0	5.0	4.0	4.0	4.0
E Europe & CIS	3.1	-2.1	3.5	4.0	2.5	2.0	2.0
Latin America	-5.0	-8.9	8.0	4.0	3.0	2.5	2.5
Middle East & Africa	-3.5	-9.7	6.0	6.0	6.0	3.5	3.5

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