



TEXAS

“Texas economic activity accelerated in September. Payrolls increased strongly and jobless claims dipped. While **job growth picked up, sentiment remained pessimistic,** according to the September Texas Business Outlook Surveys.

Texas exports expanded slightly in August. Dining out and consumer spending continued to rise in October.” – Oct 2022 – Texas Economic Indicators – Dallas Fed

“The Fed's influence on rising interest rates has resulted in an **abrupt halt in real estate activity,** particularly in the residential sector. Between the Fed's current monetary regime and negative global economic factors, **the Texas economy is expected to slow in the coming months.**” – Oct 2022 – Texas Real Estate Research Center - TAMU

AUSTIN

“Austin’s economy slowed in August, as the Austin Business-Cycle Index grew slightly, unemployment declined, and COVID-19 hospitalizations fell. **Existing-home sales were stable, while housing inventory recovered,** and employment and wage growth declined.” – Oct 2022 – Austin Economic Indicators – Dallas Fed

UNITED STATES

“Output declined in Q2. Drags on growth included inventories, consumer spending on goods, and residential investment. Exports and spending on consumer services boosted growth.

Real disposable income increased modestly in August. The level remained well below its trend growth path. Real consumer spending on goods fell. The personal saving rate stayed at a low level.

Payroll employment grew at a solid pace while the unemployment rate fell due to a drop in the labor force.

Core PCE inflation over the year moved higher in August.

The 10-year Treasury yield rose, the S&P 500 stock index retreated, and the dollar appreciated.” – Oct 2022 – U.S. Economy in a Snapshot – NY Fed

SOCIAL SECURITY BENEFITS TO INCREASE 8.7% IN 2023

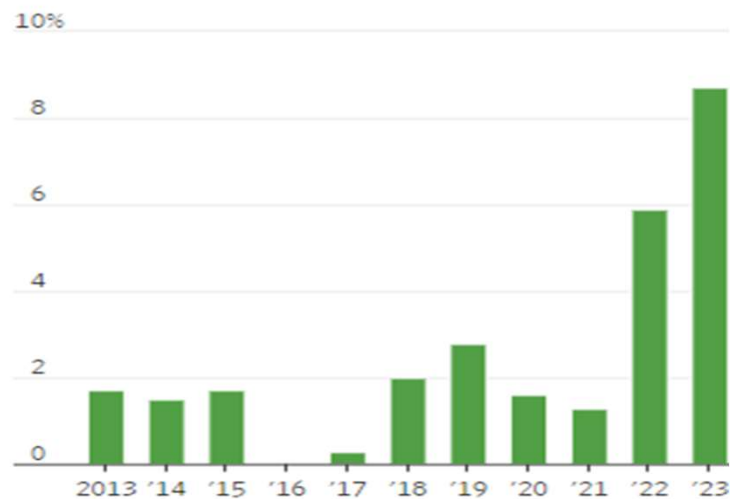
“Social Security checks will be 8.7% bigger in 2023, the largest cost-of-living adjustment to benefits in four decades, the Social Security Administration said Thursday.

The extra funds will **provide relief for many of the roughly 70 million Social Security recipients** whose budgets have been stretched thin by high inflation and whose nest eggs were walloped by plunging stock and bond markets. The **average monthly Social Security check for retired workers will rise to \$1,814** in January, up from \$1,669 this year.

For the government, this supersize cost-of-living adjustment, or COLA, means paying out more money to retirees, whose ranks are swelling as baby boomers retire. For retirees, however, the COLA will ‘be a welcome relief to people when they get it this January,’ said David Certner, legislative counsel at AARP.

Next year’s increase will be the largest since 1981, when benefits rose 11.2%, according to Social Security Administration data. The highest COLA since the program began automatic cost-of-living increases in 1975 was 14.3% in 1980.”

Social Security Automatic Cost-of-Living Adjustment (COLA)



Source: Social Security Administration

“Just over 40% of Americans age 65 and older rely on Social Security for half or more of their income, according to an AARP analysis of recent government data. About 20% of recipients in that age group depend on the benefits for 90% or more of their income, the analysis found.

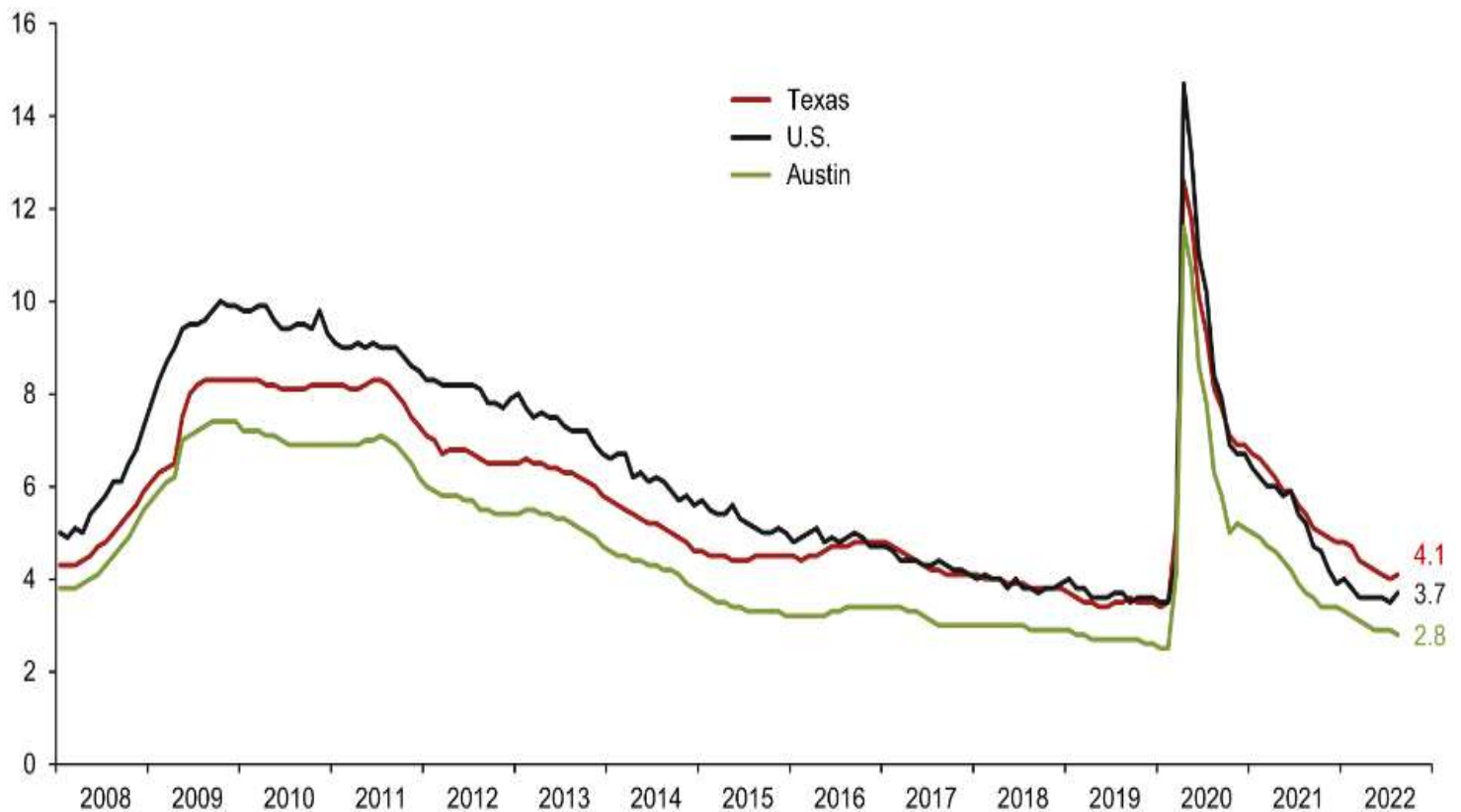
Mr. Certner said soaring inflation has been hard for many retirees to manage. **While Social Security benefits rose 5.9% this year, that hasn’t fully kept pace with inflation.** Most private-sector pensions don’t have a cost-of-living adjustment, he said, and most other sources of retirement income, such as 401(k) and individual retirement accounts, have declined this year with the markets.” – Oct 2022 – WSJ

JOBS – UNEMPLOYMENT RATES – AUSTIN MSA, TEXAS, U.S.

“Austin’s unemployment rate fell to 2.8 percent in August, which compares to the state’s figure of 4.1 percent and the nation’s 3.7 percent. The metro area labor force increased an annualized 2.0 percent in July.” – Oct 2022 – Austin Economic Indicators – Dallas Fed

Unemployment Rate

Percent, seasonally adjusted



SOURCE: Bureau of Labor Statistics.

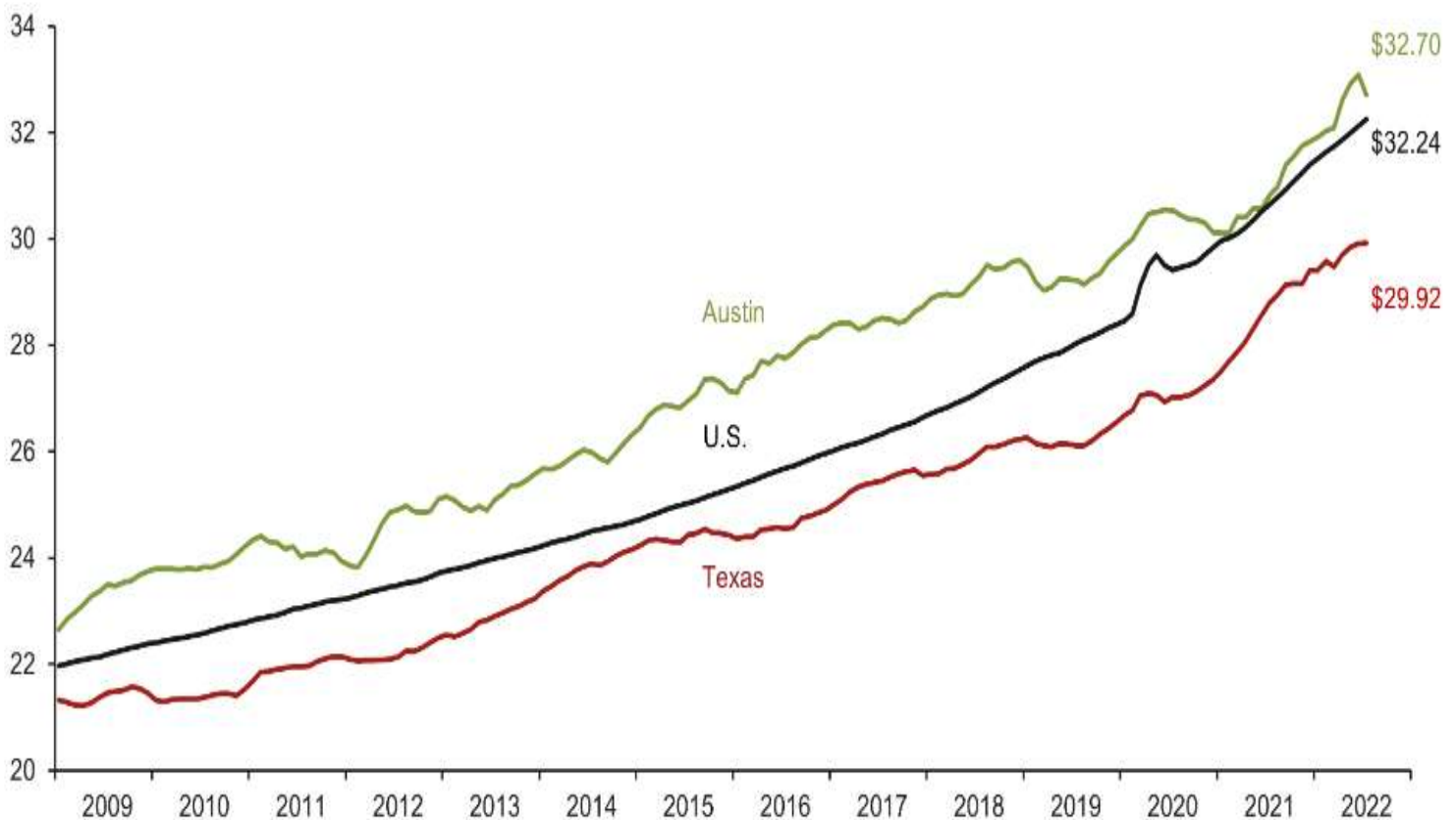
Provided by Federal Reserve of Dallas – Austin Economic Indicators – Oct 2022

JOBS – PRIVATE SECTOR AVERAGE HOURLY EARNINGS

“Austin’s three-month moving average for wages declined to \$32.70 in August, remaining higher than both the U.S. average of \$32.24 and the state average of \$29.92. Year-over-year wage growth for Austin declined to 3.5 percent, remaining above Texas’ 2.7 percent gains, but no longer outpacing the U.S. growth of 5.2 percent.” – Oct 2022 – Austin Economic Indicators – Dallas Fed

Private Sector Average Hourly Earnings

Dollars per hour*



*Seasonally adjusted, three-month centered moving average.

