

Review of Colorado Economy Through April 2021



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Colorado-based Business and Economic Research
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Overview

The purpose of this chartbook is to review U.S. and Colorado data that show how both economies are recovering from COVID-19 policies at a faster pace than anticipated several months ago.

In April, the U.S. saw “lackluster” job growth, while the expansion in Colorado exceeded expectations. The federal stimulus programs have been a mixed blessing – they have helped and hindered the recovery from COVID-19 policies.

There are different impacts on industry sectors and MSA areas. As a result, there are different rates of recovery.

The value for the real U.S. GDP will return to the pre-pandemic level during Q2 2021. Total employment will return to pre-pandemic levels in 2022 or 2023.

Highlights

United States

- Real GDP
- Employment and Unemployment
- Business Applications
- Major Indices
- S&P 500 and WTI Oil Prices

Colorado

- Colorado Employment
- Business Applications and Establishments
- Select Industry Data
- Summary Colorado

Highlights

Key Points – United States

- The re-opening of the economy and the federal stimulus have improved economic activity and the labor market. At the same time, some of the assistance programs have disincentivized people to return to work.
- The low unemployment rate and the fast-paced recovery are masking problems that are preventing faster growth.
- The labor market is improving unevenly across geographies and industries.
- Many businesses are having problems finding qualified workers. As a result, some companies are paying signing bonuses.
- Some people will not find a job!
- The equity markets remain strong – but for how long?
- The price of oil is above \$60 per barrel.
- Inflation has entered the picture. It seems inevitable that the Fed will raise interest rates.

Key Points - Colorado

- The re-opening of the Colorado economy has been uneven. The fastest rate of growth has been in Colorado Springs and Fort Collins. The slowest recovery has been in Boulder and Greeley.
- Colorado is the 20th ranked state in terms of its recovery. It is ranked 35th for its unemployment rate of 6.4%.
- Employment for MCE, TWU, and the federal government has returned to pre-pandemic levels. These sectors are about 7% of the total state employment.
- Employment for leisure and hospitality, extractive services, and private education have experienced the worst recoveries.
- Leisure and hospitality employment is about 82.5% of the February 2020 value. In April, significant job growth occurred in the AER and food services. Hotel employment may return to full strength in 2022 (or later).
- Sectors with higher wages have recovered more quickly.

The United States Economy



Real Gross Domestic Product

United States

Key Points

The near-term forecasts for economic activity continues to improve. Real GDP will grow by 6.4% in 2021 with increased consumer spending. A more modest rate of growth will occur in 2022.

The value of real GDP will return to pre-COVID levels in Q2 2021.

It will take U.S. employment much longer to return to pre-COVID levels, most likely in 2022 or 2023.

U.S. Real GDP Growth

The Conference Board Forecast (May 7, 2021)

Real GDP in 2021

The Conference Board May 7 forecast calls for real GDP growth of 6.4% in Q1 2021, followed by 8.6% in Q2. Real GDP growth for 2021 will be 6.4%, with an increase in personal consumption of 7.6%. There will be strong growth in the housing market in 2021. The value of real GDP will return to pre-pandemic levels in Q2 2021.

Assumptions of the Forecast

There will be a reduction in the number of new COVID-19 cases. As a result, mobility will increase. The federal stimulus programs will support increased personal consumption and business investment. The labor markets will improve as the year progresses and, economic activity will taper off to a more modest level in 2022.

Conference Board 2021 US Real GDP Growth Forecast

	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	2020	2021	2022
Real GDP	- 5.0%	- 31.4%	33.4%	4.3%	6.4%	8.6%	6.8%	4.2%	- 3.5%	6.4%	3.7%
Personal Consumption	- 6.9%	- 33.2%	41.0%	2.3%	10.7%	9.0%	6.2%	5.1%	- 3.9%	7.6%	
Residential Investment	19.0%	- 35.5%	63.0%	36.6%	10.8%	9.0%	9.0%	7.0%	6.1%	15.8%	
Nonresidential Investment	-6.7%	-27.2%	22.9%	13.1%	9.9%	7.2%	6.3%	6.2%	-4.0%	6.0%	
Total Gov't. Spending	1.3%	2.5%	-4.8%	-0.8%	6.3%	0.9%	0.9%	0.9%	1.1%	1.3%	
Exports	- 9.5%	- 64.4%	59.6%	22.3%	3.0%	8.6%	6.6%	6.1%	- 12.9%	4.4%	
Unemployment Rate	3.8%	13.1%	8.8%	6.8%	6.2%	5.6%	4.9%	4.4%	8.1%	5.3%	
PCE Inflation (%Y/Y)	1.7%	0.6%	1.2%	1.2%	1.7%	2.9%	2.9%	3.0%	1.2%	2.7%	
Core PCE Inflation (%Y/Y)	1.8%	1.0%	1.4%	1.4%	1.5%	2.3%	2.2%	2.4%	1.4%	2.1%	

Source: The Conference Board and cber.co.

Source: The Conference Board, <https://www.conference-board.org/publications/Economic-Forecast-US>, cber.co.

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Employment and Unemployment

United States and Colorado

Key Points

U.S. employment in April was 94.6% of the total for February 2020.

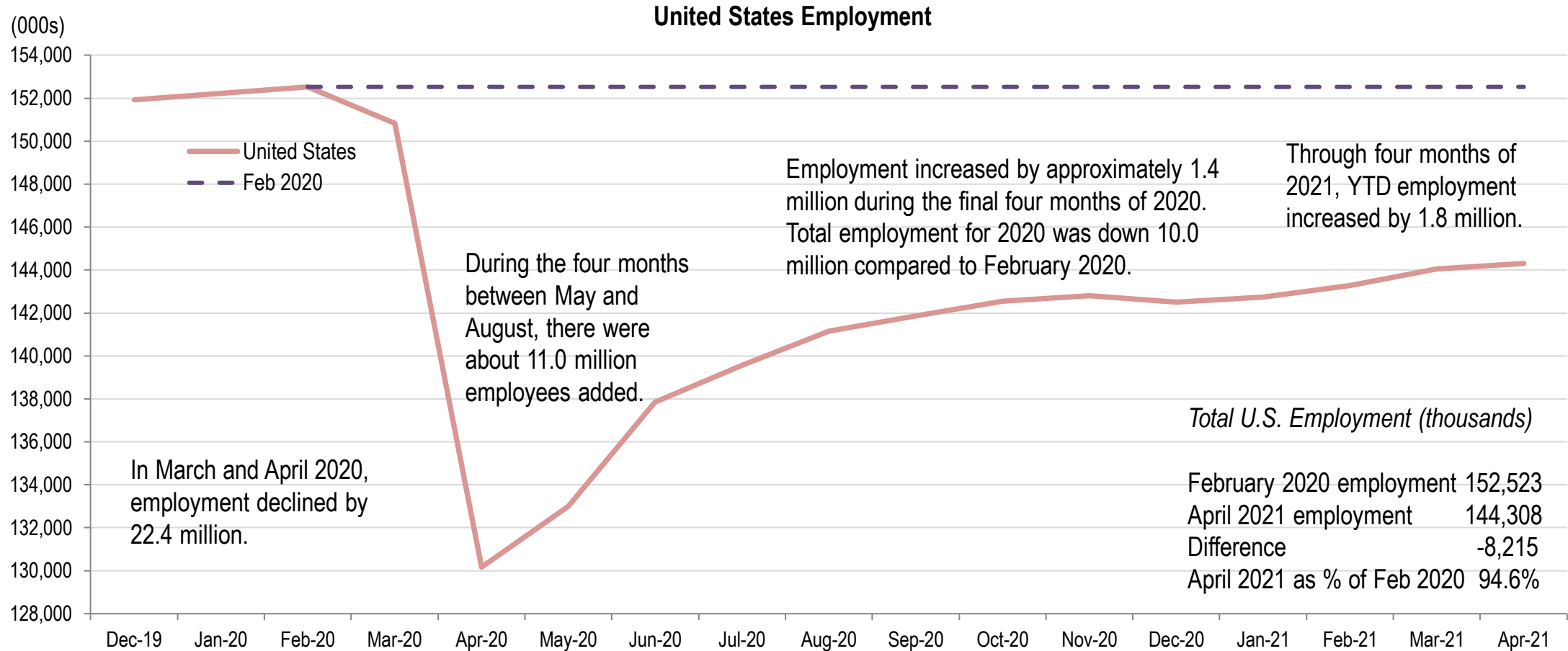
Both the LFPR and the unemployment rate for Colorado and the U.S. improved during the first four months of 2021. The Colorado unemployment rate is greater than the U.S.

Five states have unemployment rate less than 3.0%. At the other end of the spectrum, Hawaii has a rate of 8.5%.

Idaho and Utah are the top two states for the job recovery. Both have returned to their pre-pandemic levels.

Change in Employment

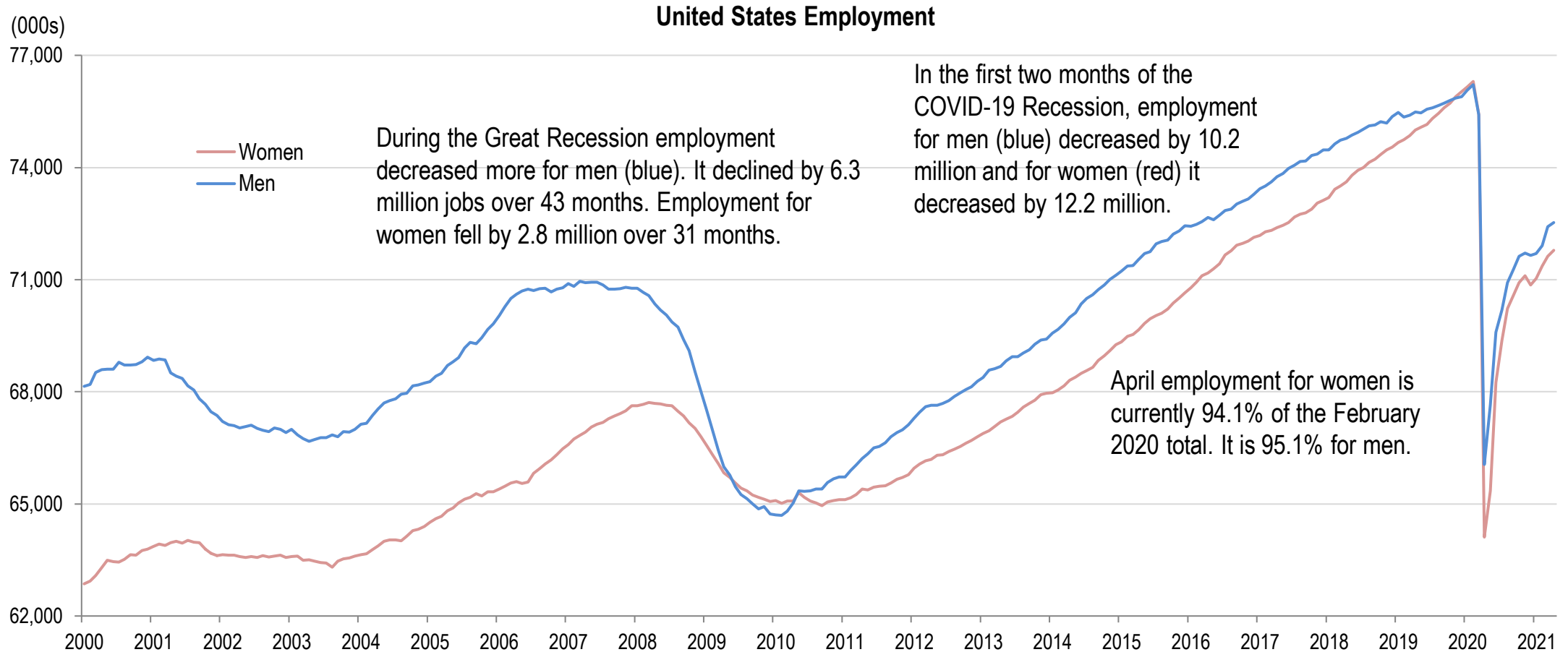
United States



Source: Bureau of Labor Statistics, cber.co.

