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Largest Texas Metros Lure Big-City, Coastal Migrants During Pandemic

PLUS

Largest Texas Metros Lure Big-City, Coastal Migrants During Pandemic

By Wenli Li and Yichen Su

ABSTRACT: Almost two years since the pandemic began, high-frequency data show that migration to Texas has accelerated, as the state's four biggest metros experience an influx of migrants often from the nation's largest metropolitan areas. The emergence of working from home has lessened both workers' and some companies' reliance on physical offices, clearing the way for the new wave of mobility.

Texas has been a magnet, drawing people and firms from around the country over the past decade. Pull factors include plentiful job opportunities, an accommodative business environment and a relatively low cost of living.[1]

Even with those attributes, when the COVID-19 pandemic struck, it was unclear how migration to the state would be affected.

Almost two years since the pandemic began, high-frequency data based on credit-bureau address changes show that migration to Texas sped up, increasing from already-high levels. The state received 174,000 migrants on net in the five quarters following the onset of the pandemic, up from 109,000 in the previous five quarters.[2]

On the Move

Chart 1A shows the estimated net inflow of interstate migrants from the start of the pandemic (first quarter 2020) to second quarter 2021 based on the Federal Reserve Bank of New York Consumer Credit Panel/Equifax data.[3] The migration statistics are based on address changes reported to the credit bureau of adults with credit reports. (About 80 percent of adults have credit reports.)[4]

In contrast to Texas, states such as California and New York experienced population exodus during the pandemic, raising already-elevated out-migration to new highs. Of note, despite rapid in-migration, Texas remained the second-largest net recipient of migrants behind Florida.[5] And since Texas has a large population, 13 states have higher *rates* of net in-migration than Texas.

Much of Texas' population gain comes from people exiting California and New York (*Chart 1B*). Since before the pandemic, California has been by far the largest population feeder state for Texas. The number of Californians coming to Texas roughly doubled from 34,000 to 64,000 during the initial 18 months of the pandemic.

Net moves to Texas from New York and Illinois also increased—partly because of a large exodus from big metros such as New York and Chicago.

But Texas also suffered losses, sending more people than it received to a few states—notably, Oklahoma, Arkansas and Montana—though the numbers were small relative to the gains from California and New York.

Pandemic-Related Migration

Many factors led to the spike in migration to Texas during the pandemic.