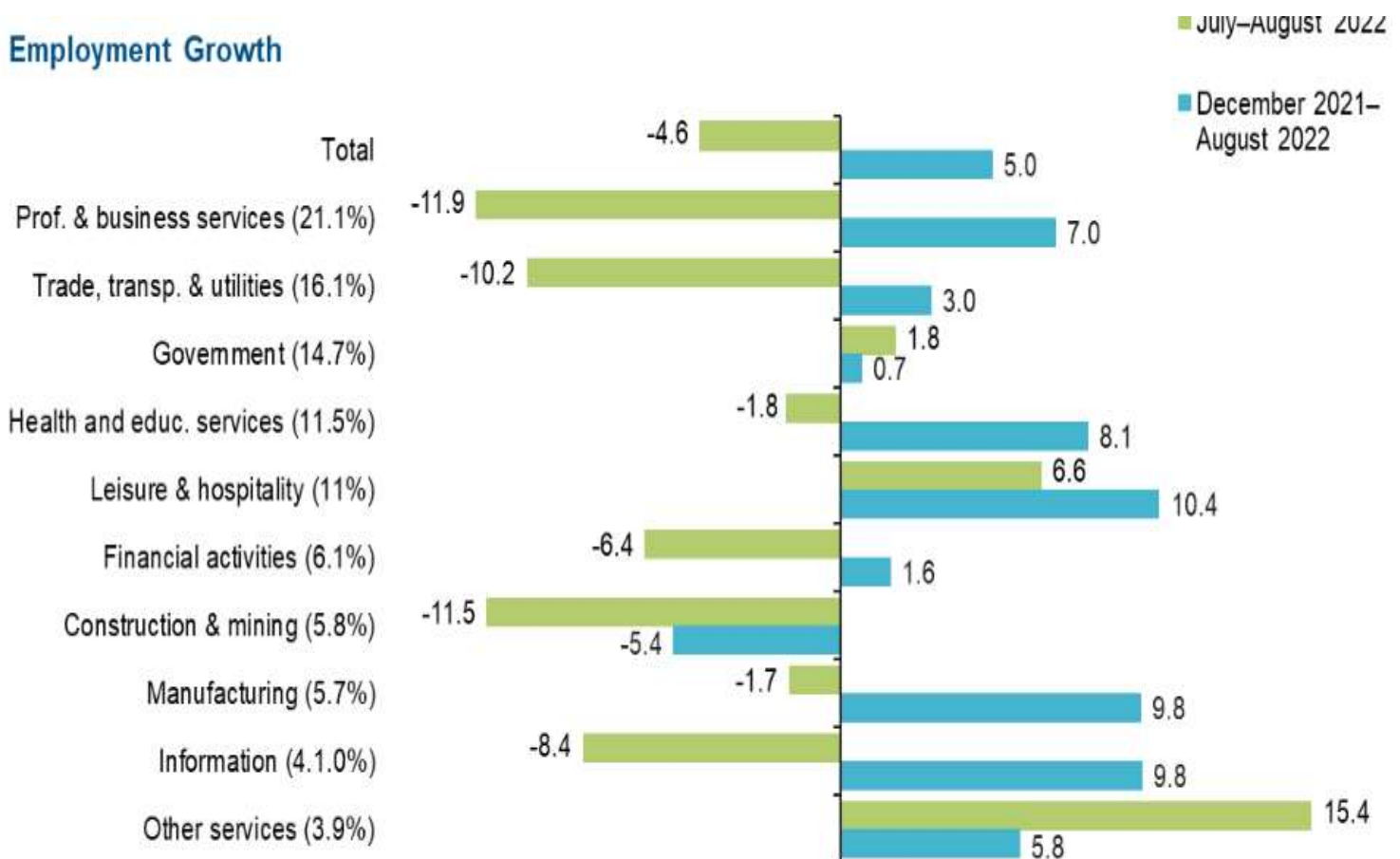
SOURCE: Bureau of Labor Statistics; Texas Workforce Commission; adjustments by the Dallas Fed.

Provided by Federal Reserve of Dallas – Austin Economic Indicators – Oct 2022

JOBS – EMPLOYMENT GROWTH – AUSTIN

“Austin employment fell an annualized 4.6 percent, or by 4,933 net jobs, in August. This was due to declines in professional and business services (11.9 percent, or 2,814 jobs), construction and mining (11.5 percent, or 749 jobs), and trade, transportation and utilities (10.2 percent, or 1,831 jobs). However, other services (15.4 percent, or 577 jobs), and leisure and hospitality (6.6 percent, or 728 jobs) saw increases. As of August, Austin payrolls have increased 6.1 percent year over year and 5.0 percent year to date.” – Oct 2022 – Austin Economic Indicators – Dallas Fed

Employment Growth



NOTE: Data show seasonally adjusted and annualized percentage employment growth by industry. Numbers in parentheses represent the share of total employment and may not sum to 100 due to rounding.

SOURCE: Bureau of Labor Statistics; Texas Workforce Commission; adjustments by the Dallas Fed.

Provided by Federal Reserve of Dallas – Austin Economic Indicators – Oct 2022

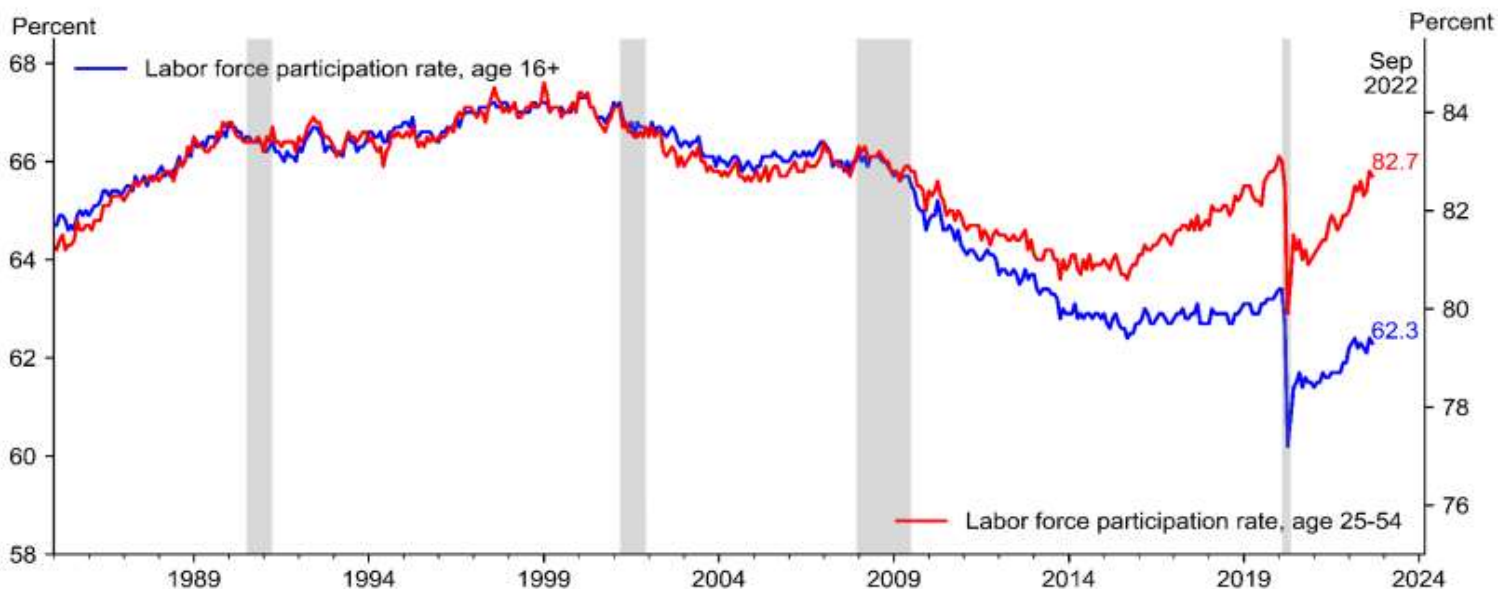
JOBS – LABOR PARTICIPATION RATE IN THE U.S.

“The labor force participation rate was little changed at 62.3 percent in September, and the employment-population ratio was unchanged at 60.1 percent. Both measures are 1.1 percentage points below their values in February 2020, prior to the coronavirus (COVID-19) pandemic.

The number of persons employed part time for economic reasons decreased by 306,000 to 3.8 million in September. These individuals, who would have preferred full-time employment, were working part time because their hours had been reduced or they were unable to find full-time jobs.

The number of persons not in the labor force who currently want a job was little changed at 5.8 million in September and remains above its February 2020 level of 5.0 million. These individuals were not counted as unemployed because they were not actively looking for work during the 4 weeks preceding the survey or were unavailable to take a job.” – Oct 2022 – News Release – Bureau of Labor Statistics

Labor Force Participation



SOURCES: Bureau of Labor Statistics.

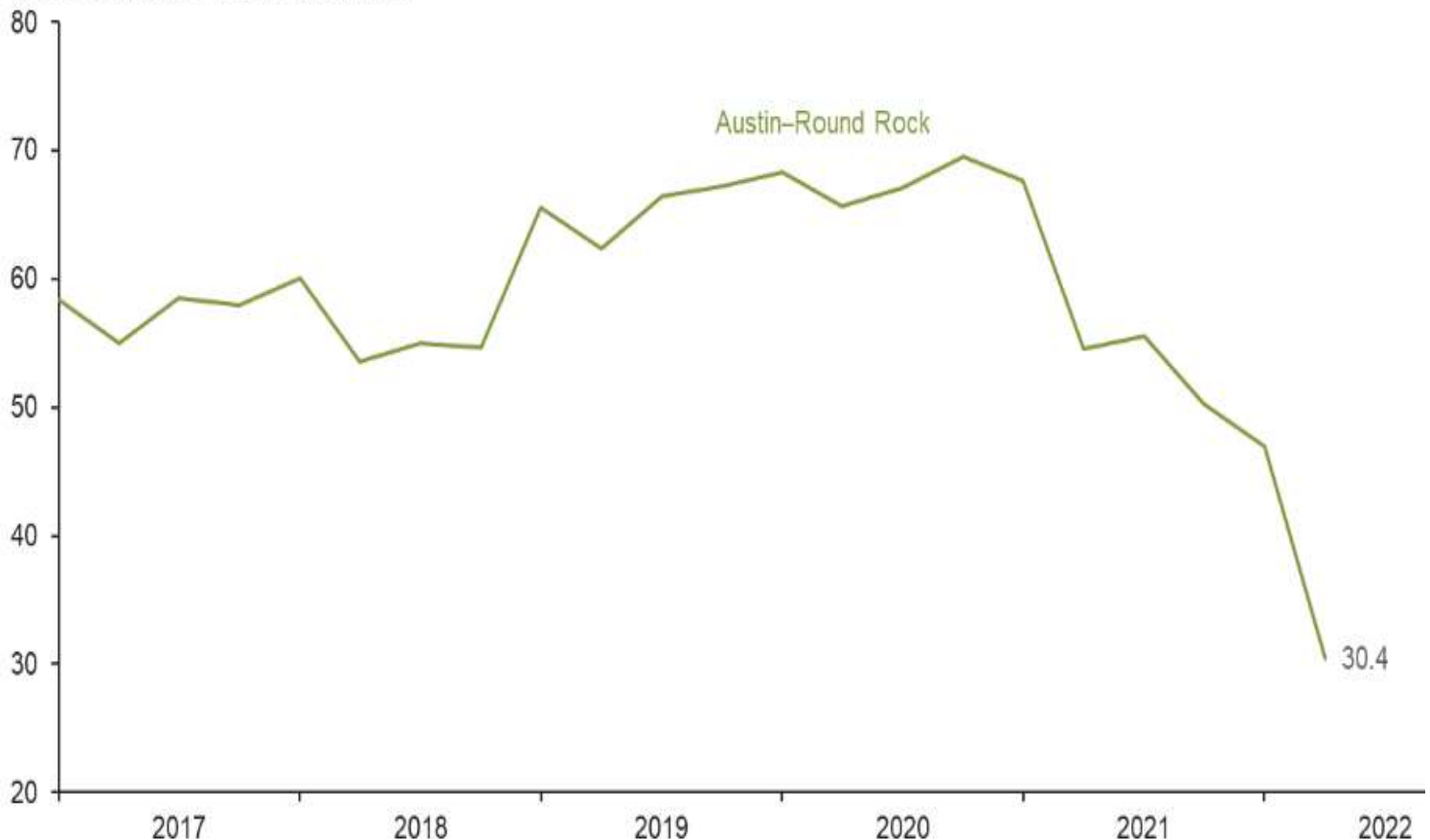
Provided by Federal Reserve of Dallas – U.S. Economy Charts – Oct 2022

HOUSING OPPORTUNITY INDEX - AUSTIN

“In July, **Austin’s Housing Opportunity Index**—which measures the percentage of homes in a given area that are affordable to a family earning the median income for the area—**further fell by 16.5 percent in second quarter 2022 to 30.4 percent**. The decrease in affordability was due to rising mortgage rates, an increase in median home prices over the past two quarters and new development primarily focusing on higher-income housing.” – Sep 2022 – Austin Economic Indicators – Dallas Fed

Housing Opportunity Index

Percent of homes that are affordable



NOTE: Data are through second quarter 2022.