Change in Employment (Men and Women)

United States



Source: Bureau of Labor Statistics, cber.co.

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Recovery by State

April 2021 – Sorted by Percent of Recovery

The following tables show the February 2020 employment, April 2021 change from February 2020, and percent of recovery by state. Colorado is ranked 20th in its percent of recovery. The U.S. rate of recovery is 94.6%. Thirty-one states have recovery rates greater than that rate.

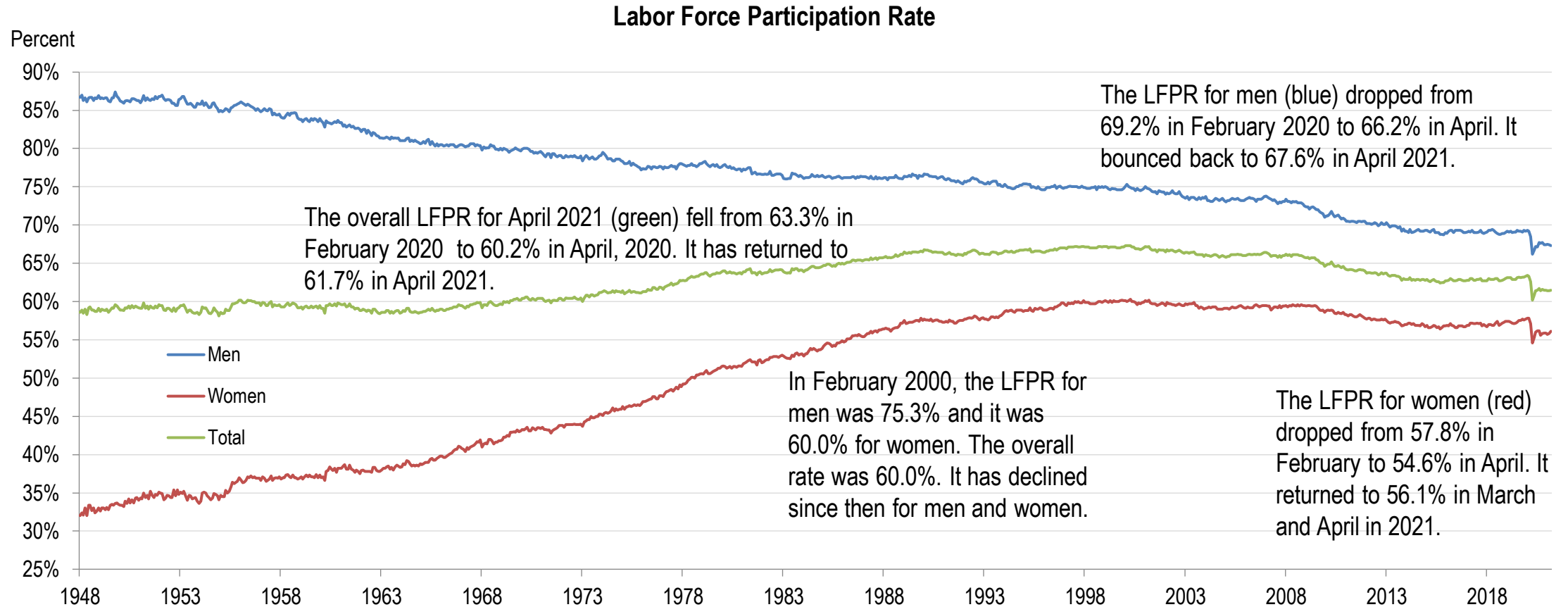
Percent Recovery by State (Ranked 1-17)					Percent Recovery by State (Ranked 18-34)					Percent Recovery by State (Ranked 35-51)				
Rank	State	Feb 2020	4/21 vs 2/20	Rate	Rank	State	Feb 2020	4/21 vs 2/20	Rate	Rank	State	Feb 2020	4/21 vs 2/20	Rate
1	Idaho	773.4	11.5	101.5%	18	New Hampshire	689.0	-29.9	95.7%	35	Oregon	1,973.0	-130.7	93.4%
2	Utah	1,572.2	18.5	101.2%	19	Oklahoma	1,701.7	-76.3	95.5%	36	Illinois	6,142.8	-415.8	93.2%
3	Montana	488.0	-7.4	98.5%	20	Colorado	2,819.0	-128.1	95.5%	37	Connecticut	1,696.3	-115.7	93.2%
4	South Dakota	442.8	-7.2	98.4%	21	Maine	640.0	-29.2	95.4%	38	Alaska	329.8	-22.9	93.1%
5	Arkansas	1,292.4	-30.8	97.6%	22	Iowa	1,590.9	-73.5	95.4%	39	Pennsylvania	6,092.6	-426.1	93.0%
6	Nebraska	1,032.4	-25	97.6%	23	West Virginia	718.7	-33.4	95.4%	40	Vermont	314.5	-23.1	92.7%
7	Tennessee	3,153.7	-92.4	97.1%	24	Wyoming	288.6	-13.5	95.3%	41	Michigan	4,452.9	-338.5	92.4%
8	Arizona	2,993.1	-94.8	96.8%	25	Wisconsin	2,997.8	-140.5	95.3%	42	New Jersey	4,229.6	-328.8	92.2%
9	Texas	12,970.0	-445.5	96.6%	26	Washington	3,513.1	-169.9	95.2%	43	Rhode Island	507.2	-39.6	92.2%
10	Mississippi	1,163.2	-41.9	96.4%	27	Virginia	4,091.0	-201.3	95.1%	44	Louisiana	1,993.5	-156.5	92.1%
11	North Carolina	4,626.6	-166.8	96.4%	28	Kentucky	1,957.0	-98.1	95.0%	45	California	17,660.9	-1412.7	92.0%
12	Alabama	2,086.5	-75.4	96.4%	29	Delaware	468.0	-23.7	94.9%	46	Massachusetts	3,733.4	-299.6	92.0%
13	South Carolina	2,196.4	-83.1	96.2%	30	North Dakota	440.3	-22.8	94.8%	47	District of Columbia	803.4	-66.4	91.7%
14	Missouri	2,926.6	-111.6	96.2%	31	Maryland	2,779.0	-147.4	94.7%	48	New Mexico	861.9	-71.7	91.7%
15	Kansas	1,428.8	-56.4	96.1%	32	Ohio	5,609.9	-301.6	94.6%	49	Nevada	1,442.8	-134.2	90.7%
16	Georgia	4,666.5	-192.9	95.9%	33	Florida	9,072.1	-503.2	94.5%	50	New York	9,835.1	-952.9	90.3%
17	Indiana	3,163.8	-135.9	95.7%	34	Minnesota	2,996.3	-181	94.0%	51	Hawaii	662.3	-100.2	84.9%

Source: Bureau of Labor Statistics, cber.co.

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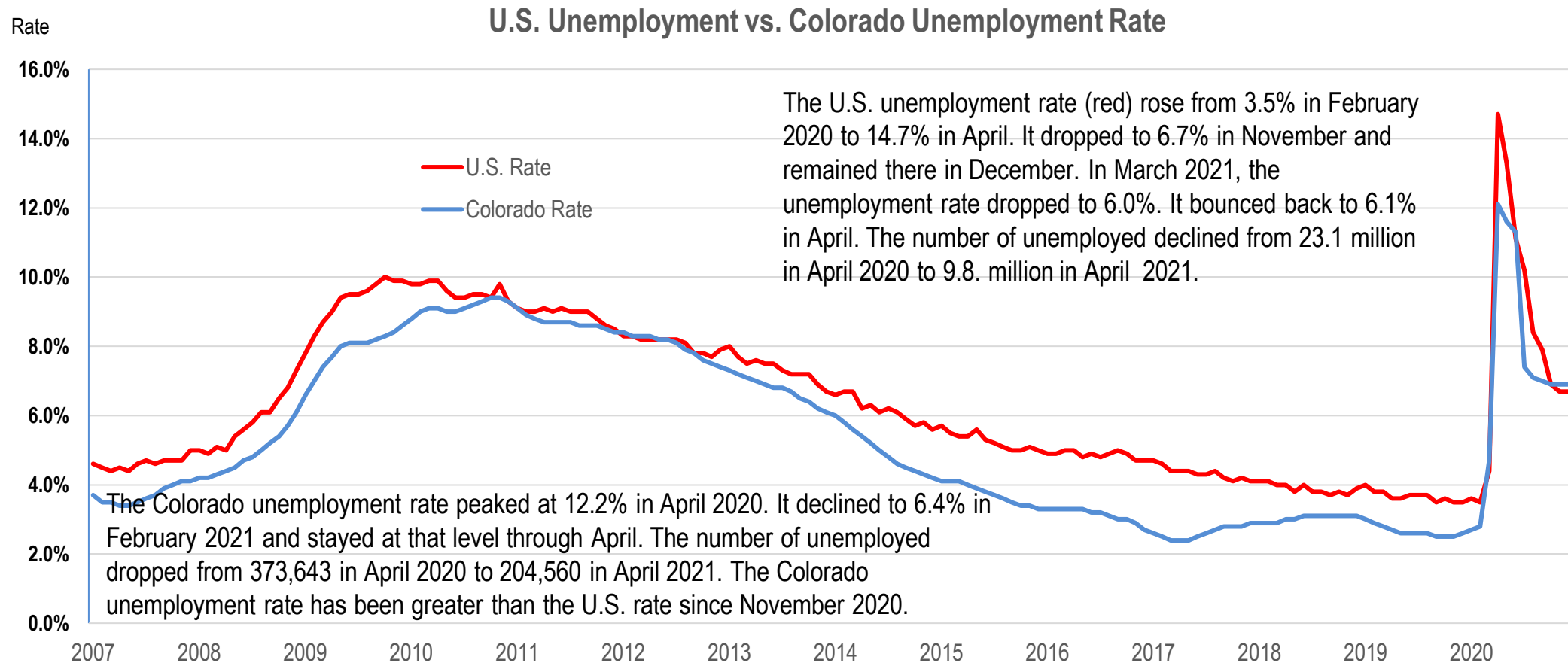
Labor Force Participation Rate (LFPR)

United States Total, Men, and Women



Source: FRED, BLS, cber.co.