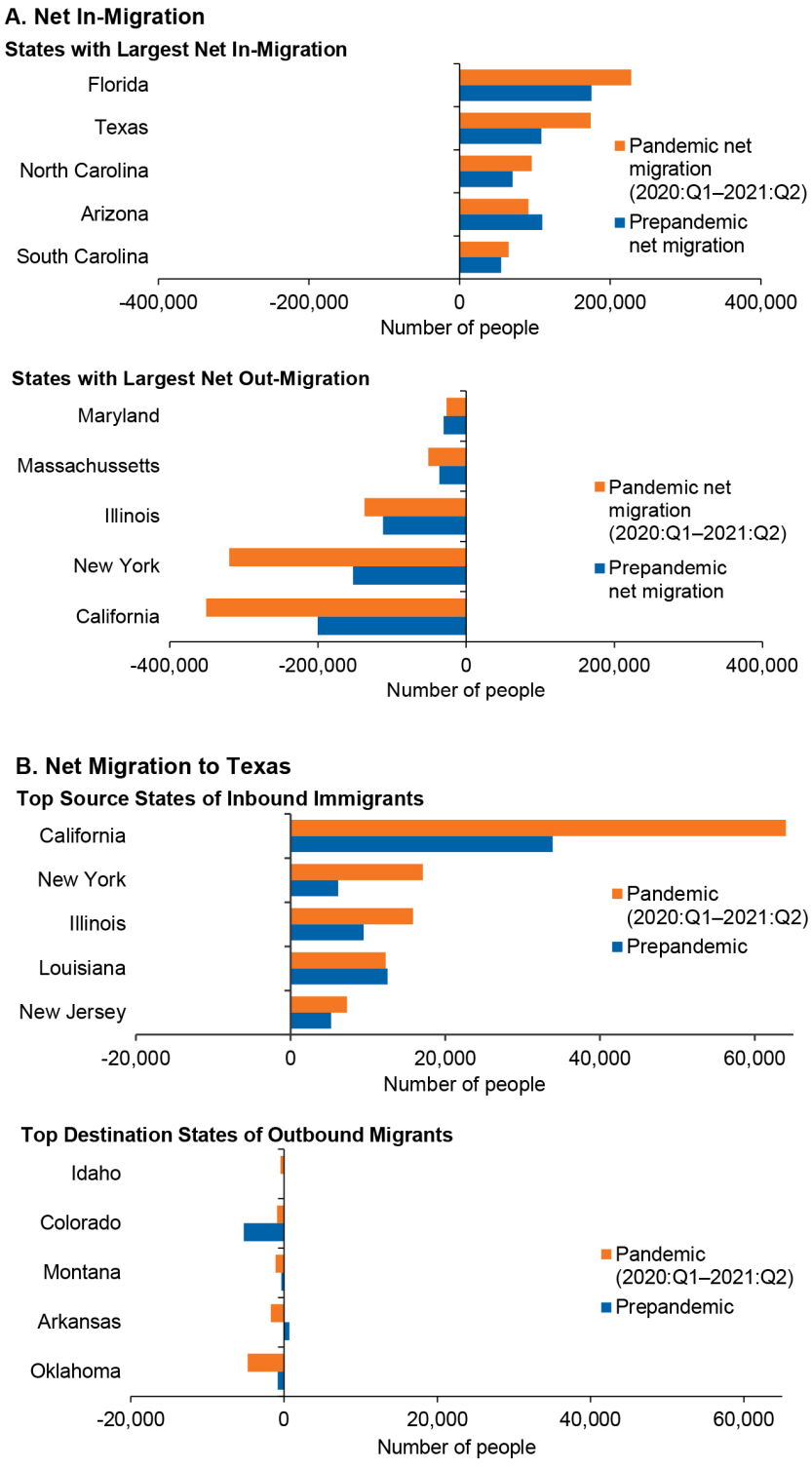
At the onset, many workers were forced to shelter at home as telecommuting was quickly adopted and became commonplace. Thus, even as COVID-19 cases subsided, the widespread adoption of distance-work technology allowed many people to continue working remotely and avoid commuting to offices.

Workers no longer tied to an office considered relocating to more attractive and more affordable metros or states, different from where their employers were located.

Cities such as New York, Los Angeles and San Francisco host a disproportionately high share of jobs that offer the option to work from home (finance, media, tech). These metros also have the highest cost of living among all of the nation's major cities.[6] Sizable portions of their residents moved to other, more affordable metros as workers took advantage of newfound mobility.[7]

CHART 1

In-Migration to Florida, Texas Surges amid Exodus from California, New York



NOTES: Net migration is computed as the difference between the inflow and outflow of population. Prepandemic net migration is calculated as the average between first quarter 2018–second quarter 2019; second quarter 2018–third quarter 2019; third quarter 2018–fourth quarter 2019; and fourth quarter 2018–first quarter 2020. Population numbers are adjusted by dividing by 0.05*0.779 to reflect that the dataset is a 5 percent national representative sample and only collected for adult population (77.9 percent of the total population, according to the 2020 census).

SOURCE: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

Before the pandemic, many workers had no choice but to remain in the high-cost states because of the strong agglomeration of high-wage jobs there. For example, high-wage tech jobs are especially concentrated in California's Silicon Valley. Those working in the industry could not easily move away despite the extraordinarily high housing costs.[8]

Similar pockets of industry clusters exist elsewhere—in New York and Los Angeles—which tied workers to the cities of their employers. The option of remote work removed these constraints, unleashing a wave of migration. In addition, some firms also moved, bringing their workers with them. (Prepandemic research has shown that firm relocations are generally responsible for a small fraction of Texas job growth.)

As such individuals relocate, they bring their demand for local services with them to their new home cities and metros, stimulating business and creating jobs in the destination locations. In contrast, locations experiencing a large population exodus confront a rapid decrease in local demand for services, which leads to slower local job growth. The difference in local job opportunities encouraged many workers in the service sector with no option to work remotely to also join the wave of migrants.

Texas Metros' Migration Influx

Migration to Texas during the pandemic has been overwhelmingly to the four largest Texas metros (*Chart 2*).