SOURCE: National Association of Home Builders, Wells Fargo.

Provided by Dallas Federal Reserve – Austin Economic Indicators – Sept 2022

MORTGAGE RATES HIT 20 YEAR HIGH

“U.S. mortgage rates jumped to their highest level in more than two decades.

The average 30-year fixed mortgage rate hit 6.92% this week [October 13], according to a survey of lenders released Thursday by mortgage giant Freddie Mac. Many lenders are offering rates well over 7%. A year ago, the average rate was 3.05%.

The most recent jump, from 6.66% a week ago, took the rate above the peak of the last financial crisis. **The benchmark has climbed nearly 2 percentage points since August**, adding to an already brisk rise since the Federal Reserve began lifting rates earlier this year.

The latest climb has been particularly painful for the housing market, **putting homeownership out of reach for many would-be buyers** because of the added monthly cost of paying a mortgage at a higher rate.



PHOTO: DAVID PAUL MORRIS/BLOOMBERG NEWS; Provided by WSJ – Oct 2022

A buyer that earns the median household income and puts 20% down could **afford a home costing \$343,000 this week. That buyer could have afforded a home costing almost \$449,000 in January**, according to listings website Realtor.com, which is operated by Wall Street Journal parent company News Corp. The median existing home cost \$389,500 in August.

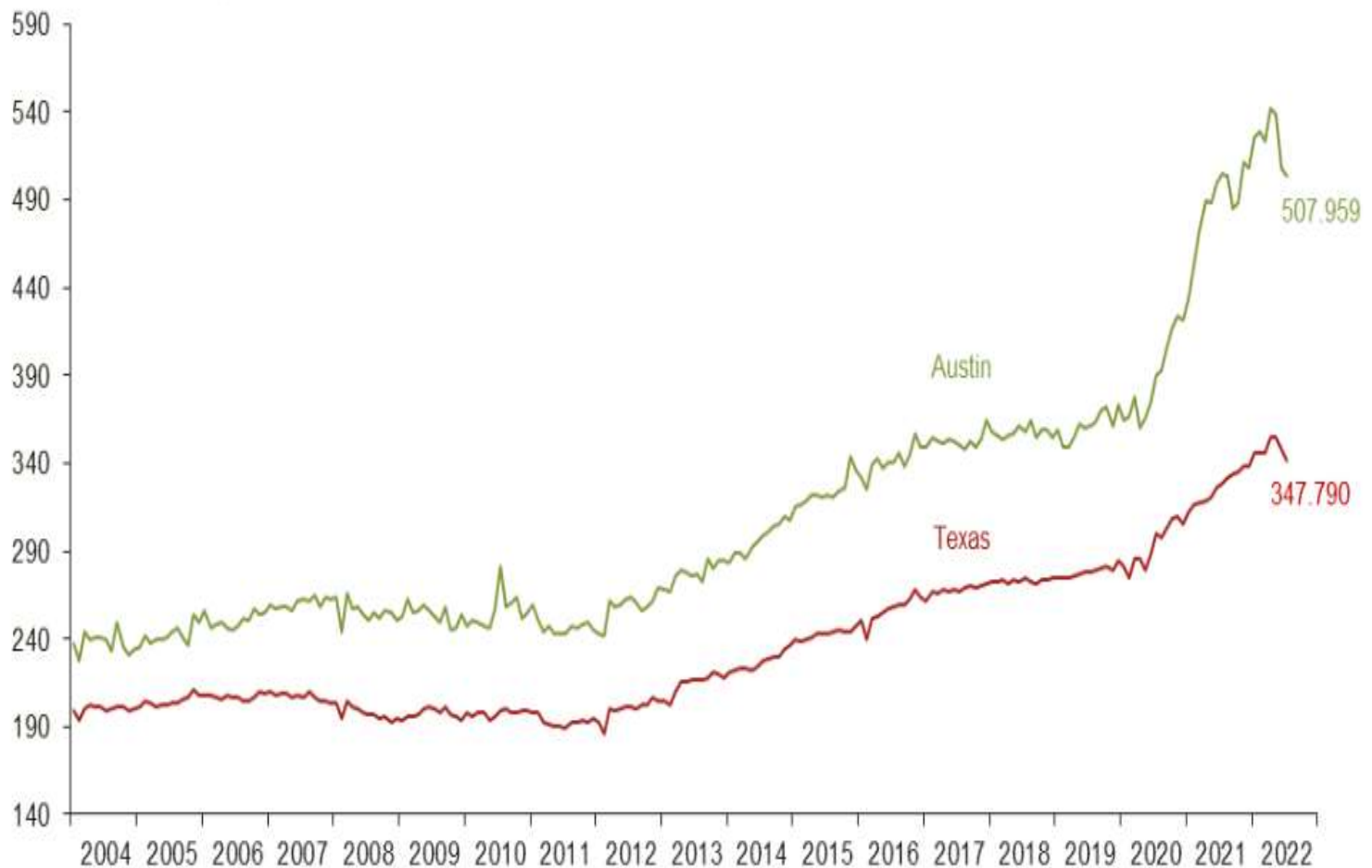
The higher rates have further cooled the housing and mortgage markets. **The volume of mortgage rate locks is down 30% over the past three months and almost 60% from last year's levels**, according to Black Knight Inc., a mortgage technology and data provider. In particular, **rate locks for people refinancing to pull cash out of their homes are down more than 26%** between August and September.” – Oct 2022 - WSJ

MEDIAN HOME PRICES – AUSTIN, TEXAS

“The median home price in Austin declined in July by 0.8 percent, reaching \$507,959. Similarly, the price in Texas ticked down 0.2 percent to \$347,790. Over the past year, Austin has experienced a slight decline of 0.2 percent in the median home price, while Texas experienced a 4.1 percent increase.” – Sep 2022 – Austin Economic Indicators – Dallas Fed

Median Home Prices

Thousands of dollars, real



SOURCE: Multiple Listing Service.

Provided by Dallas Federal Reserve – Austin Economic Indicators – Sept 2022

HOME PRICES ARE DROPPING – AUSTIN

“The inconceivable is happening. After two-plus years of unimaginable and seemingly inexorable growth, **home prices are falling** from their heady peaks over the summer.

The reason: **Higher mortgage interest rates have thinned out the ranks of buyers who can still qualify for a home loan** and sharply reduced the price of the homes the remaining few in the market can afford. Gone are most of the frenzied bidding wars and six-figure offers over the asking prices. Homes are now sitting on the market longer, inventory is piling up, and sellers—at least in some markets—are cutting prices.” – Oct 2022 – Realtor.com

“1. Austin, TX

Median home list price in September:
\$558,275

Change since June: -10.3%

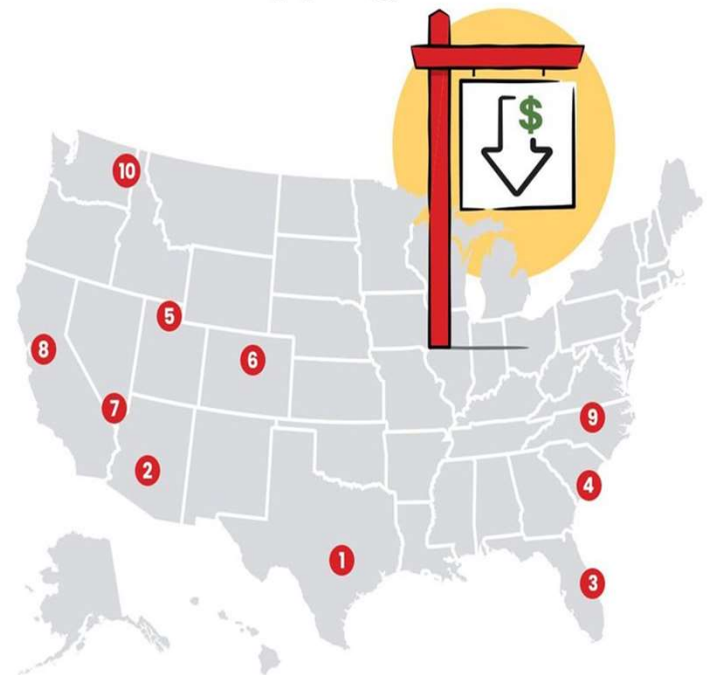
Change since September 2021: +2.2%

Austin became the poster child for torrid housing market growth during the pandemic. Prices, sales, and incoming residents all skyrocketed.”

“**Prices dropped more than 10% in just the past three months**, almost wiping out the gains seen over the past year. **Austin is still up 2.2% year over year**, but that’s the lowest remaining gain on the list.”

“The percentage of sellers in the metro area who slashed their list prices was up 252% in September compared with the previous year.” – Oct 2022 – Realtor.com

Where Home Prices Are Dropping the Most

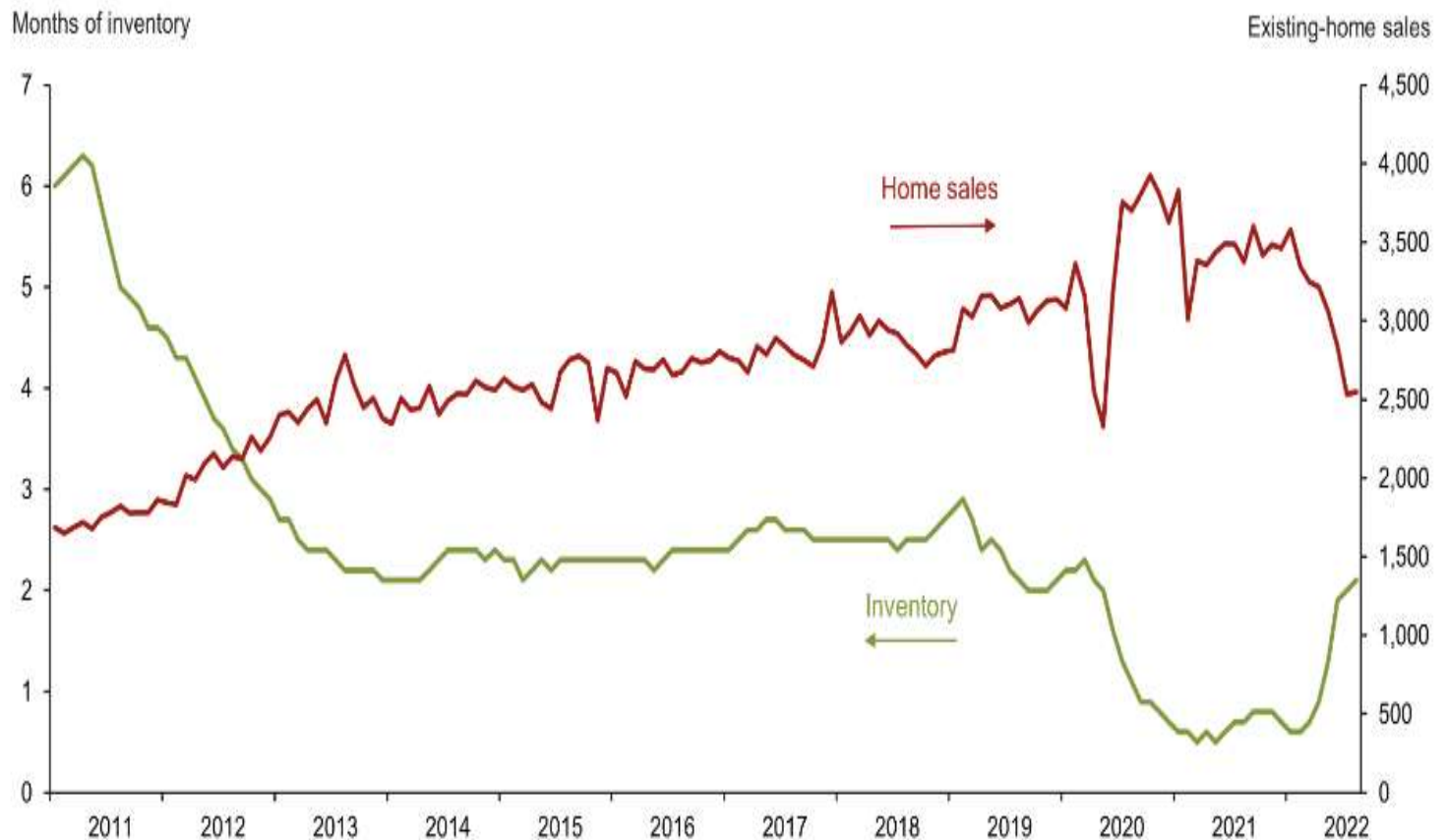


- | | | |
|------------------|-----------------|----------------|
| 1 Austin, TX | 5 Ogden, UT | 9 Durham, NC |
| 2 Phoenix, AZ | 6 Denver, CO | 10 Spokane, WA |
| 3 Palm Bay, FL | 7 Las Vegas, NV | |
| 4 Charleston, SC | 8 Stockton, CA | |

HOUSING – EXISTING HOME SALES AND INVENTORY – AUSTIN

“Austin home sales in August remained similar to July’s levels as inventory recovered from historic lows in 2021. Existing-home sales reached 2,547, while inventory increased to 2.1 months. **In the past year, as the housing market cooled from 2021 due to rising mortgage rates, existing-home sales declined by 24.5 percent.** Austin’s existing-home inventory has tripled since last August but still remains low.” – Oct 2022 – Texas Economic Indicators – Dallas Fed

Existing-Home Sales and Inventory



*Seasonally adjusted.