U.S. and Colorado Unemployment Rate



Source: Bureau of Labor Statistics and cber.co.

Unemployment Rates by States

April 2021

Unemployment Rate < 4.4%			Unemployment Rate Between 4.4% and 6.4%		
Rank	State	Rate	Rank	State	Rate
1	Nebraska	2.8%	18	Arkansas	4.4%
2	New Hampshire	2.8%	19	Kentucky	4.7%
3	South Dakota	2.8%	20	Ohio	4.7%
4	Utah	2.8%	21	Virginia	4.7%
5	Vermont	2.9%	22	Florida	4.8%
6	Idaho	3.1%	23	Maine	4.8%
7	Kansas	3.5%	24	Michigan	4.9%
8	Alabama	3.6%	25	North Carolina	5.0%
9	Montana	3.7%	26	South Carolina	5.0%
10	Iowa	3.8%	27	Tennessee	5.0%
11	Indiana	3.9%	28	Wyoming	5.4%
12	Wisconsin	3.9%	29	Washington	5.5%
13	Minnesota	4.1%	30	West Virginia	5.8%
14	Missouri	4.1%	31	Oregon	6.0%
15	North Dakota	4.2%	32	Maryland	6.2%
16	Georgia	4.3%	33	Mississippi	6.2%
17	Oklahoma	4.3%	34	Rhode Island	6.3%

In April, the U.S. unemployment rate inched up to 6.1%. Thirty-one states had unemployment rates lower than the national rate (green).

Twenty-seven states had an unemployment rate of 5.0% or less. No states had unemployment rates above 9.0%.

About 19.2% of the U.S. labor force is in the 17 states, with unemployment rates less than 4.4% (column 1).

About 32.1% of the U.S. labor force is in the 18 states, with unemployment rates between 4.4% and 6.4% (column 2).

About 48.6% of the U.S. labor force is in the 16 states and D.C., with unemployment rates greater than 6.3% (column 3).

The states with the largest labor forces are CA, TX, FL, NY, PA, IL, OH, GA, NC, and MI. About 53% of the U.S. labor force resides in these 10 states.

Unemployment Rate is > 6.3%		
Rank	State	Rate
35	Colorado	6.4%
36	Delaware	6.4%
37	Massachusetts	6.5%
38	Alaska	6.7%
39	Arizona	6.7%
40	Texas	6.7%
41	Illinois	7.1%
42	Louisiana	7.3%
43	Pennsylvania	7.4%
44	District of Columbia	7.5%
45	New Jersey	7.5%
46	Nevada	8.0%
47	Connecticut	8.1%
48	New Mexico	8.2%
49	New York	8.2%
50	California	8.3%
51	Hawaii	8.5%

Source: Bureau of Labor Statistics, cber.co.

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Business Applications

United States

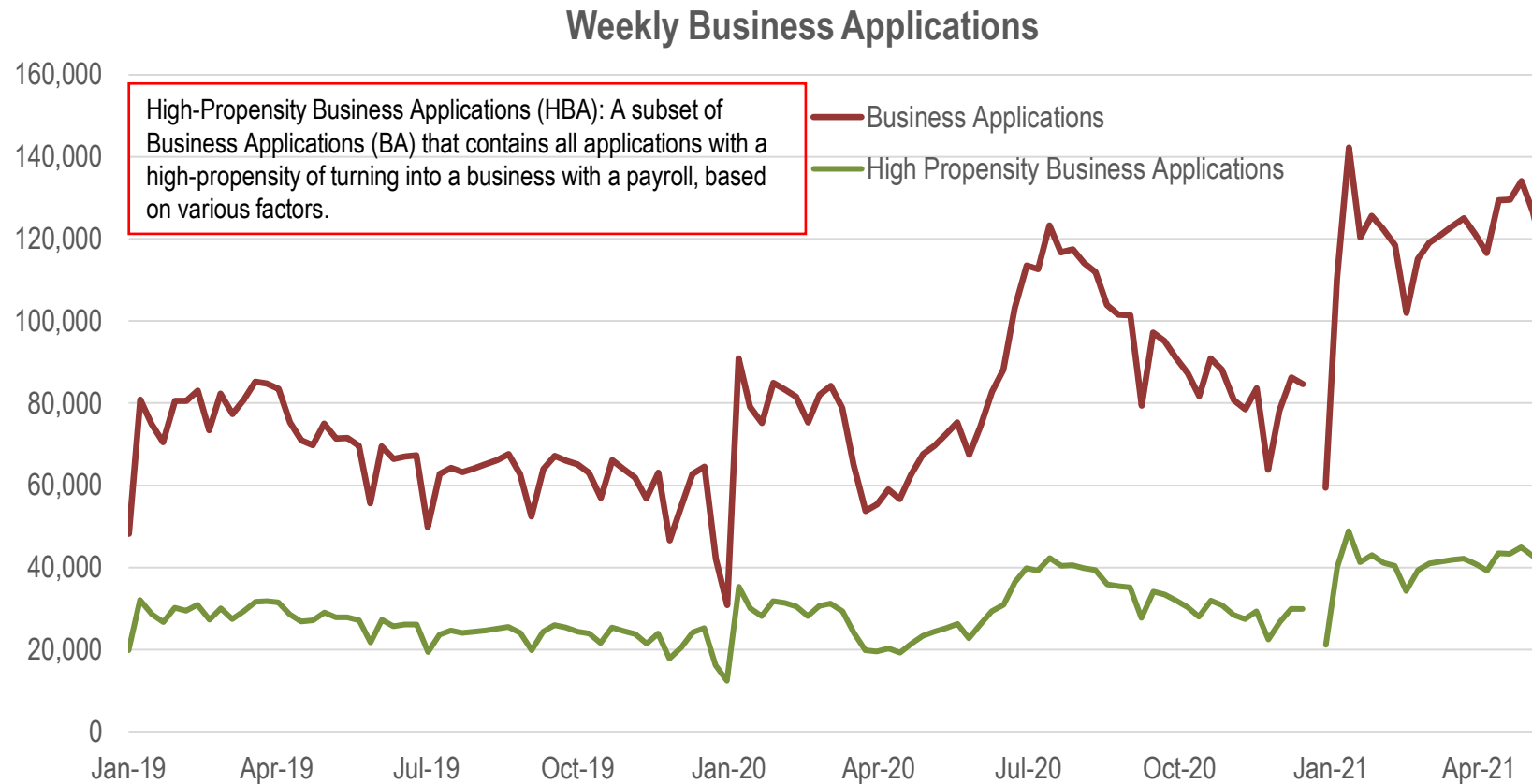
Key Points

U.S. business and high propensity applications for 2020 increased at a faster rate than in 2019.

Through the first twenty weeks of 2021, U.S. applications and high propensity applications increased at a significantly greater rate than in 2020. The rate of growth in 2021 has been better than anticipated.

U.S. Weekly Business Applications

Total and High Propensity 2019 through 2021



Business Applications

There were 4.3 million business applications (burgundy) in 2020, a 22.4% increase over 2019. The number of applications through the first 20 weeks of 2021 is 68.8% greater than the same period in 2020.

High Propensity Business Applications

There were 1.3 million high propensity applications (green) in 2020, a 14.9% increase over 2019. The number of high propensity applications through the first 20 weeks of 2021 is 56.8% greater than the same period in 2020.

Source: FRED, U.S. Census Bureau, NSA, cber.co.

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Major Indices

NAHB, Consumer Sentiment Index, NFIB Small Business Optimism Index, and Manufacturing and Services PMI Indices

Key Points

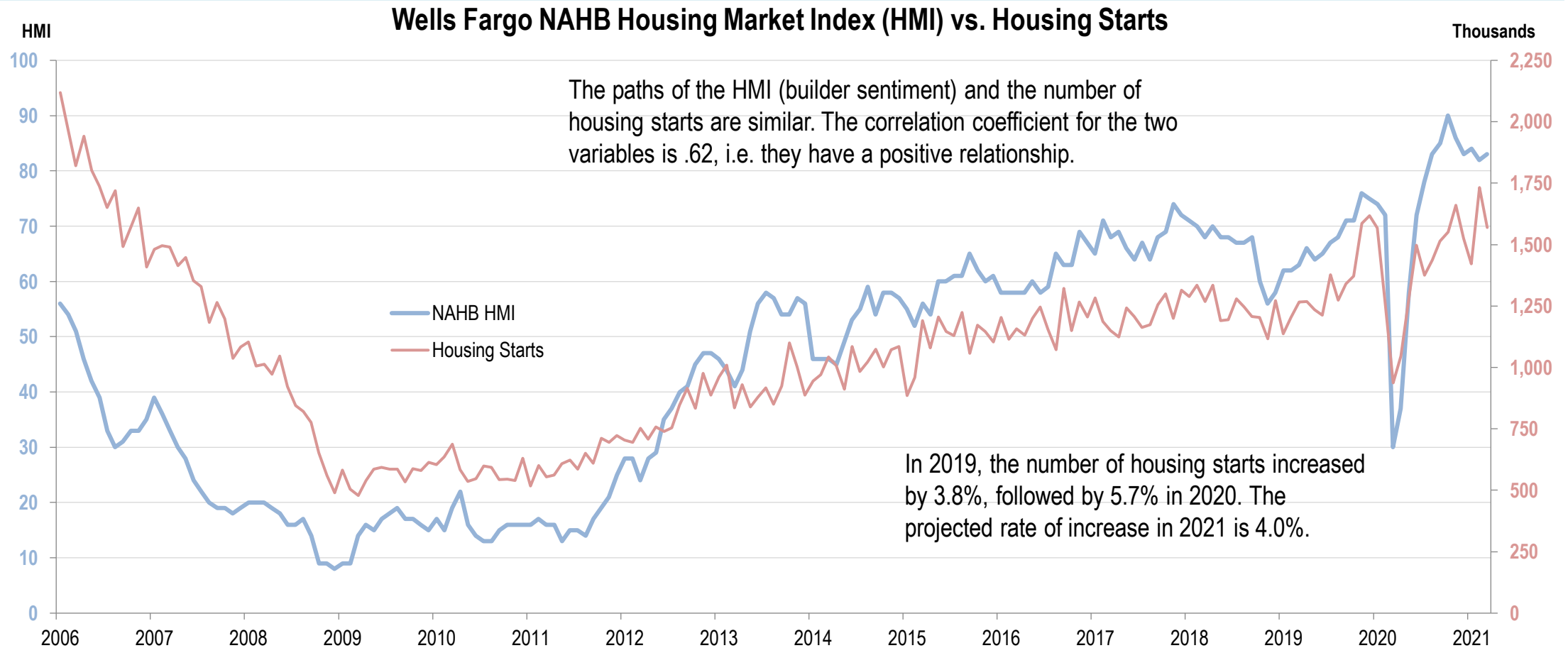
The housing market was strong in 2020. Growth will continue at a modest pace in 2021.