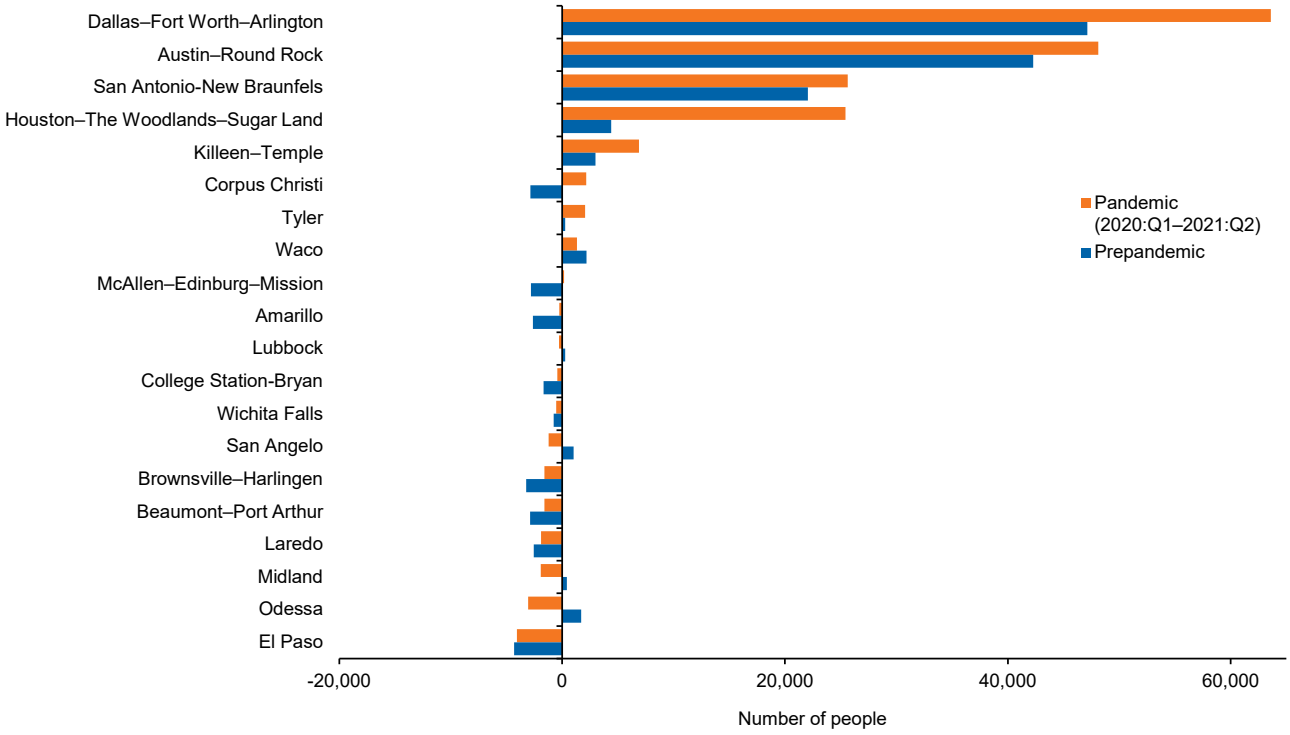
The Dallas–Fort Worth area led the state in the number of net in-migrants, followed by Austin, which topped the metros in a related metric, the migration rate—net in-migrants relative to population.

Migration toward smaller metros in Texas also increased. Before the pandemic, most smaller metros in Texas lost population on net. But during the pandemic, most of these metros either experienced a decrease in the net outflow of people or began gaining population.

Corpus Christi, for example, turned from a net outflow before the pandemic to a net inflow during it. Other metros

CHART 2

Four Largest Texas Metros Dominate as Migration Destinations



NOTES: Data shown are net in-migration (out-migration) figures for Texas metros. Residents living in micropolitan areas or rural areas are dropped due to the quality of the geocoding in the data.

SOURCE: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

such as Beaumont–Port Arthur, Brownsville–Harlingen and Laredo continued to experience a net outflow of population but at a much-reduced level.

The Midland–Odessa area is a notable exception. It began losing population after the pandemic began. The sudden spike in outward migration is likely due to the large job loss in the energy sector in 2020. Out-migration also continued in El Paso, where it has occurred for some time.

Coastal Cities' Relocation

Four major Texas metros gained population from the nation's largest non-Texas metropolitan areas during the pandemic, particularly high-cost locales such as New York, Los Angeles and San Francisco (*Chart 3*).