NOTE: Data measure sales of residential units (single-family homes, condominiums and townhomes).

SOURCE: Multiple Listing Service; Real Estate Center at Texas A&M University; adjustments by the Dallas Fed.

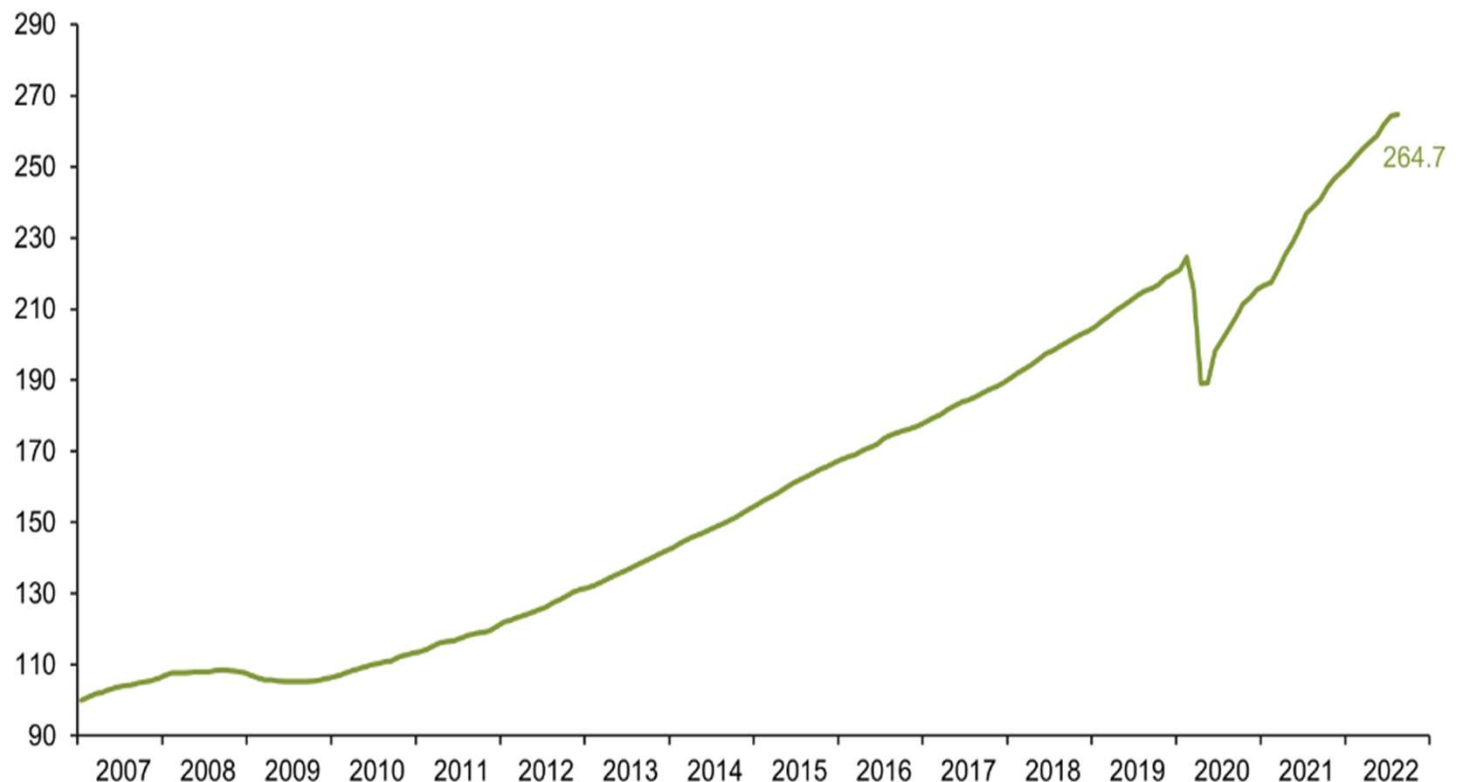
Provided by Texas Economic Indicators – Dallas Federal Reserve – Texas Economic Indicators – Oct 2022

BUSINESS CYCLE INDEX – AUSTIN MSA

“The Austin Business-Cycle Index – a broad measure of economic activity – grew at an annualized 2.1 percent in August, slowing from 11.7 percent growth in July.” – Oct 2022
– Austin Economic Indicators – Dallas Fed

Austin Business-Cycle Index

Index, January 2007 = 100



SOURCE: Dallas Fed.

Provided by Federal Reserve of Dallas – Austin Economic Indicators – Oct 2022

Business Cycle Indexes are meant to reflect broad movements in local economic conditions. The Dallas Fed states that “the [local area] indexes are constructed based on the aggregated movements in the local area unemployment rate, nonagricultural employment, inflation-adjusted wages, and inflation-adjusted retail sales. The weights of the components are statistically optimized for each metropolitan area in order to best capture the underlying cyclical movements in the local area economy.”

TEXAS BUSINESS OUTLOOK SURVEYS

“Perceptions of broader business conditions remained negative in September’s Texas Business Outlook Surveys. The general business activity indexes for the manufacturing and retail sectors were negative for the fifth consecutive month. The manufacturing business activity index dipped 4.3 points to -17.2, while the retail index fell 1.9 points to -20.5. The service sector business activity index was negative for the fourth consecutive month and held steady at -5.4.” – Oct 2022 – Texas Economic Indicators – Dallas Fed

Texas Business Outlook Surveys' General Business Activity Indexes



*Seasonally adjusted.

SOURCE: Dallas Fed's Texas Manufacturing Outlook Survey, Texas Service Sector Outlook Survey and Texas Retail Outlook Survey.

Provided by Federal Reserve of Dallas – Texas Economic Indicators – Oct 2022

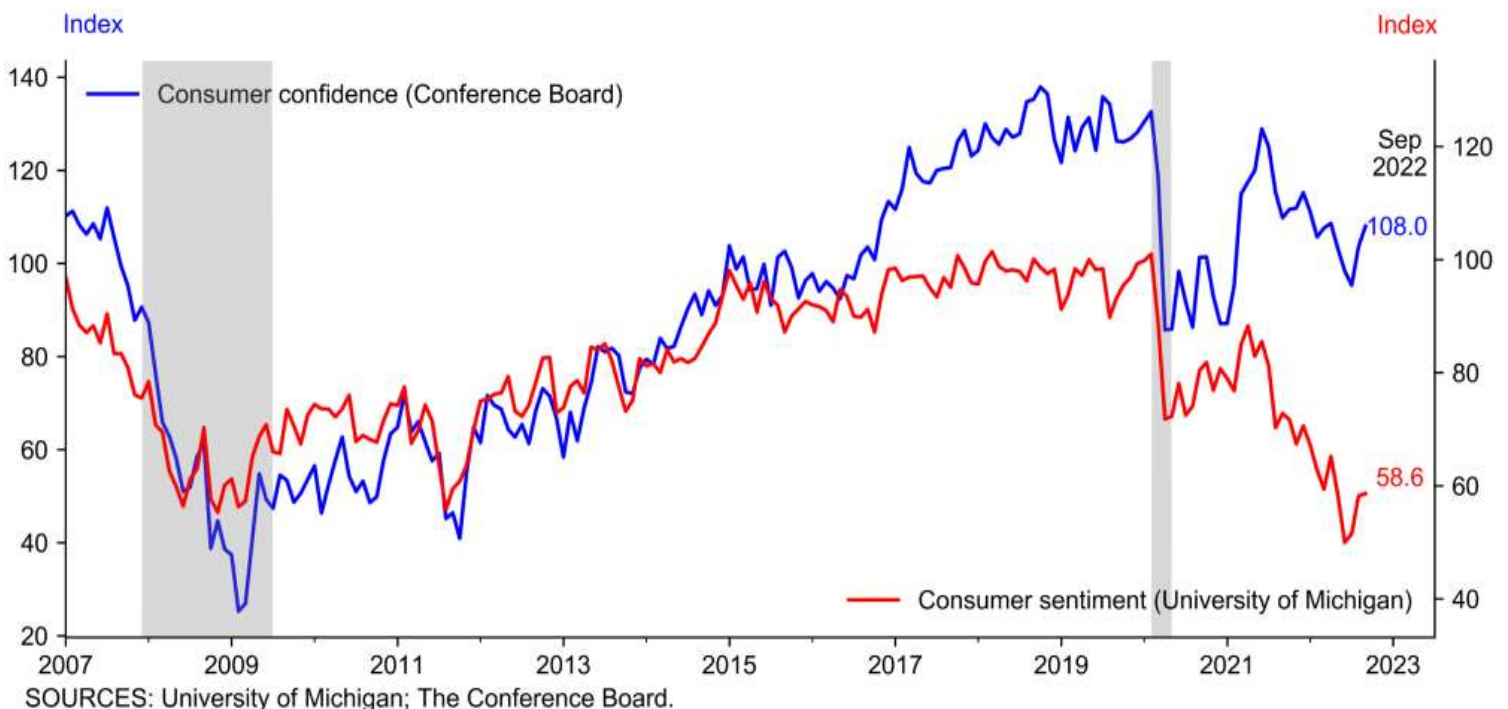
CONSUMER CONFIDENCE AND SENTIMENT – U.S.

“Consumer confidence improved in September for the second consecutive month supported in particular by jobs, wages, and declining gas prices,” said Lynn Franco, Senior Director of Economic Indicators at The Conference Board.” “Looking ahead, the improvement in confidence may bode well for consumer spending in the final months of 2022, but **inflation and interest-rate hikes remain strong headwinds to growth in the short term.**” – Sep 2022 – The Confidence Board

“Consumer sentiment confirmed the preliminary reading earlier this month and **was essentially unchanged from the month prior**, at less than one index point above August. Buying conditions for durables and the one-year economic outlook continued lifting from the extremely low readings earlier in the summer, but these gains were largely offset by modest declines in the long run outlook for business conditions.”