The Michigan Consumer Sentiment Index fell in May on fears of inflation.

The NFIB Small Business Optimism Index advanced slightly in March and April.

The indices for manufacturing and services have increased for eleven consecutive months. They are in expansionary territory.

Wells Fargo NAHB HMI vs. Housing Starts

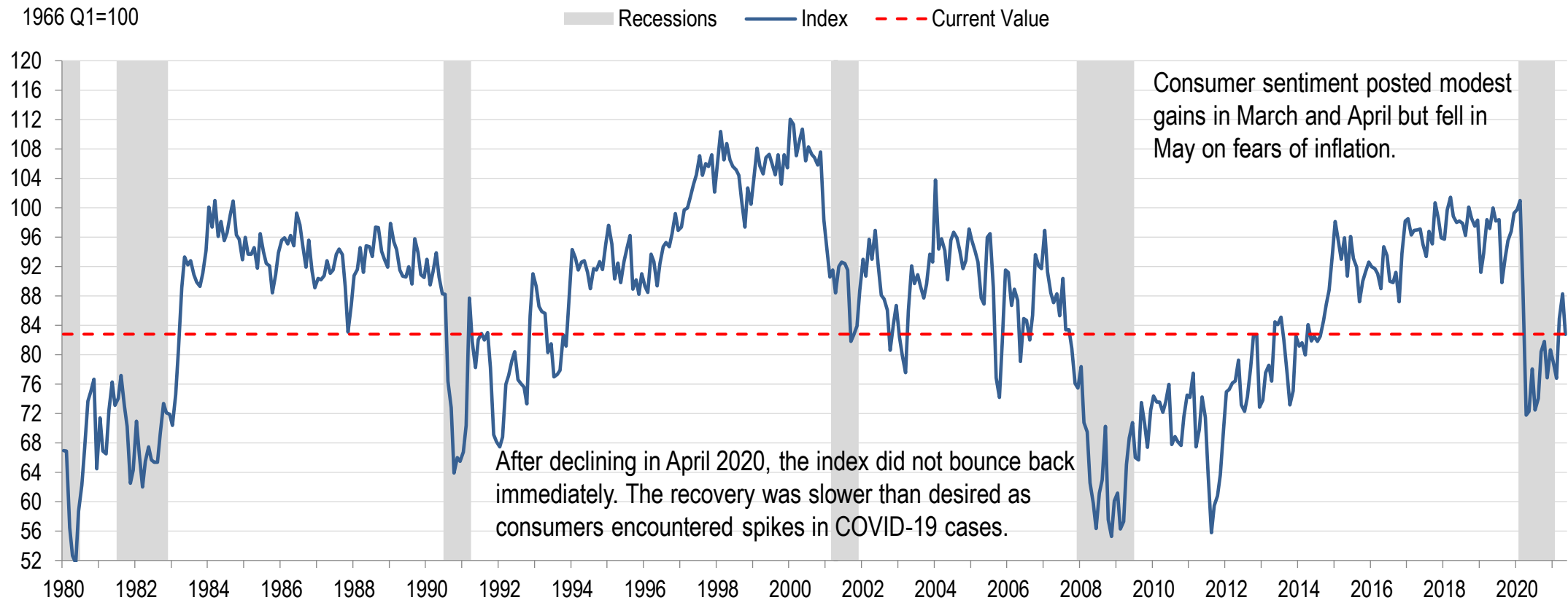


Source: NAHB, cber.co.

Consumer Sentiment Index

University of Michigan

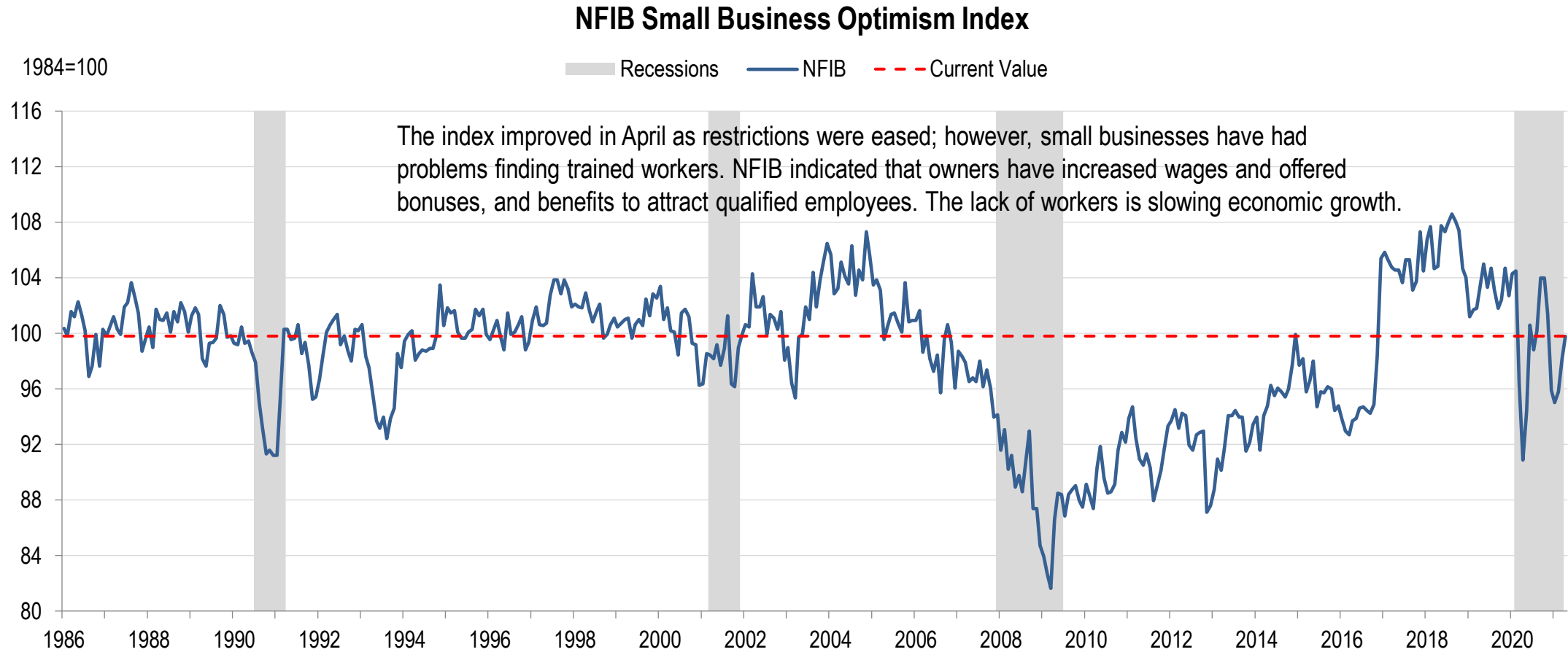
Michigan Consumer Sentiment Index



Source: University of Michigan, cber.co.

NFIB Small Business Optimism Index

United States

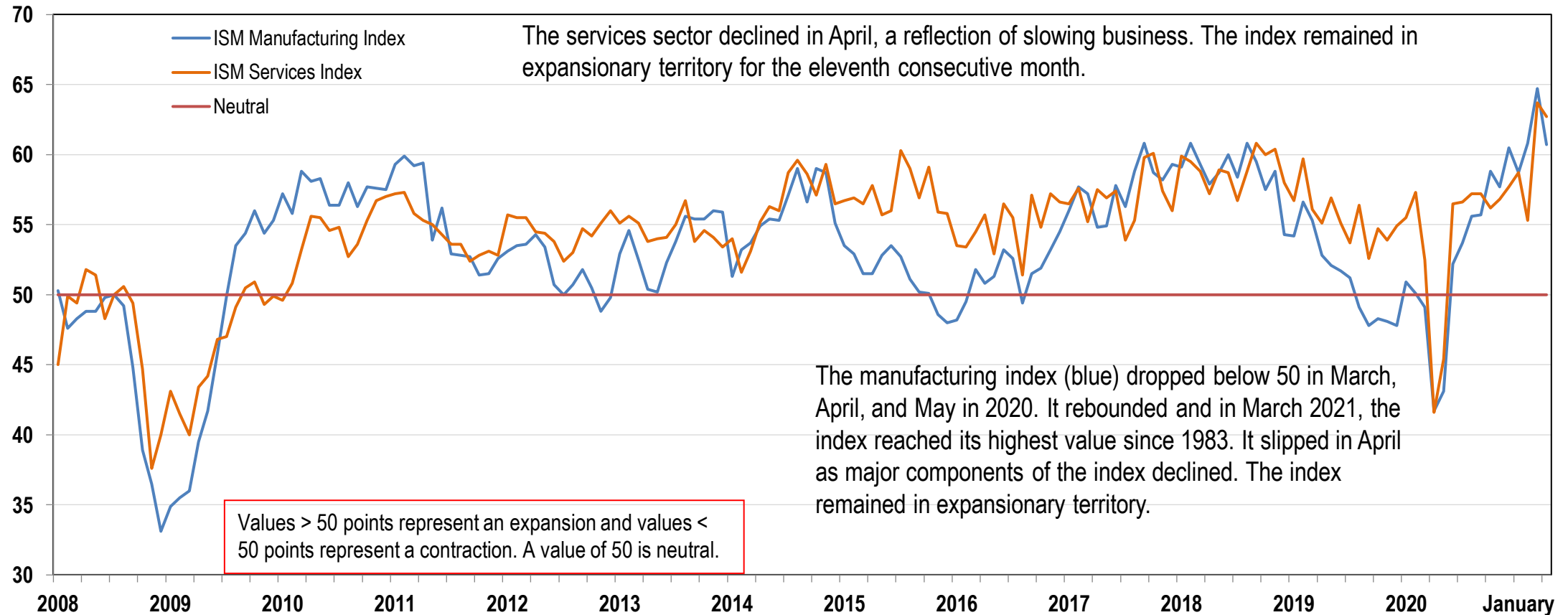


Source: NFIB, cber.co.