In particular, Dallas–Fort Worth and Austin saw the most robust inflow of people from the largest and most expensive metros outside of Texas. Houston and San Antonio saw a smaller stream of net in-migration from these areas.

The inflows to Texas metros have brought considerable talent from those high-skilled labor markets on the coasts. Austin, for example, is a likely beneficiary of a large movement of talent, particularly in the high-tech sector. Net migration from the combined metro areas of San Francisco and San Jose (Silicon Valley) has been the biggest out-of-state contributor to Austin's in-migration, doubling since the start of the pandemic.

The growing talent pool in Texas may, in turn, become a magnet for relocating firms searching for local talent.

Notably, Texas metros are not the only destination for coastal migrants.[9] The migration statistics indicate that smaller and lower-cost metros all over the nation have gained population at the expense of these traditionally large, high-cost coastal metros.

Suburban Inflow

Population gains in the four major Texas metro areas with the largest inflows have occurred primarily in the suburbs (*Chart 4*).

In all four metros, the pandemic-era net migration rates skyrocketed in neighborhoods farther than 20 miles from downtown. In contrast, there was either modest growth or population loss in neighborhoods within five to 20 miles of downtown.[10] This contrasts with the prepandemic growth patterns within the Texas metros, where the city centers were in demand, particularly among high-income and college-educated individuals.[11]

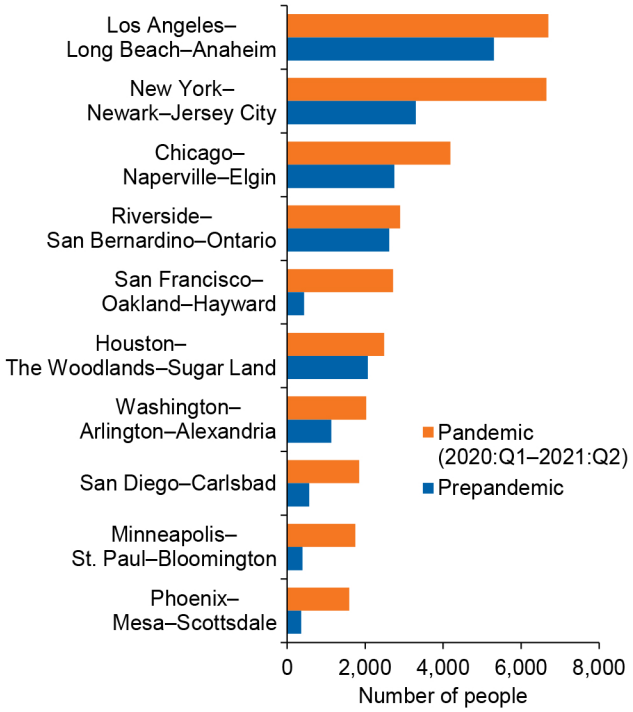
The important reason behind the suburbs' heightened popularity during the pandemic is the increased preva-

CHART 3

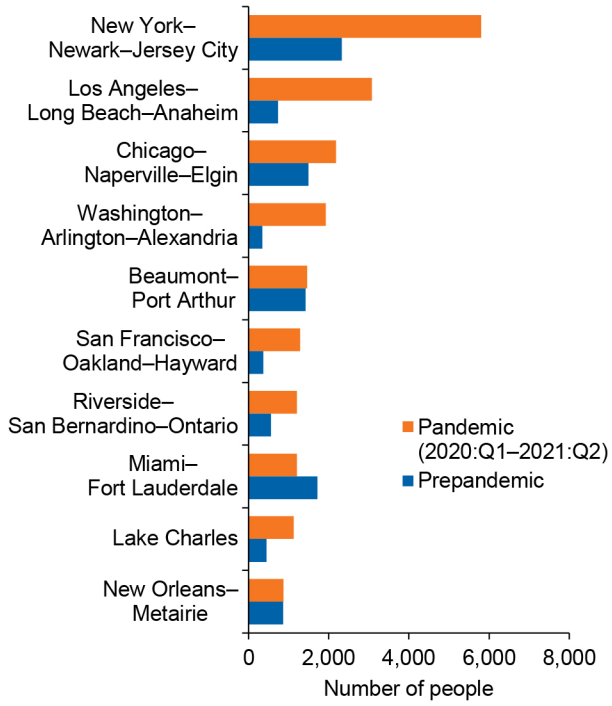
Major Texas Metros Attract People Exiting Large Coastal Metro Areas