“The median expected year-ahead inflation rate declined to 4.7%, the lowest reading since last September. At 2.7%, median long run inflation expectations fell below the 2.9-3.1% range for the first time since July 2021.” – Sep 2022 – Michigan News

Consumer Confidence

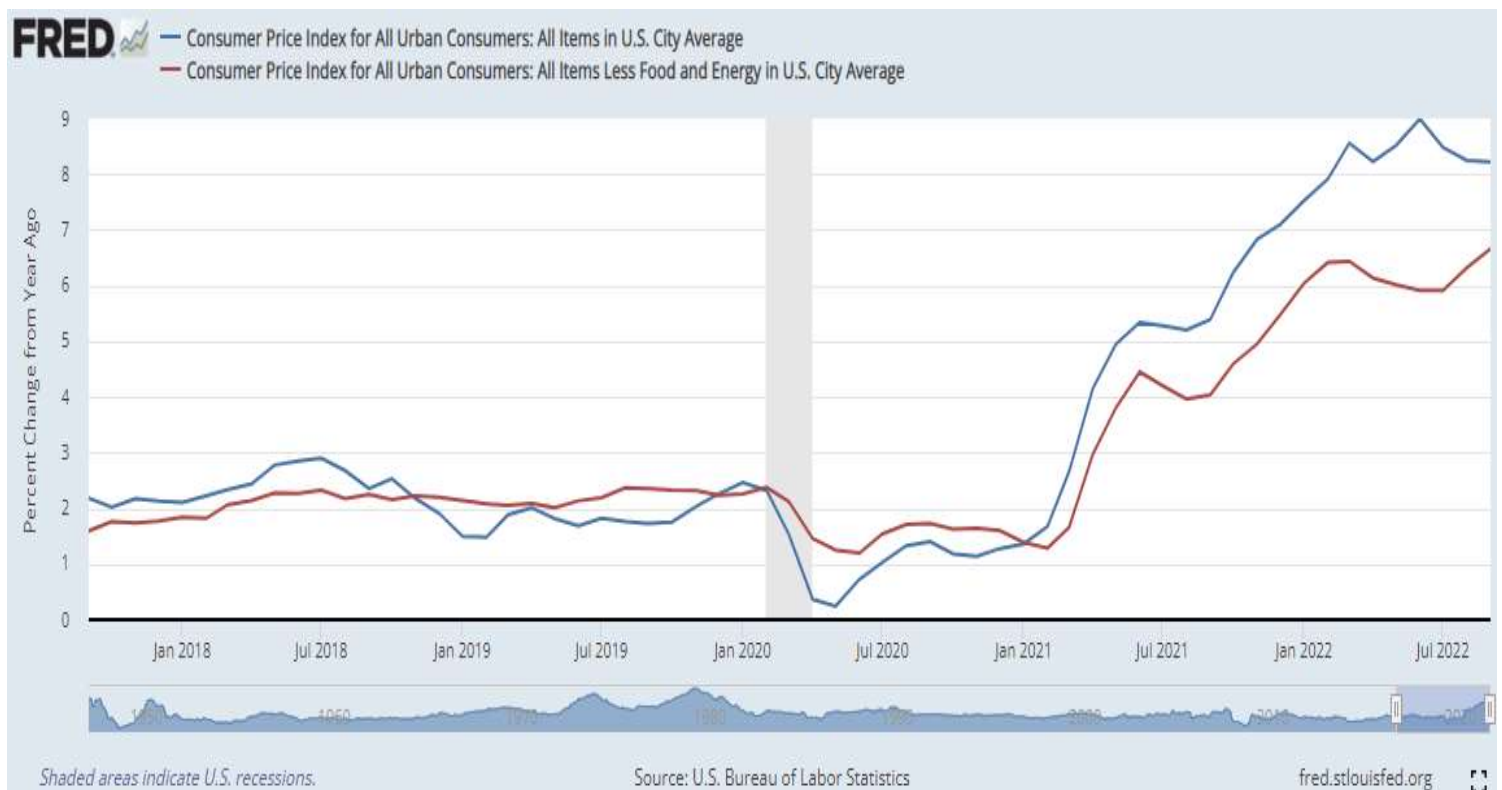


Provided by Federal Reserve of Dallas – U.S. Economy Charts– Sep 2022

CONSUMER PRICE INDEX

“The **all items index increased 8.2 percent** for the 12 months ending September, a slightly smaller figure than the 8.3-percent increase for the period ending August. **The all items less food and energy index rose 6.6 percent** over the last 12 months. The **energy index increased 19.8 percent** for the 12 months ending September, a smaller increase than the 23.8-percent increase for the period ending August. The **food index increased 11.2 percent** over the last year.” – Oct 2022 – Economic News Release – Bureau of Labor Statistics

Consumer Price Index - 12 Month Percentage Change



Source: Bureau of Labor Statistics, not seasonally adjusted, 1982-84=100 Provided by the St. Louis Fed

According to the Bureau of Labor Statistics (BLS), “There are a variety of CPI numbers generated each month. In the graph above, two numbers are compared. The first is the **Official CPI Number** that is reported to the media. It is the broadest and most comprehensive CPI and is called the **All Items CPI for All Urban Consumers**. The second one is called the **All items less food and energy**.” The BLS mentions that “Some users of CPI data use this index because food and energy prices are relatively volatile, and these users want to focus on what they perceive to be the ‘core’ or ‘underlying’ rate of inflation.”

OIL AND NATURAL GAS

“Oil prices have fallen and are well below the average year-end price forecast reported in the second-quarter Dallas Fed Energy Survey. **As of the week ending Sept. 9, the price of West Texas Intermediate crude was \$85.29 per barrel**, a decrease of \$5.50 from the previous week. **Natural gas (Henry Hub) dipped 86 cents to \$8.31 per million British thermal units**. The number of active rigs in Texas dropped from 362 to 359 over the same period and remained below prepandemic levels.” – Sep 2022 – Texas Economic Indicators – Dallas Fed



NOTE: Data are through the week ending Sept. 9, 2022. The West Texas Intermediate (WTI) oil price is dollars per barrel; the natural gas price is dollars per million British thermal units, multiplied by 10.

SOURCE: Baker Hughes; Energy Information Administration; Wall Street Journal.

Provided by Federal Reserve of Dallas – Texas Economic Indicators – Sep 2022

TEXAS EXPORTS

“Texas exports edged up 0.7 percent in August, and the three-month moving average rose 1.0 percent. On a smoothed basis, exports to Texas’ largest trading partners were mixed. **Exports to China surged 17.6 percent in August.** Exports to Mexico (2.0 percent), Canada (1.7 percent) and Latin America (0.4 percent) showed more modest growth. Exports to Europe declined 2.5 percent, and exports to the rest of Asia were little changed. **Through August, Texas exports were 18.0 percent above the same period last year.**” – Oct 2022 – Texas Economic Indicators – Dallas Fed

Texas Exports by Region

Index, 2015 = 100*



*Three-month moving average, real dollars; seasonally adjusted.

NOTE: Numbers in parentheses refer to the share of August 2022 Texas exports and do not sum to 100 due to rounding.

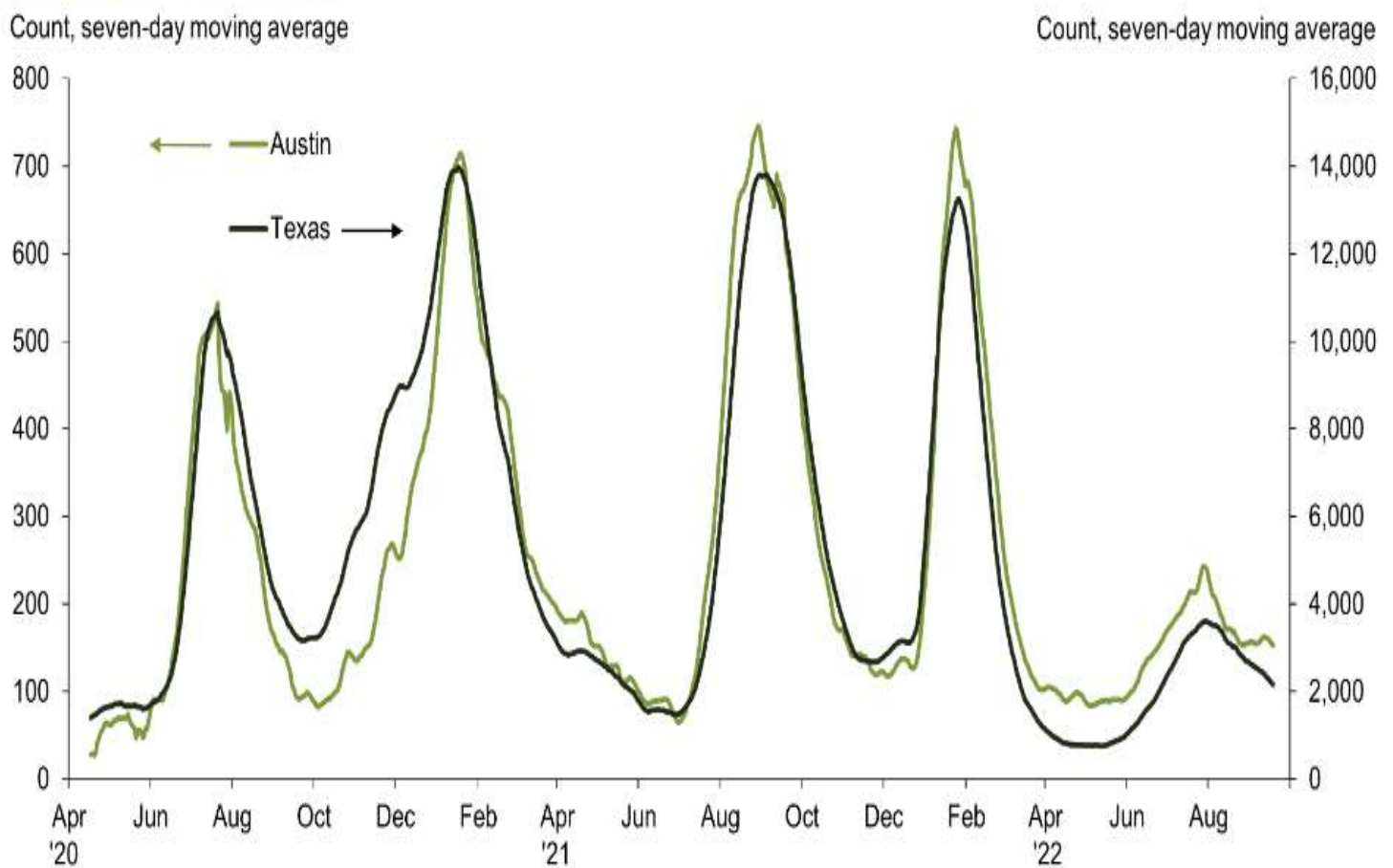
SOURCE: Census Bureau; Bureau of Labor Statistics.

Provided by Federal Reserve of Dallas – Texas Economic Indicators – Oct 2022

COVID-19 HOSPITALIZATIONS – AUSTIN

“In August, the number of people hospitalized with COVID-19 both in Austin and Texas dropped. In the past two weeks, Austin’s hospitalization rate declined 5.2 percent, while Texas saw a decrease of 27.0 percent. As of Sept. 18, 140 people in Austin and 2,074 people in the state were hospitalized with COVID-19.” – Oct 2022 – Austin Economic Indicators – Dallas Fed

COVID-19 Hospitalizations



NOTE: Data for Austin refer to the area covered by the Austin Trauma Service Area. Data are daily, seven-day moving averages through Sept. 18, 2022.
SOURCE: Texas Department of State Health Services.

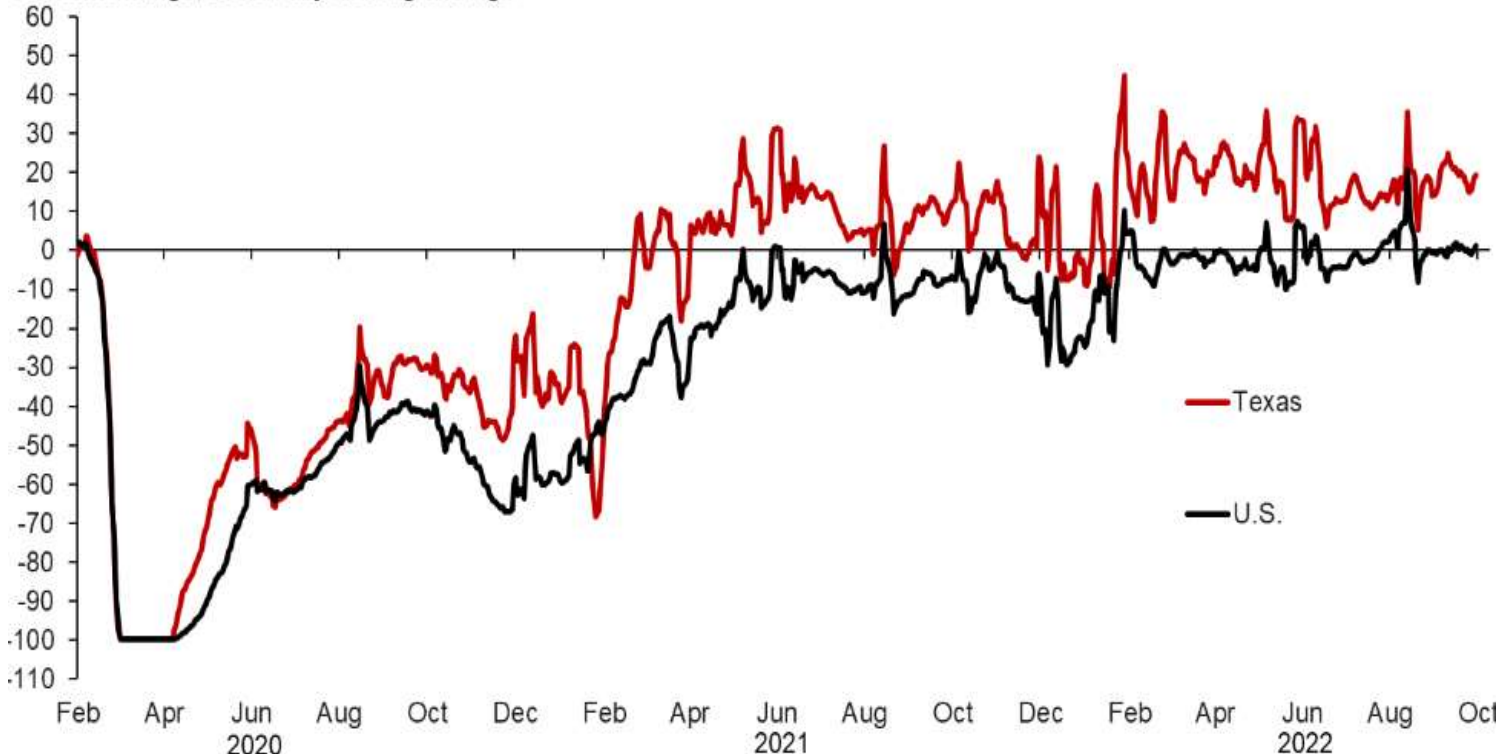
Provided by Federal Reserve of Dallas – Austin Economic Indicators – Oct 2022