ISM PMI Composite Indices

Manufacturing vs. Services

ISM Manufacturing PMI vs. Services PMI Composite Indices



Source: Institute of Supply Management, cber.co

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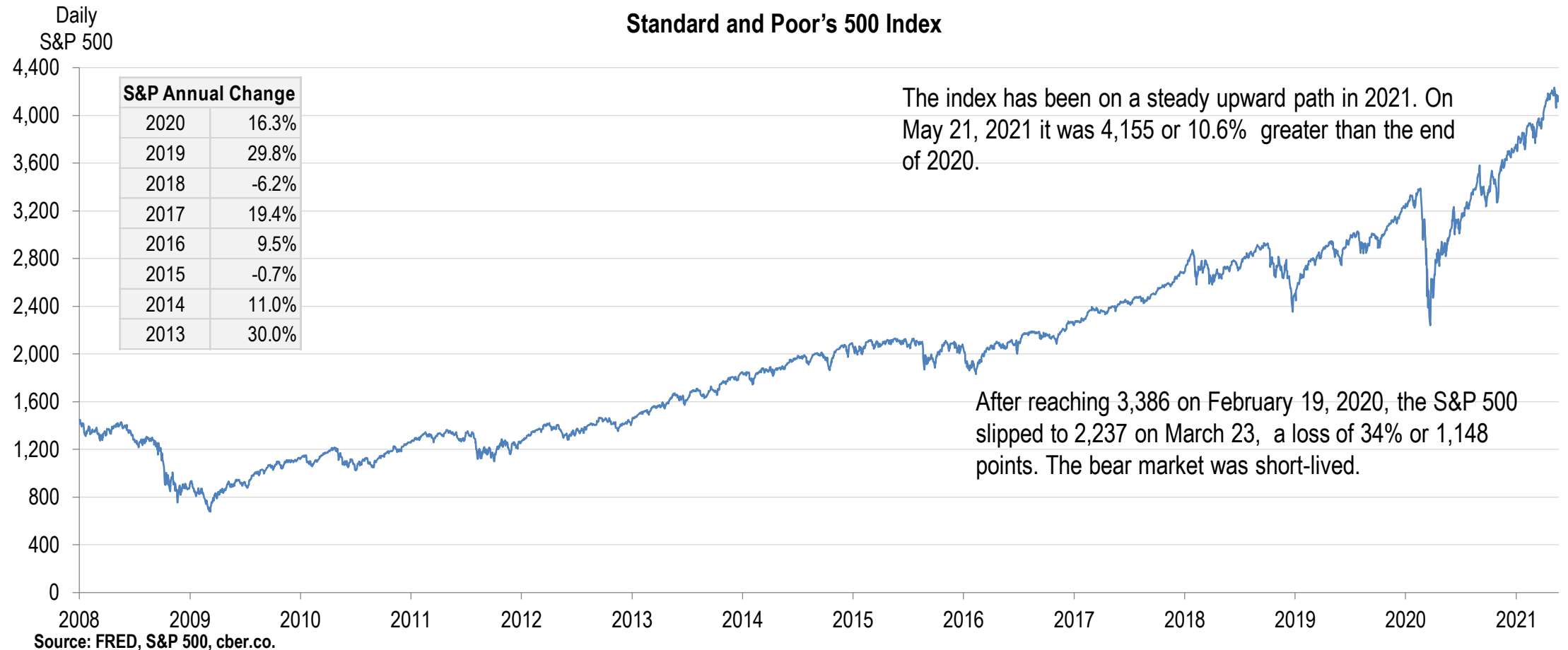
S&P 500 Index and WTI Crude Oil Prices

Key Points

The S&P Index posted double-digit gains in 2020. Strong growth has continued in 2021.

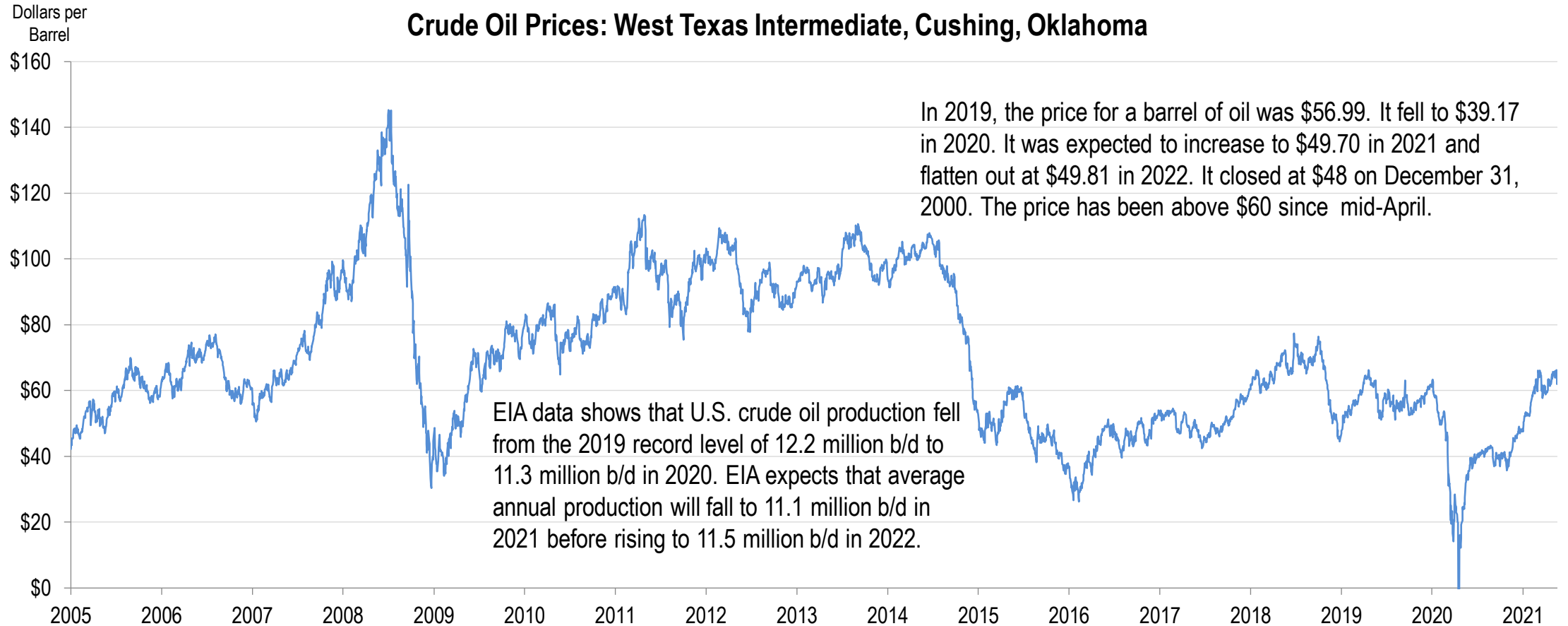
In 2020 the price for a barrel of oil declined because of lower demand. In 2021 demand increased and the price has been above \$60 per barrel since mid-April.

Standard and Poor's 500 Index



Crude Oil Prices

West Texas Intermediate



Source: FRED, EIA, cber.co.

Colorado



Colorado Employment

Change in Total Employment, MSA Employment, and Labor Force Participation Rate (LFPR)

Key Points

The April 2021 seasonally adjusted employment data for Colorado was 121,800 less than February 2020. The April 2021 value was 95.5% of February 2020.

There are only a handful of sectors that have greater employment in April 2021 compared to February 2020.

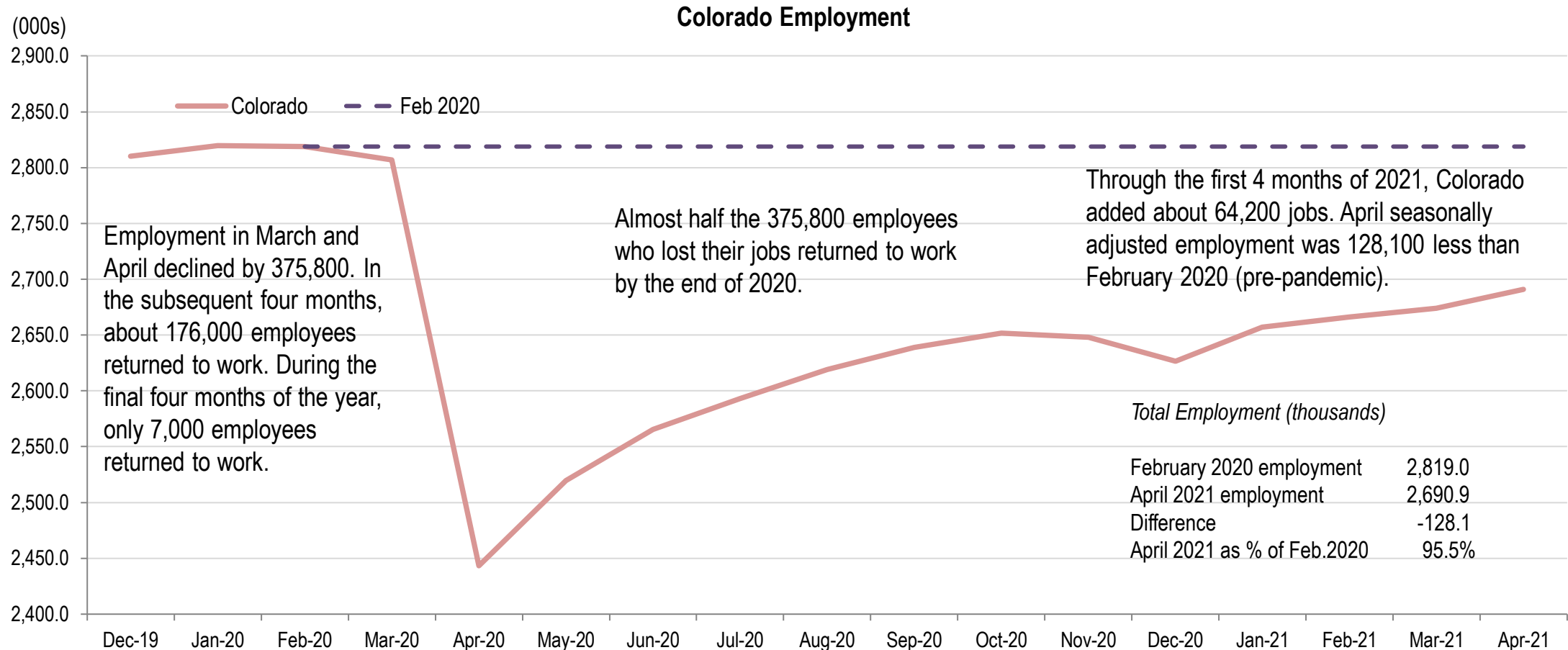
The LFPR has returned to its pre-pandemic level.

The most significant shortfalls are in leisure and hospitality and government employment.

Colorado Springs is the best performing MSA in Colorado.

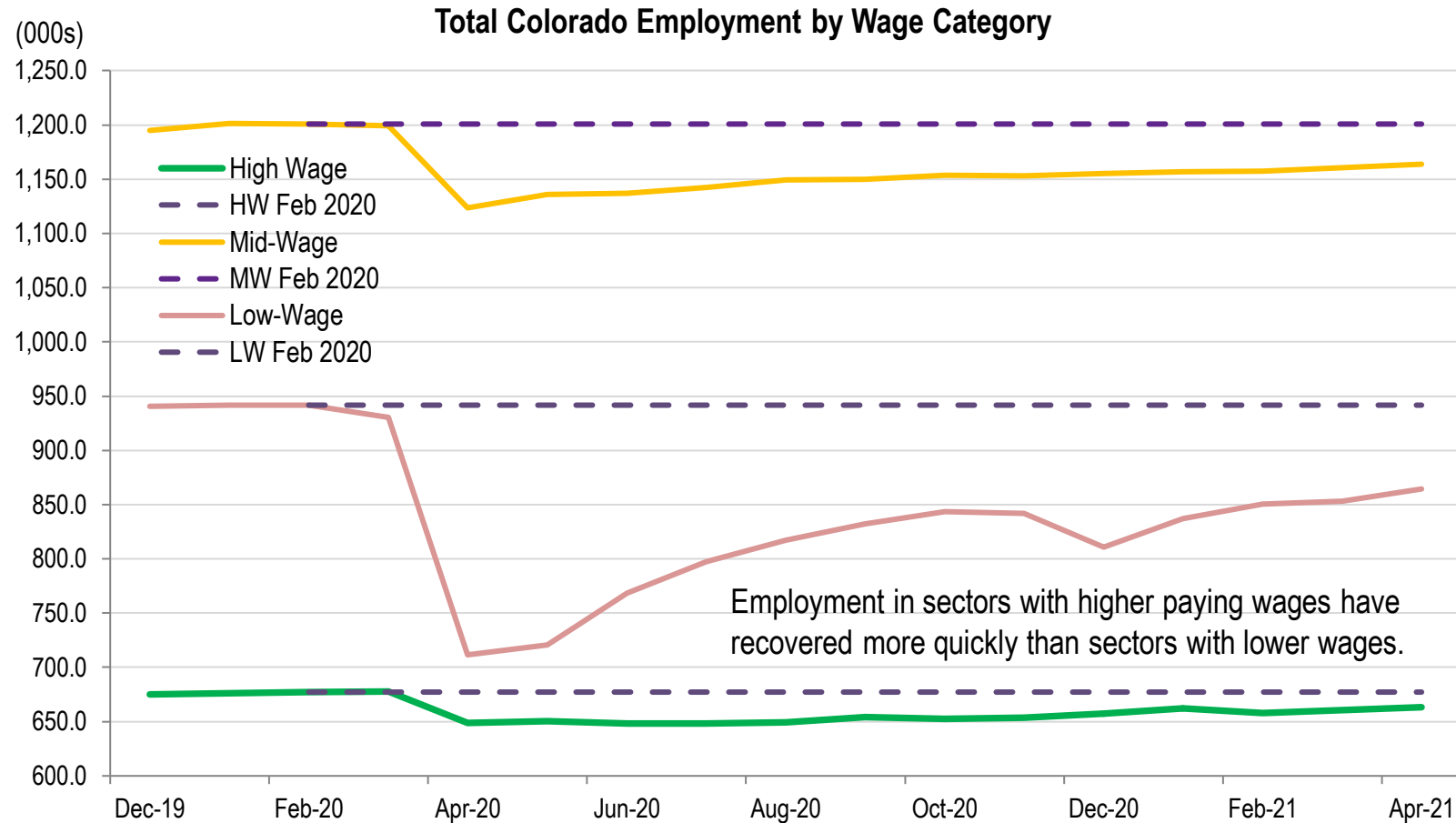
Change in Employment

Colorado



Source: Bureau of Labor Statistics, cber.co.

Total Colorado Employment by Wage Category



Mid-Wage (thousands) YELLOW 44% of Total

February 2020 employment	1,200.6
April 2021 employment	1,163.9
Difference	-36.7
April as % of February	96.9%

Low-Wage (thousands) PINK 31% of Total

February 2020 employment	941.4
April 2021 employment	864.6
Difference	-77.2
April as % of February	91.8%

High-Wage (thousands) GREEN 25% of Total

February 2020 employment	677.0
April 2021 employment	663.1
Difference	-13.9
April as % of February	97.9%

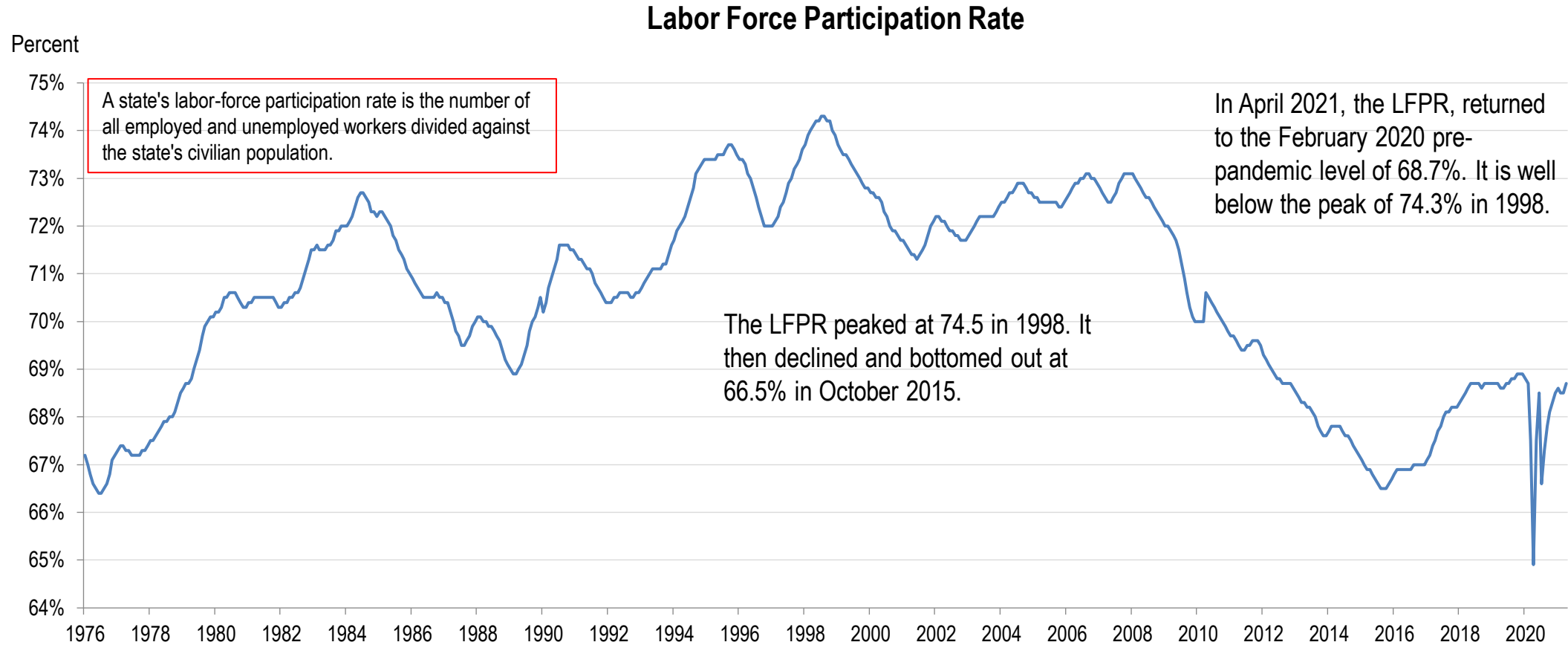
Mid-Wage -- Const, Mfg, TWU, Healthcare, Govt.
 Low-Wage -- Retail, Tourism, Admin Serv., Other, Educ.
 High-Wage -- Wholesale, Info, Fin.Act, PST, MCE, NRM.

Source: Bureau of Labor Statistics, cber.co.

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Labor Force Participation Rate

Colorado



Source: BLS, cber.co.

Summary of Employment Recovery

Colorado

Employment through April 2021 was 128,100 below the value for February 2020. Most of the shortfall is in the leisure and hospitality, and state and local government sectors.

Recovered +8,600

- Management of companies
- Transportation, warehousing, and utilities
- Federal government

MCE, or corporate headquarters will continue to add jobs as the economy re-opens.

TWU increased because of stronger warehousing employment. Transportation employment will continue to struggle.

Federal government employment is an anomaly because it includes part-time Census 2020 employees.

Short-Term Recovery -10,300

- Retail trade
- Financial activities
- Wholesale trade
- Healthcare
- Professional, scientific, and technical services

Retail trade and financial activities employment have been flat in 2021.

Wholesale trade, healthcare, and PST employment have added jobs in 2021.

The trade sectors are near their pre-pandemic employment levels.

Mid-Term Recovery -31,800

- Manufacturing
- Construction
- Administrative services
- Information
- Other services

In April, jobs were added in other services. Losses occurred in all other sectors.

Long-Term Recovery -94,600

- State government
- Local government
- Leisure and hospitality
- Extractive industries
- Educational services

All sectors added jobs in April as a result of the reopening. The largest gains were restaurant and entertainment jobs.

Change in Employment by Area

MSAs and non-MSAs

Change in Employment by MSA/Non – MSA March 2021 vs. February 2020			
Area	Employment (000s) February 2020	April 2021 vs. Feb. 2020 (000s)	April 2021/February 2020
Colorado Springs	304.6	-8.3	97.3%
Fort Collins	176.4	-7.6	95.7%
Denver	1,557.5	-67.7	95.7%
Grand Junction	65.0	-3.1	95.2%
Non-MSA	335.8	-17.2	94.9%
Pueblo	65.1	-3.5	94.6%
Boulder	201.1	-12.6	93.7%
Greeley	113.5	-8.1	92.9%
Colorado	2,819.0	-128.1	95.5%

Source: BLS, cber.co

In 2021, the pattern of MSA employment recovery is different than in 2020. The state will recover at a faster rate as the larger MSAs begin to add jobs more quickly.

The table on the left is sorted by the last column (April 2021 divided by February 2020). In recent months, Colorado Springs, Fort Collins, and Denver have recovered at a faster rate than other areas.

The counties outside the MSAs are recovering at a slower rate than the state. They have a different mix of industries than the metro areas. Many have a higher concentration of government and tourism-related businesses.

Pueblo, Boulder, and Greeley are also recovering at a slower rate than the state.

Overall, Colorado employment for April 2021 is 95.5% of the employment for February 2020.

Source: BLS, cber.co.