DINING OUT

“In October, the number of seated diners at restaurants across the OpenTable network remained above 2019 levels both statewide and nationwide, based on a seven-day moving average. The U.S. figure moderated throughout October and was 1.2 percent above 2019 levels on Oct. 22. The Texas figure was above 2019 levels for the 36th consecutive week, reaching 19.4 percent above the benchmark on Oct. 22. **Austin led major Texas metros at 32.1 percent above 2019 levels.** Dining out was up 17.7 percent in San Antonio and 7.2 percent in Houston. Dining-out levels in Dallas have been consistently at or below 2019 levels since Sept. 1 and are currently 3.8 percent below the benchmark.” – Oct 2022 – Texas Economic Indicators – Dallas Fed

Dining Out

Percent change, seven-day moving average



NOTE: The chart shows seven-day moving averages through Oct. 22, 2022. Data refer to the percent change in seated diners at restaurants from the corresponding day in 2019 on the OpenTable network across all channels: online reservations, phone reservations and walk-ins.

SOURCE: OpenTable.

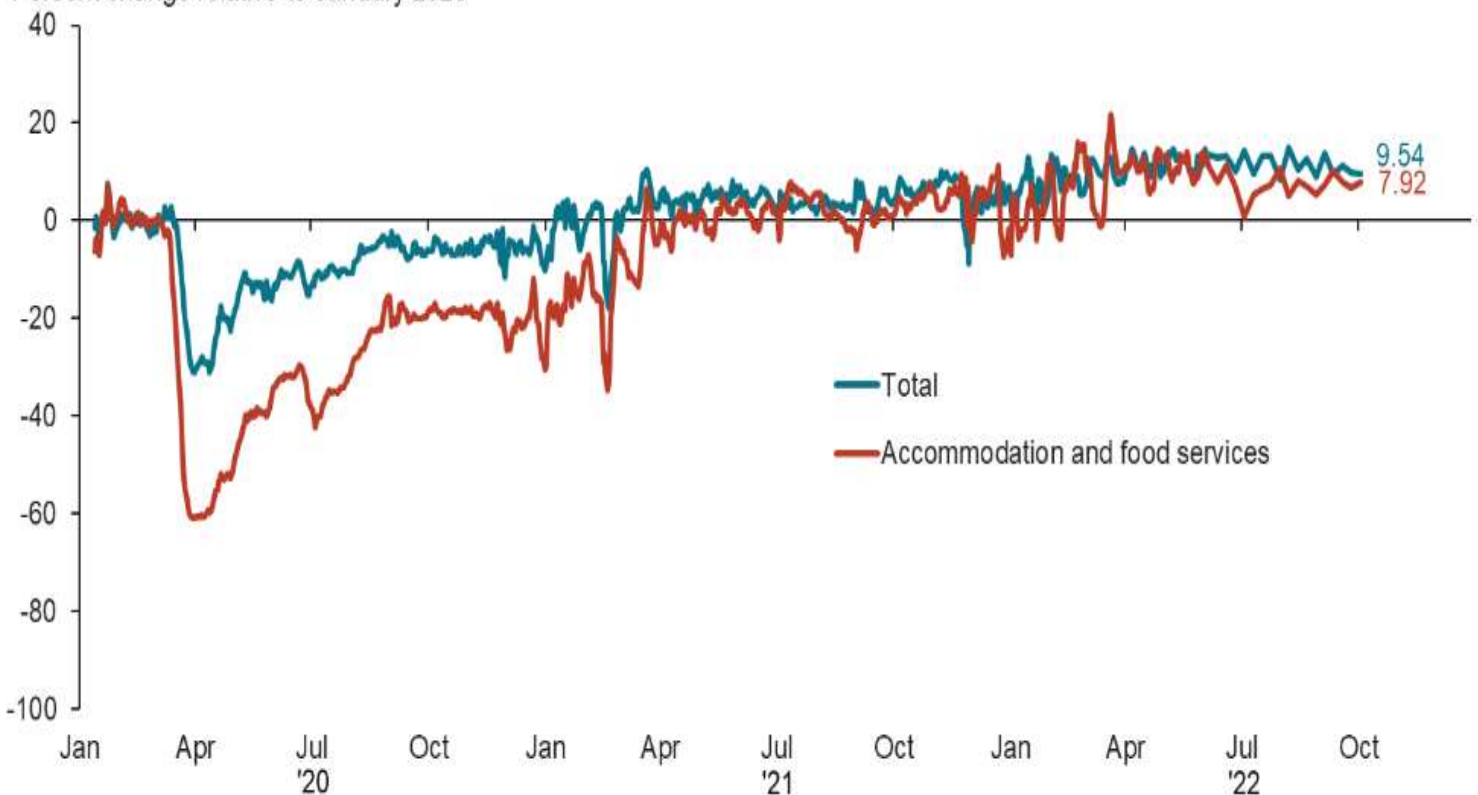
Provided by Texas Economic Indicators – Dallas Federal Reserve – Texas Economic Indicators – Oct 2022

DEBIT/CREDIT CARD SPENDING - TEXAS

“Relative to January 2020 levels, **consumer spending in Texas continued to increase amid high inflation**. As of the week ending Oct. 2, total debit and credit card spending was 9.5 percent above January 2020 levels. Accommodation and food services spending rose to 7.9 percent above January 2020 levels.” – Oct 2022 – Texas Economic Indicators – Dallas Fed

Debit/Credit Card Spending in Texas

Percent change relative to January 2020*



*Seasonally adjusted, seven-day moving average.

NOTE: The latest data are for the week ending Oct. 2, 2022. Data are daily through June 5, 2022, and weekly thereafter. All data refer to debit and credit card spending relative to Jan. 4–31, 2020.

SOURCE: Affinity Solutions, via tracktherecovery.org.

I BONDS – UPDATE

“The U.S. Department of the Treasury on [November 1] announced Series I bonds will pay **6.89% annual interest through April 2023**, down from the 9.62% yearly rate offered since May.

It’s the third-highest rate since I bonds were introduced in 1998, and investors may lock in this rate for six months by purchasing anytime before the end of April.”
– Nov 2022 - CNBC

“Savers loaded up on I Bonds when the rate leapt to 9.62% in May, the highest interest rate since I Bonds were introduced in 1998.”

“Why will the inflation-adjusted rate fall so much if inflation is still roaring? Annual inflation has remained near the highest levels since the early 1980s, but monthly inflation has slowed, including 0.1% and 0.0% monthly gains in July and August. **The formula for I Bond interest looks back only six months.**”



Source: Getty Image, Provided by The Wall Street Journal – Oct 2022

“Even at a lower interest rate, I Bonds are likely to offer a yield that is at least 2 percentage points higher than a 30-year U.S. Treasury bond and **more than 40 times the average U.S. savings-account interest rate.**”

“There is no secondary market for I Bonds, meaning investors can’t sell the bonds after they have bought them, and **they cannot redeem them for at least one year. If bondholders cash them out at any time within the first five years they lose the final three months of interest payments.**

I Bonds can be purchased by U.S. citizens, or civilian employees of the U.S., and **can only be purchased through the Treasury Department’s website, TreasuryDirect.gov.**” – Oct 2022 – The Wall Street Journal

WORLD UNIVERSITY RANKINGS – FEWER U.S. UNIVERSITIES IN TOP 100

“The U.S.’s pre-eminence among the world’s top research universities continues to diminish, according to a new global ranking, while Chinese universities are on the rise, producing a greater quantity and higher quality of research than ever before.”

“The U.S. and U.K. continue to dominate the upper echelon of the rankings, with the U.S. taking seven of the top 10 slots and Britain three.”

“But among the top 100 universities, the number of those in the U.S. fell to 34 from 43 between 2018 and this year. The number of Chinese universities in the top 100 increased from two to seven.”

“‘The data is very clear: America can no longer take for granted its decades long dominance of world higher education and research, and it is China that is leading the challenge,’ said Phil Baty, the rankings editor. ‘If current trends remained the same, we would see China overtaking the U.S. in the coming years.’”

“In 2021, American research and development fell to a 70-year low as a percentage of the federal budget, according to federal data.”

“In August President Biden authorized tens of billions of dollars to support



This year's World University Rankings named University of Oxford in England the world's leading research university for the seventh straight year. PHOTO: I-IMAGES/ZUMA PRESS

federal research and development and regional technology startups when he signed the Chips and Science Act, which aims to spur construction of factories that produce microchips.”

“China spent \$526 billion on research and development in 2019, according to data from the National Science Foundation. It was still lagging behind the U.S., where R&D expenditure totaled \$656 billion, but China has been closing the gap, increasing its spending by an average of 10.6% annually from 2010 to 2019.

China also increased its share of international patents to 49% in 2020, up from 16% a decade earlier, while the U.S. share declined from 15% to 10% in the same period, according to data from the National Science Foundation.” – Oct 2022 – The Wall Street Journal

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EXECUTIVE ORDER 14017 – REVIEW AMERICA’S CRITICAL SUPPLY CHAINS

“On February 24, 2021, President Biden signed **Executive Order (E.O.) 14017, “America’s Supply Chains,”** in which he directed the U.S. government to undertake **a comprehensive review of critical U.S. supply chains to identify risks, address vulnerabilities and develop a strategy to promote resilience.**” – Jun 2021 - 100 Day Reviews - The White House

FINDINGS OF THE 100-DAY REVIEW ON SUPPLY CHAINS

“The 100-day reports make clear: more secure and resilient supply chains are essential to our national security, our economic security, and our technological leadership.”

“**The high-capacity battery market is arguably one of the most critical to our Nation’s interests.**”

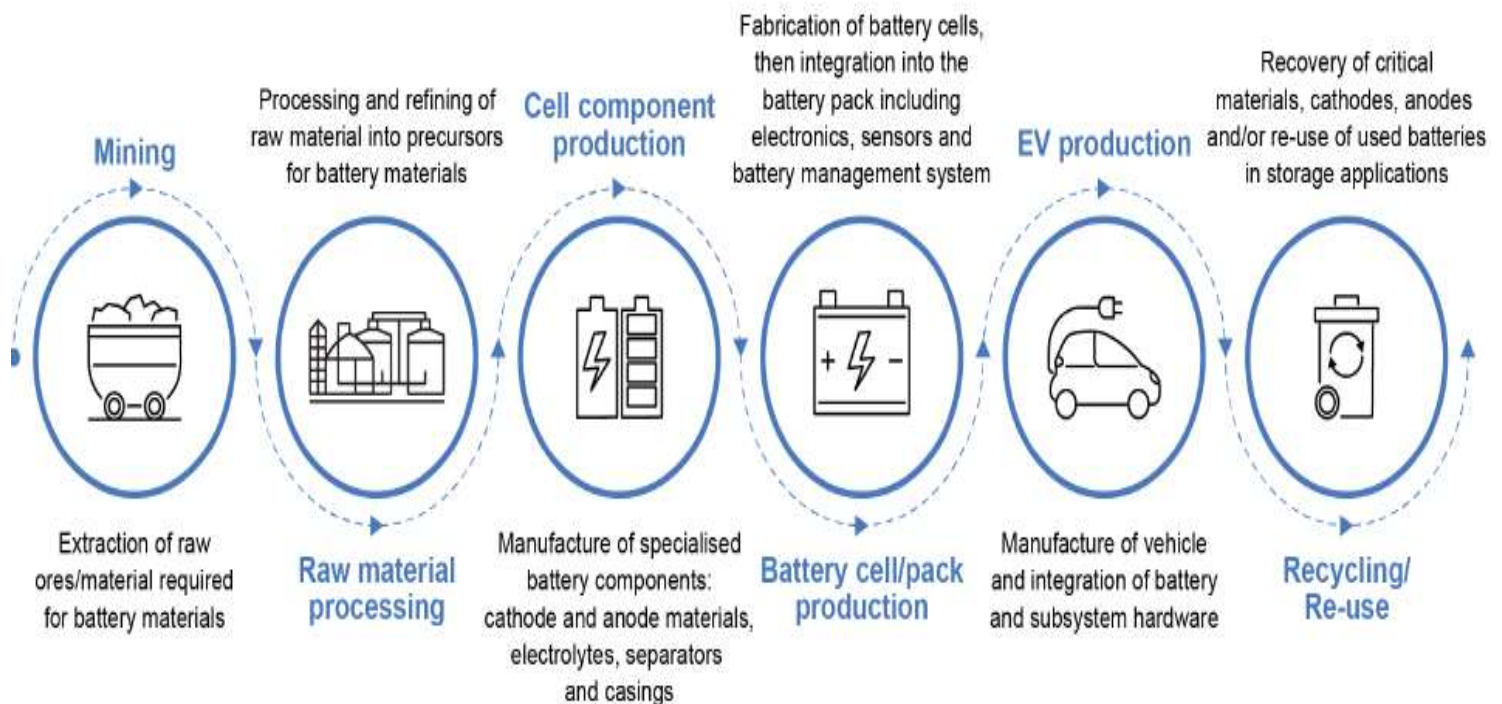
“**China has positioned itself as a market leader in the manufacturing supply chain** through the practice of questionable environmental policies, price distortion, state-run entities that minimize competition, and large subsidies throughout the battery supply chain.