Business Applications and Establishments

Colorado

Key Points

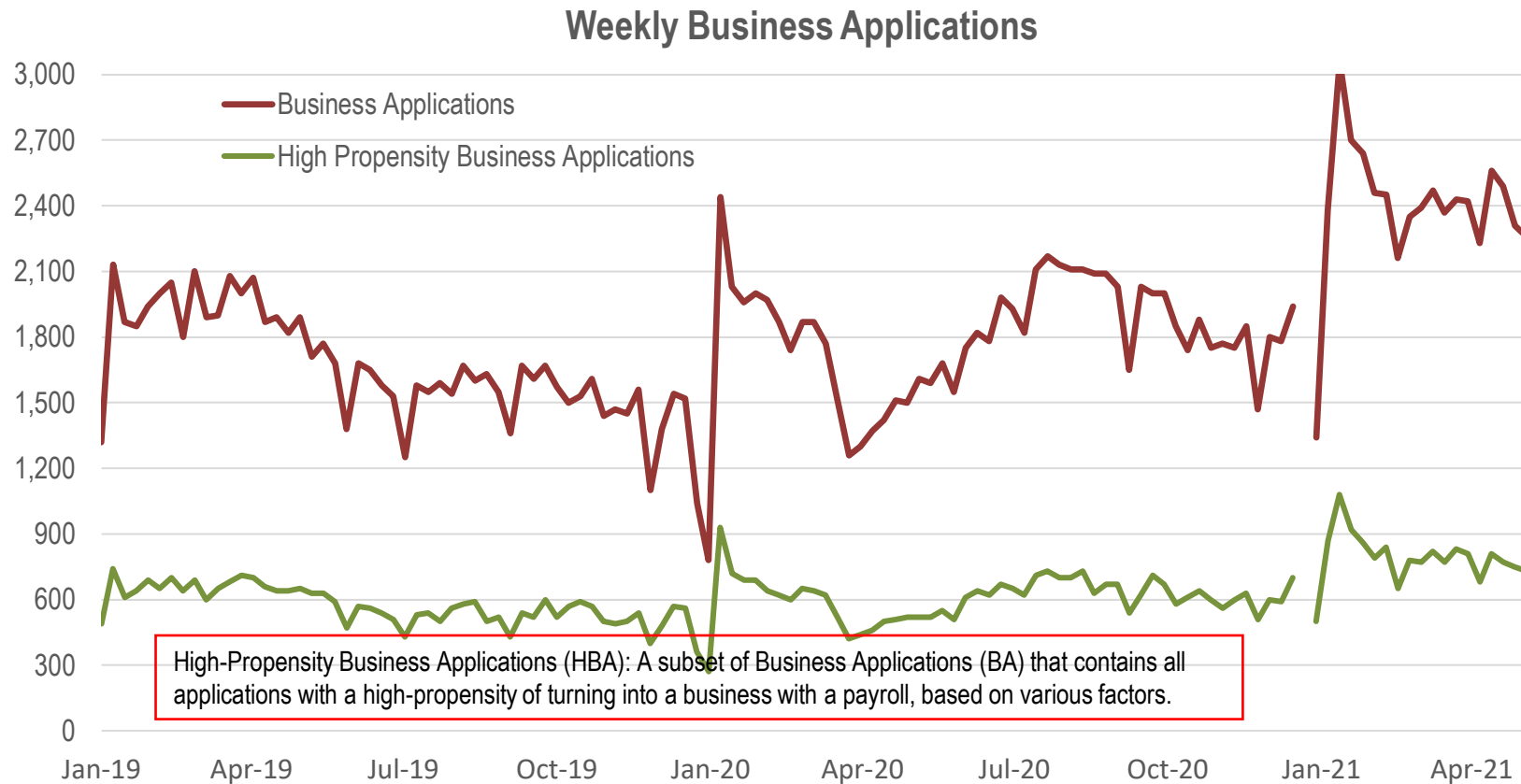
During the first 20 weeks of 2021, the number of Colorado business applications and high propensity applications increased at a faster rate than in 2020.

U.S. applications increased at a greater rate than Colorado applications in 2020 and the first 20 weeks of 2021.

The number of business establishments with 10 or more employees decreased between Q4 2019 and Q4 2020.

Colorado Weekly Business Applications

Total and High Propensity 2019 vs 2020



Business Applications

There were 91,790 business applications (burgundy) in 2020, a 6.2% increase over 2019. The number of applications through the first 20 weeks of 2021 is 43.1% greater than the same period in 2020.

High Propensity Business Applications

There were 31,050 high propensity applications (green) in 2020, a 4.3% increase over 2019. The number of applications through the first 20 weeks of 2021 is 37.1% greater than the same period in 2020.

Source: FRED, U.S. Census Bureau, NSA, cber.co.

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Change in Colorado Establishments

Q4 2019 vs. Q4 2020

Change in the Number of QCEW Reporting Units				
Employee Range	Units Q4 2019	Units Q4 2020	Absolute Change	Percent Change
0	27,552	31,983	4,431	16.1%
1-4	107,522	112,560	5,038	4.7%
5-9	28,914	29,509	595	2.1%
10-19	21,345	21,063	-282	-1.3%
20-49	15,383	14,104	-1,279	-8.3%
50-99	4,811	4,239	-572	-11.9%
100-249	2,547	2,264	-283	-11.1%
250-499	571	552	-19	-3.3%
500-999	185	167	-18	-9.7%
1000+	99	92	-7	-7.1%
	208,929	216,533	7,604	3.6%

Source Colorado LMI, cber.co.

The QCEW data produced by Colorado LMI shows there was an increase of 7,604 units between Q4 2019 and Q4 2020. A closer look indicates the total number does not tell the complete story.

There was an increase of 4,431 establishments with zero employees. These organizations may be seasonal, or they may be starting or going out of business.

There was an increase of 5,038 establishments with 1 to 4 employees. This increase may be new establishments or businesses that had a reduction in employees to this category. On a similar note, there was an increase of 595 establishments with 5 to 9 employees. In Q4 2020, there were about 400,000 employees at the 174,062 establishments with 0 to 9 employees.

There were declines in the other seven categories. The 42,481 organizations employed about 1.8 million workers. There was a net decrease of 2,460 establishments in these seven categories.

Select Industry Data

Retail Sales, Building Permits, DIA Passengers, and Oil Production

Key Points

Retail sales got off to a sluggish start in 2021, but they rebounded in March.

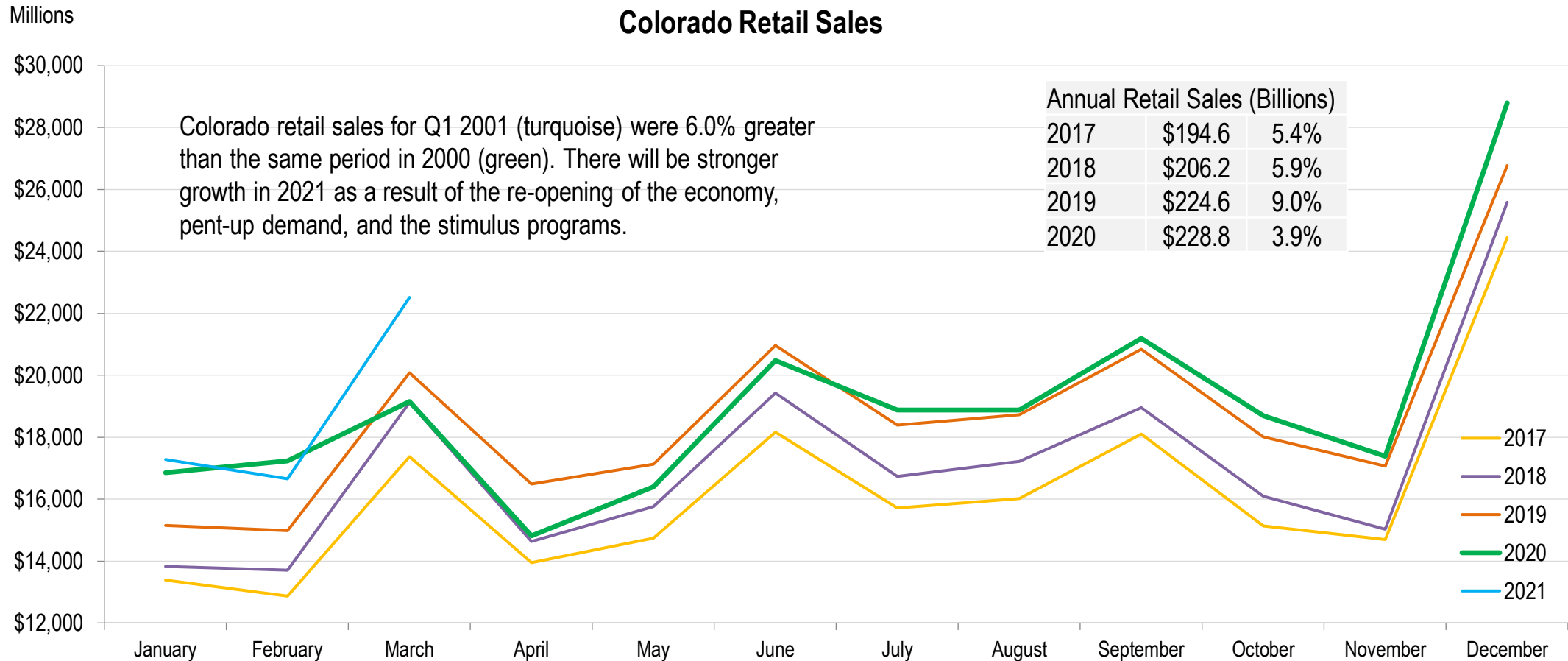
The total number of permits issued for single-family and multifamily housing in Q1 2021 is much greater than the same period in 2020.

The number of passengers at DIA continues to increase.

The production of oil in Colorado has declined because of state regulations and reduced global demand.

Colorado Retail Sales

Monthly



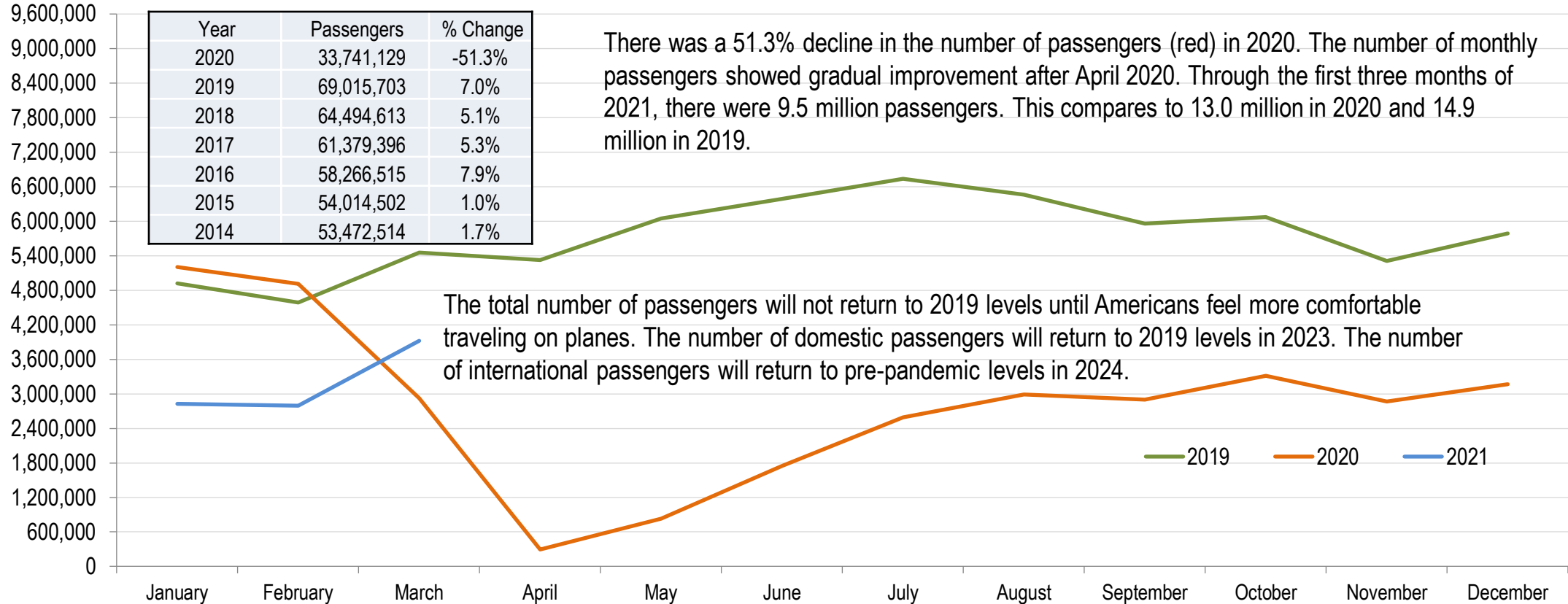
Source: Colorado Department of Revenue, <https://cdor.colorado.gov/retail-sales-reports>, cber.co. Note: Not adjusted for inflation.
 Colorado-based Business and Economic Research <https://cber.co>

Denver International Airport Passengers

Monthly

DIA Passengers

Passengers

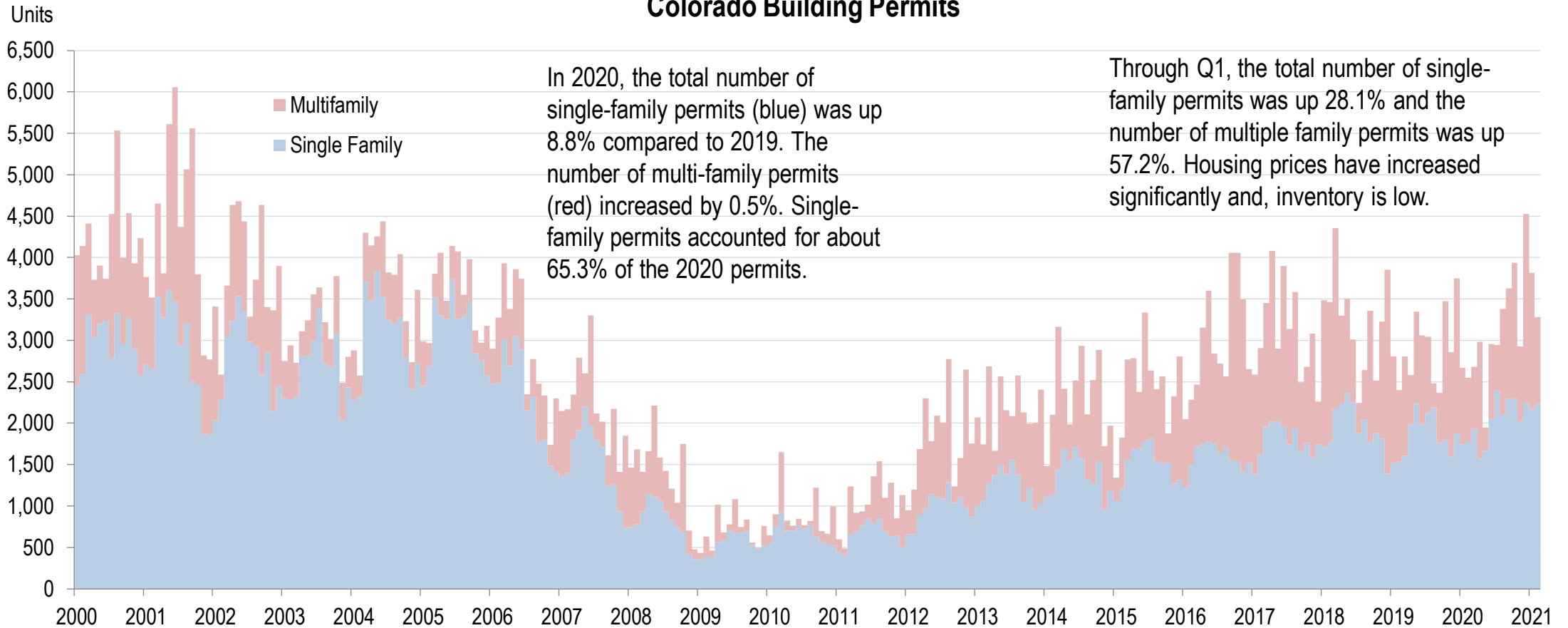


Source: flydenver.com, cber.co.

Colorado Residential Building Permits

Units

Colorado Building Permits

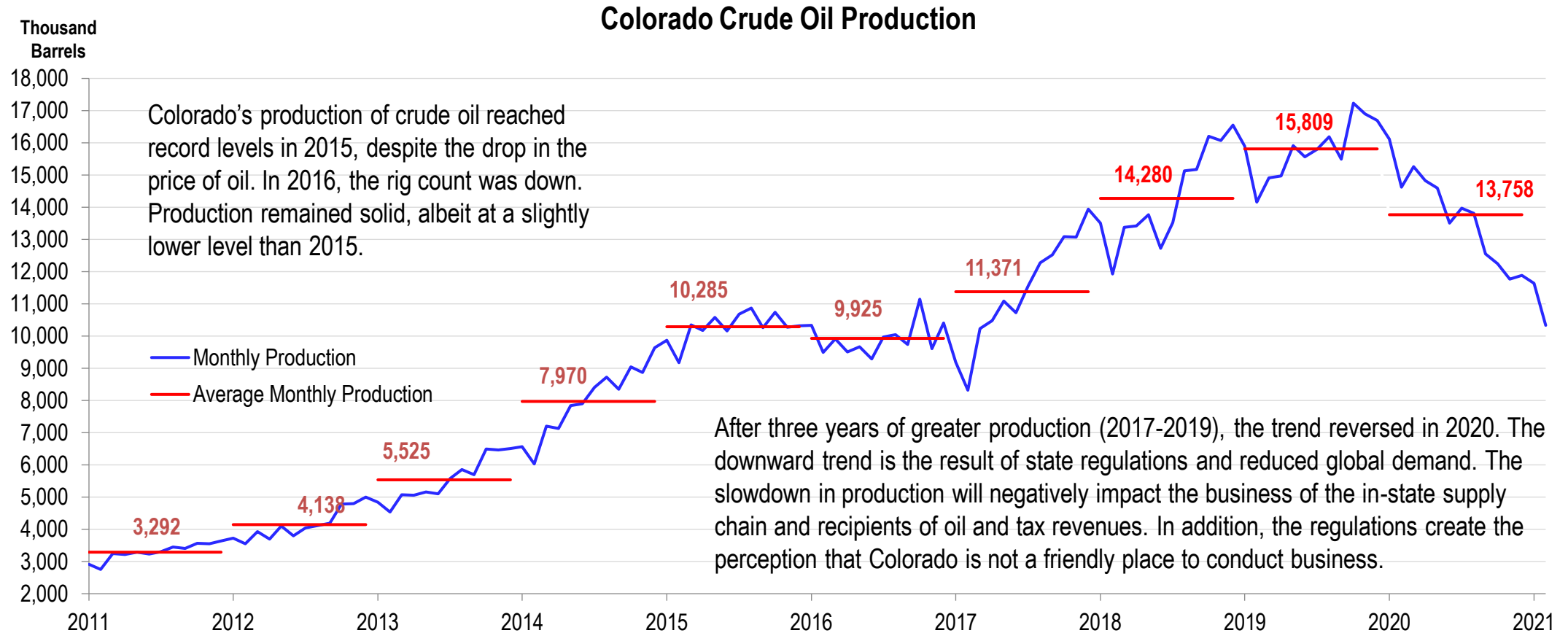


Source: TAMU Real Estate Center, U.S. Census Bureau, cber.co.

Colorado-based Business and Economic Research <https://cber.co>

Colorado Field Production of Crude Oil

2011 to 2020 (Thousand Barrels)



Source: EIA, cber.co.

Colorado-based Business and Economic Research <https://cber.co>

Summary of Colorado Forecast

Colorado's real GDP growth rate for 2021 will be similar to the U.S. rate. It will return to its pre-pandemic value in early 2021.

Employment will return to its 2019 level in 2022 or 2023.

Retail sales will rebound in 2021 as a result of pent-up demand.

In 2021 and 2022, Colorado inflation will increase. It will be greater than the U.S. rate. As a result, the Fed will raise interest rates sooner than later.

Colorado Economic Forecast				
	2019	2020	2021	2022
Real GDP Value (billions)	\$356.28	\$351.07	\$373.54	\$389.23
% Change Real GDP	3.9%	-1.5%	6.4%	4.2%
CES Employment (thousands)	2,790.1	2,644.6	2,728.6	2,794.6
Annual Change (thousands)	62.8	(145.5)	84.0	66.0
% Change	2.3%	-5.2%	3.2%	2.4%
Unemployment Rate	2.7%	7.3%	5.8%	4.9%
Retail Sales (billions)	\$224.6	\$227.0	\$243.0	\$252.0
% Change	9.0%	1.1%	7.0%	3.7%
Consumer Price Index	1.9%	2.0%	2.8%	2.4%
DIA Passengers (millions)	69.0	33.0	52.0	61.0
Single Family Permits	24,756	26,489	26,900	27,350
Multi-family Permits	13,877	13,738	13,950	14,200
Oil Production (thousands) barrels	189,707	172,000	170,000	175,000

The number of passengers through DIA in 2020 was about half of the 2019 total. Domestic flights will return to their 2019 level in 2023. International flights will return to their pre-pandemic level in 2024.

There was an increase in the number of building permits issued in 2020. There will be more permits issued in 2021 as demand for new homes remains high. Also, there is a need for affordable housing in the metro areas.

State regulations and reduced demand caused a decline in oil production in 2020. The production of oil will be flat in 2021 and 2022.

cber.co
Review of Colorado Economy Through April 2021

This analysis is for informational purposes only. Any opinions or interpretations of data are those of the presenter. As such, they do not represent the viewpoints of any group or particular organization.

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Gary Horvath has produced annual employment forecasts of the state economy for over 30 years. They have been supplemented by monthly economic updates and indices that track economic performance over the short term. In addition, he has directed three statewide analyses that included reviews of all 64 county economies.

Horvath was the principal investigator for a state and federally funded project to prepare a nanotechnology roadmap for Colorado. As well, he was a co-founder of the Colorado Photonics Industry Association, a trade group for Colorado’s Photonics cluster. Horvath has been an active board member of the group since its inception.

Horvath has also served on the Board of Directors for the Economic Development Council of Colorado, Northwest Denver Business Partnership, Adams County Economic Development, and Broomfield Economic Development Corporation. Horvath has also been the chair of the photonics/electronics committee in the Governor’s Office of Economic Development and International Trade early stage and proof of concept grant program.