Therefore, it is critical for the United States to leverage our leading position in research and development (R&D) of new technologies with a comprehensive set of domestic and international initiatives to accelerate commercialization throughout the battery supply chain. This strategy would translate to well-paying jobs throughout the United States and represents a **once-in-a-generation opportunity to position the United States as a global leader in the manufacturing of energy storage materials** and technologies to protect both the environment and our economic and national security interests.”– Jun 2021 – 100 Day Reviews - The White House

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

THE EV BATTERY SUPPLY CHAIN CONSISTS OF SEVERAL STAGES

EV battery supply chain



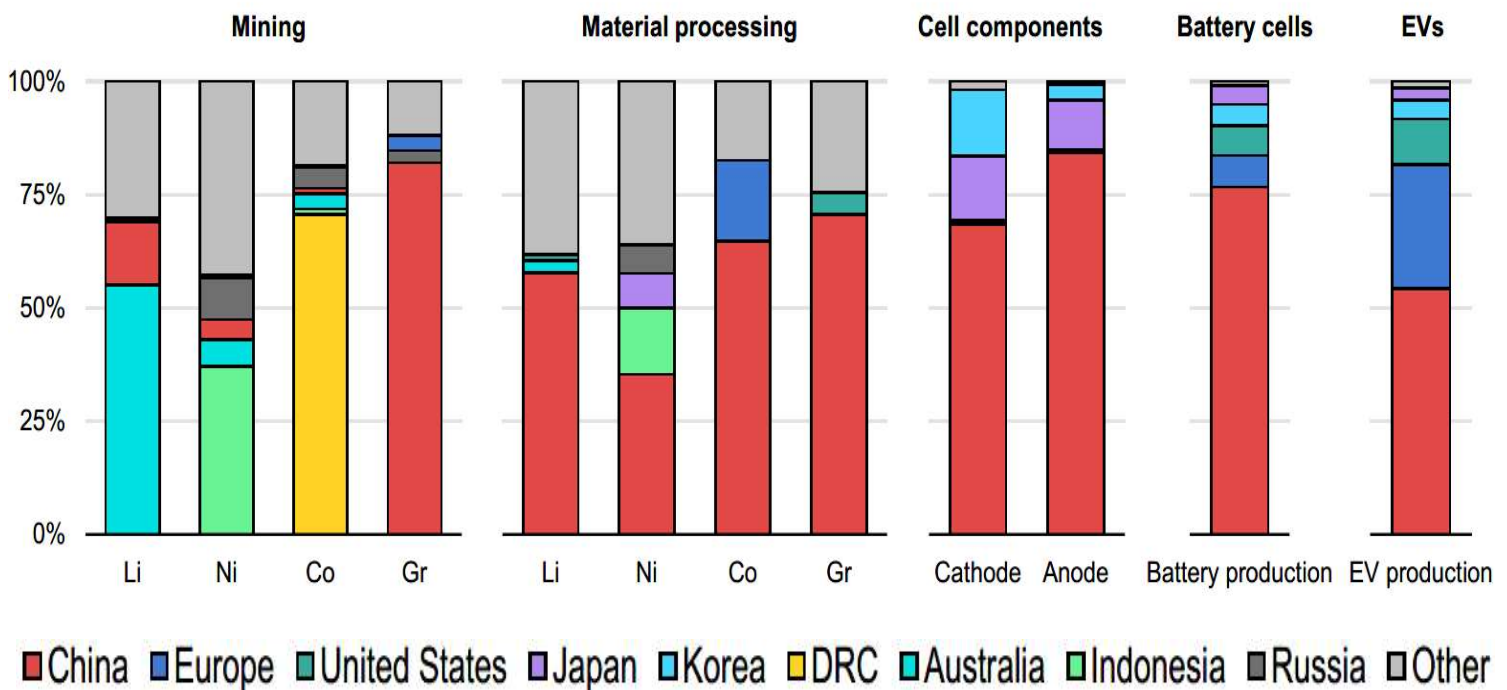
Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

“EV battery supply chains consist of multiple complex stages that are spread around the world. From extracting the necessary mineral ores, refining to form sufficient purity chemicals, then advanced materials synthesis to form cathode and anode materials. Similar complex supply chains [characterize] other battery components such as electrolytes and separators. Cells are then fabricated and housed in modules within a battery pack which is integrated into the EV.” – IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

CHINA DOMINATES THE EV BATTERY SUPPLY CHAIN

Geographical distribution of the global EV battery supply chain



“Notes: Li = lithium; Ni = nickel; Co = cobalt; Gr = graphite; DRC = Democratic Republic of Congo. Geographical breakdown refers to the country where the production occurs.

Mining is based on production data.

Material processing is based on refining production capacity data.

Cell component production is based on cathode and anode material production capacity data.

Battery cell production is based on battery cell production capacity data.

EV production is based on EV production data.” - Sources: IEA analysis based on: EV Volumes; US Geological Survey (2022); Benchmark Mineral Intelligence; Bloomberg NEF. – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EV BATTERY SUPPLY CHAIN - OVERVIEW

“Batteries typically accounts for 30% to 40% of the value of an electric vehicles (EV), and the race to net zero will focus attention on the security of supply of the critical minerals and metals needed to manufacture them.” - Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

CHINA – **“China dominates production at every stage of the EV battery supply chain downstream of mining.** Three-quarters of battery cell production capacity is in China, with the same for the specialized cathode and anode material production, for which China accounts for 70% of cathode and 85% of anode material global production capacity. Over half of global raw material processing for lithium, cobalt and graphite also occurs in China. With 80% of global graphite mining, China dominates the entire graphite anode supply chain end-to-end.”

EUROPE – **“Europe is responsible for over a quarter of EV production, but holds very little of the rest of the supply chain apart from cobalt processing at 20%, mostly plants in Finland.”**

KOREA AND JAPAN – **“Both Korea and Japan have considerable shares of the supply chain downstream of raw material processing,** particularly in cathode and anode material production. Korea is responsible for 15% of cathode, and 3% of anode material production capacity while Japan accounts for 14% and 11%, respectively.”

UNITED STATES – **“The United States has a smaller role in the global EV battery supply chain, with only 10% of EV production and 7% of battery production capacity.”** – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EV BATTERY SUPPLY CHAIN – STEP 1 – MINING



An open-pit mine that produces cobalt in Katanga Province near Lubumbashi, the Democratic Republic of Congo. © 2022 BLOOMBERG FINANCE LP: Provided by Forbes

“In terms of raw material supply and extraction, **battery metals are highly concentrated geographically and thus are relatively more vulnerable to supply shocks and constraints.** More than half of the world’s lithium is produced in Australia **while 70% of the world’s cobalt is produced in the DRC [Democratic Republic of Congo].** Nickel supply is slightly more diverse; Indonesia has the largest share of production with almost 40% of total nickel supply, yet today little of it is used in the EV battery supply chain as it mostly produces Class 2 nickel. Not only is Russia the world’s third-largest producer of nickel, more significantly, it is the world’s largest producer of Class 1 battery-grade nickel with around 20% of the global supply.

The geographical distribution of mineral extraction is unlikely to shift significantly in the near term given today’s project pipeline.” – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EV BATTERY SUPPLY CHAIN - STEP 2 – MATERIAL PROCESSING

“Batteries require high purity materials and therefore high-grade sources, as well as significant refining, is required to reach sufficient quality battery chemical precursors. These refining processes typically involve heavy industrial processes based on heat or chemical treatment (typically pyrometallurgy and/or hydrometallurgy) to refine the raw ore into the usual required chemicals, lithium carbonate or hydroxide, or cobalt and nickel sulphate.”

“Raw material processing is highly concentrated. For example, in lithium carbonate and hydroxide production, five major companies are responsible for three-quarters of global production capacity.”

“While manganese resources are widely distributed, production of high-purity manganese sulphate raises concerns around geographical concentration of supply. China currently accounts for around 90% of the global production capacity, raising the need for new, diversified manganese refining capacity. New manganese sulphate projects are starting to come online in Australia, Europe, Indonesia and United States.” – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.



Pools of brine containing lithium carbonate stretch across a lithium mine in the Atacama Desert of Chile. Local opposition can be a challenge to mining proposals.

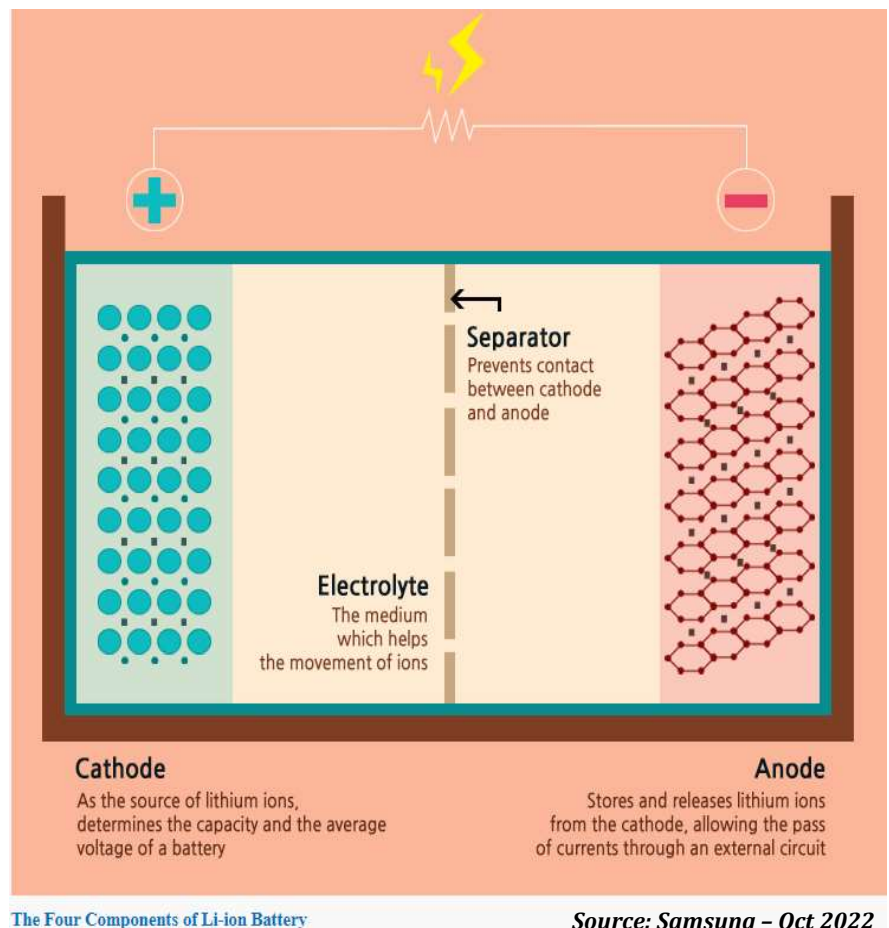
Source: John Moore/Getty Images; Provided by: The Conversation – August 2022

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EV BATTERY SUPPLY CHAIN - STEP 3 – CELL COMPONENT PRODUCTION

“Scaling up cell and battery production will require additional output from anode and cathode manufacturers. In the Stated Policies Scenario, there is a sixfold increase in cathode demand and a fivefold increase in anode demand in 2030 relative to 2021 production.”

“Current cathode and anode material production are highly concentrated; **together China, Japan and Korea account for 97% of current cathode and 99% of anode production.** Looking forward, the picture does not change much in the near term.”



“Assessing all current announced and under construction cathode and anode material production plants, which are set to be online by 2025, shows **the United States and Europe together will only produce around 4% of cathode material and 2% of anode material in 2025.**

Increased diversification is expected in the longer term based on announcements of planned production in Europe and North America. For example, by BASF with a planned cathode material production plant in Canada.” – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EV BATTERY SUPPLY CHAIN – STEP 4 – BATTERY PRODUCTION

“Producing the battery cells is a multi-step process with two broad stages: electrode manufacturing and cell fabrication. Though cell manufacturers have different cells designs, the cell manufacturing processes are similar, use mature technologies and are well established.” – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

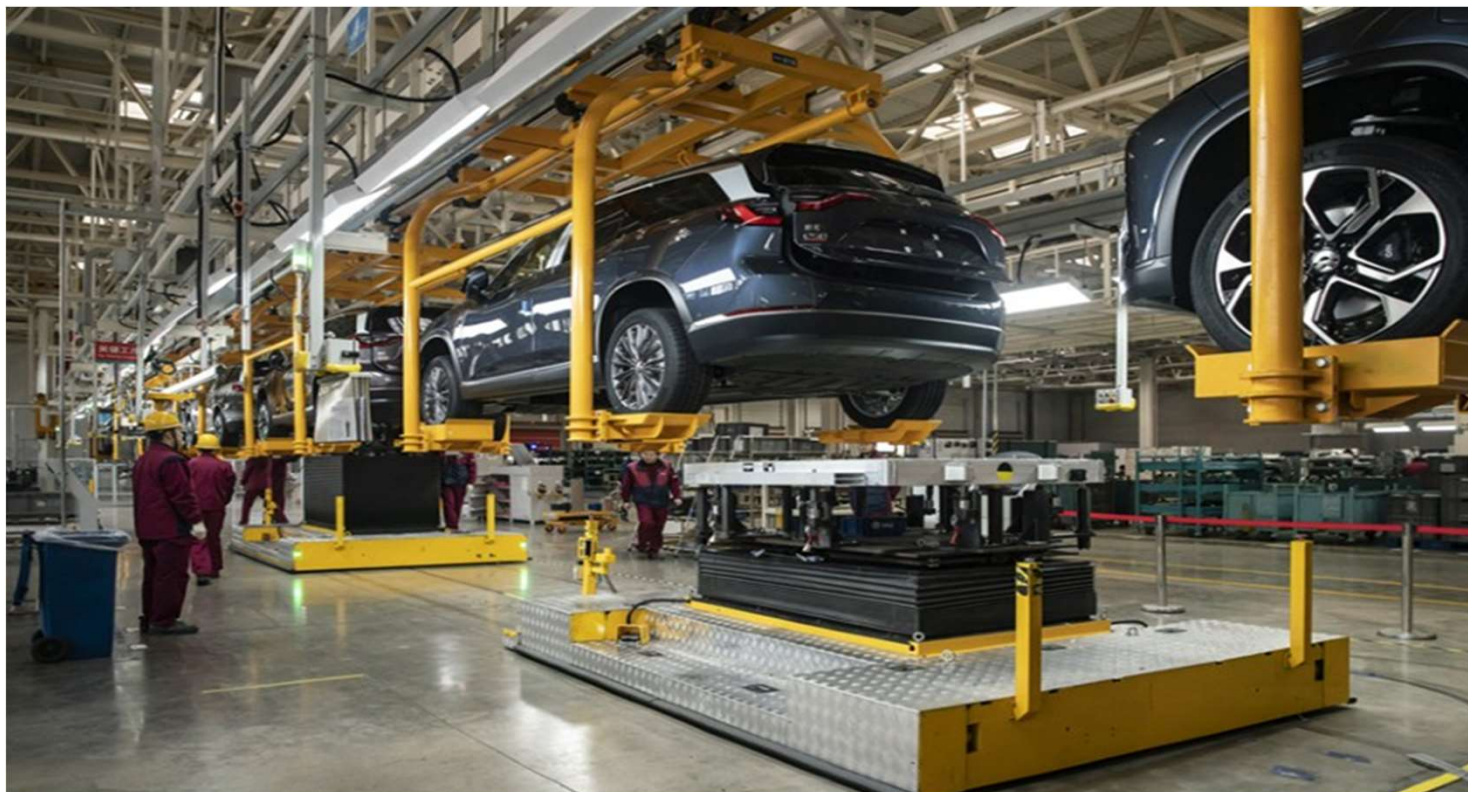
“[The] downstream supply chain distribution is set to change this decade, particularly for batteries. **If current policies, announcements and investments are [realized], by the end of this decade a quarter of battery production capacity will be located in Europe and the United States.**” – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

Rank	Company	2022 Market Share	Country
#1	CATL	34%	China 🇨🇳
#2	LG Energy Solution	14%	Korea 🇰🇷
#3	BYD	12%	China 🇨🇳
#4	Panasonic	10%	Japan 🇯🇵
#5	SK On	7%	Korea 🇰🇷
#6	Samsung SDI	5%	Korea 🇰🇷
#7	CALB	4%	China 🇨🇳
#8	Guoxuan	3%	China 🇨🇳
#9	Sunwoda	2%	China 🇨🇳
#10	SVOLT	1%	China 🇨🇳
	Other	8%	ROW 🌐

Provided by Visual Capitalist - Oct 2022

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

EV BATTERY SUPPLY CHAIN - STEP 5 – ELECTRIC VEHICLE ASSEMBLY



An electric car production pipeline at Nio's factory in Hefei, China.

Credit: Qilai Shen Source: Bloomberg/Getty Provided by Nature – Aug 2021

“The battery pack is integrated into the EV by the automakers, where it is connected with the electric motor, on-board charge module, high voltage distribution box, electric transmission and thermal systems, depending on the vehicle architecture.” - Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

“The three largest producers, Tesla (United States), VW Group (Germany) and BYD (China), accounted for a third of EV production in 2021. The rapid growth of BYD has been particularly impressive, it was not even among the top-six producers in 2020, but ranked as the third-largest producer of EVs in 2021.” – Source: IEA (2022) – Global Supply Chains of EV Batteries. All rights reserved.

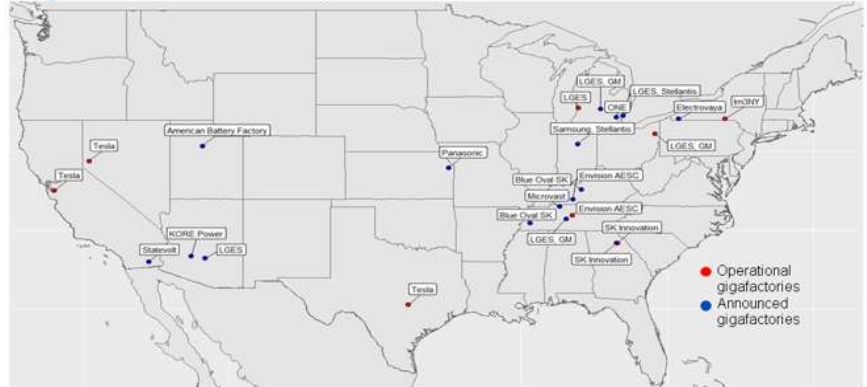
IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

INFLATION REDUCTION ACT (IRA) – BENEFIT TO MANUFACTURERS

“Passed in August of this year, the Inflation Reduction Act (IRA) was heralded by many as a landmark piece of climate legislation in the United States. **The IRA’s tax credits for electric vehicles were among its most anticipated benefits.**”

– Oct 2022 – JDSUPRA

New Gigafactories Cluster in the Midwest, South and Near Tesla Facilities



NOTES: We define a gigafactory as having capacity of 1 gigawatt hour or greater. Map does not include announcements that fail to specify a city or capacity estimate.
SOURCE: Company announcements, media reports, NAATBatt North American Lithium-Ion Battery Supply Chain Database.
Federal Reserve Bank of Dallas

“Now automakers and battery suppliers will be eligible for billions of dollars in federal loans and tax credits to offset those costs and spur additional investments.

For example: **The government will provide a tax credit of \$35 per kilowatt hour (kWh) for each U.S.-produced battery cell. That's 35% of today's average cost of producing a battery cell.** Ford, for instance, could get a \$3 billion tax break for the twin factories it's building in Kentucky, which will be able to produce 86 gigawatt hours' worth of batteries annually.

There's also a tax credit for U.S.-produced battery modules — groups of cells bundled together that fit inside a battery pack. At \$10/kWh, the credit would whack about one-third off the cost of assembling an EV battery pack, according to Bloomberg NEF.

Critical materials and minerals produced in the U.S. also get a 10% tax credit under the new law. That will help companies like Redwood Materials, which is investing \$3.5 billion in Nevada for cathode and anode processing — essential work in the battery production process that's currently done mostly overseas.

There's also \$2 billion in grants to retool existing auto plants to make clean vehicles, and up to \$20 billion more in loans to build new factories.” – Aug 2022 – Axios

IN DEPTH - ELECTRIC VEHICLE BATTERY SUPPLY CHAIN – CRITICAL TO U.S.

INFLATION REDUCTION ACT (IRA) – BENEFIT TO CONSUMERS

“The IRA includes a tax credit of up to \$7,500 at the point of sale for new EVs under Section 30D of the Internal Revenue Code (i.e., the consumer EV tax credit).

The IRA **changed the eligibility criteria** for the previously existing tax credit under Section 30D in several important ways...

Specifically, under the revised criteria, to be eligible for half the amount of the credit (\$3,750), beginning in 2023, **at least 50% of the value of the components of the EV battery must be manufactured or assembled in North America**. This minimum threshold will rise in the following years up to 100% by 2029.

To be eligible for the other half of the total possible credit (\$3,750), beginning in 2023, **at least 40% of the critical mineral components of the EV battery must be extracted or processed in the United States or a country that is party to a US free trade agreement (FTA), or recycled in North America**. This minimum threshold will continue to rise in the following years, up to 80% by 2027.

In addition, **EVs with battery components or materials sourced from “foreign entities of concern,” such as China, are excluded** from the Section 30D credit entirely after a certain phase-in period.” – Oct 2022 – JDSUPRA

IF MOST EVs RELY ON FOREIGN BATTERY SUPPLY CHAINS, WILL ANY EVs ACTUALLY BE ELIGIBLE FOR THE IRA CONSUMER EV CREDIT?

“[I]ndustry analysts note that China produces three-quarters of all lithium-ion batteries and between 70%-85% of the production capacity for key battery components.” **“What this means for the industry is that the consumer EV tax credit could be out of reach for many, if not most, EVs.”** – Oct 2022 – JDSUPRA

“In essence, the U.S. has shifted the incentives for EV adoption from consumers to manufacturers — **instead of making electrics cheaper for car buyers, the new law rewards carmakers** for building EVs with U.S.-made batteries.” – Aug 2022 - Axios

IN-DEPTH TOPICS LOCATED ON THE COUNTY AUDITOR'S WEBPAGE

5G Network	4 th Qtr 2018	Money Market Reform	3rd Qtr 2016
Afterpay	4 th Qtr 2020	Natural Gas – U.S. Exports	4th Qtr 2019
Alibaba	3 rd Qtr 2017	Negative Interest Policy	2nd Qtr 2016
Bitcoin	4 th Qtr 2016	New Silk Road	2nd Qtr 2017
Cashless Society	4 th Qtr 2017	Non-Fungible Tokens	1st Qtr 2021
Chatbots	1 st Qtr 2019	Pandemic – Impact	1st Qtr 2020
Deep Sea Mining	3 rd Qtr 2020	Quantitative Easing	1st Qtr 2016
EV Supply Chain	3 rd Qtr 2022	Repurchase Agreements	3rd Qtr 2019
Facial Recognition	1 st Qtr 2018	Series I Bonds	1st Qtr 2022
IRS - Online Platforms	2 nd Qtr 2022	Small Business Reorg Act	2nd Qtr 2020
Labor Participation Rate	4 th Qtr 2015	Texas Imports and Exports	2nd Qtr 2018
Libra, Calibra, Facebook	2 nd Qtr 2019	Universal Postal Union	3rd Qtr 2018
Lumber Prices Soaring	4 th Qtr 2021	Vehicle Shortage	2nd Qtr 2021

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