Net Migration to Texas Metros and the Cities New Arrivals Left

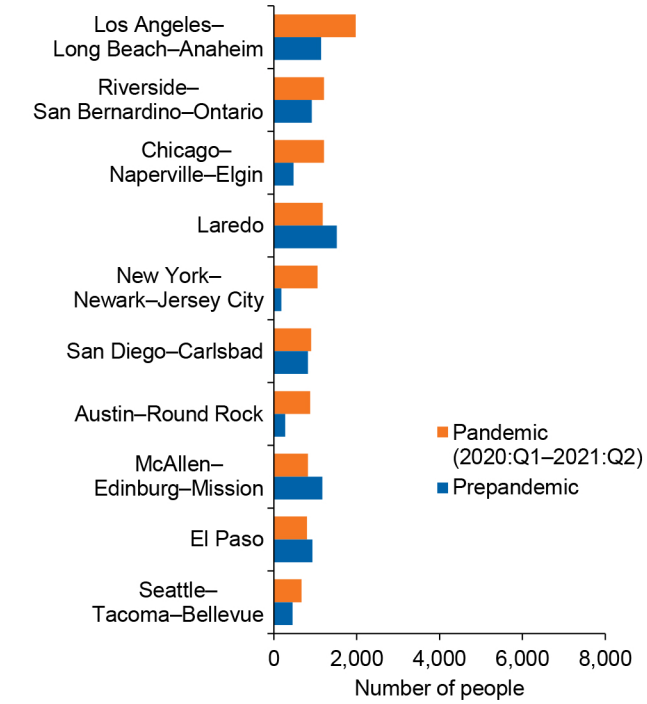
A. Dallas–Fort Worth



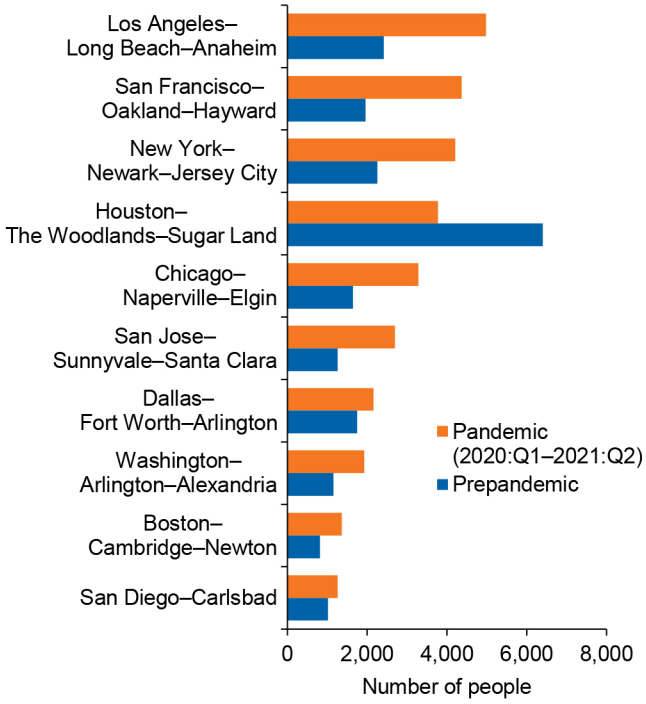
B. Houston



C. San Antonio



D. Austin

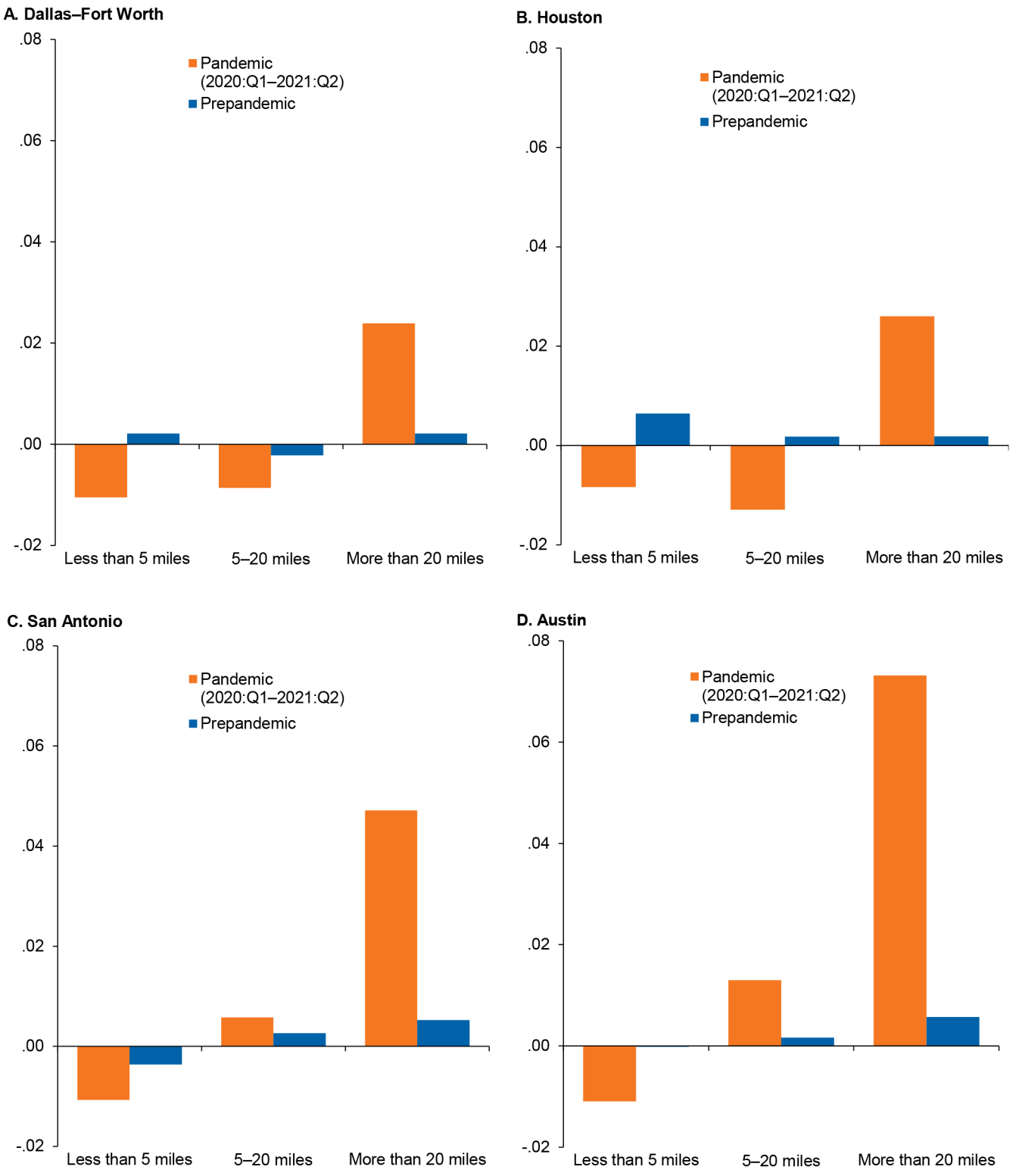


NOTE: Residents living in micropolitan areas or rural areas are dropped due to the quality of geocoding in the data.
SOURCE: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

CHART 4

Suburbs Gained Population; City Centers Lost Residents

Net In-Migration Rate by Distance from Downtown



NOTES: In-migration rates are calculated at the census tract level. The values shown in the chart are average net in-migration rates averaged with census tract population (from the American Community Survey (ACS) 2013–17) as the weight. Net in-migration rates are calculated by dividing the net inflow by census tract by the census tract's population (from ACS 2013–17).

SOURCE: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

lence of the option to work remotely. As this arrangement becomes commonplace for office jobs, the reduced need to commute to job centers—city centers or office parks—allows people to relocate to more-remote neighborhoods, which provide cheaper, more-spacious living areas.

Migration Pains

The in-migration from the crowded coastal cities to Texas metros has brought additional workers and their talents, and firms and their investment, which have collectively fueled the state's sustained economic growth.

But with these gains comes some pain. The large inflow of people has likely contributed to rising apartment rents and home prices, especially at a time of shortages in construction materials and labor. Additionally, the rapid increase in migrants to Texas has added pressure on existing infrastructure such as roads and bridges, hospitals, utilities and educational resources.

Future Destination

Will the newly arrived transplants stay in Texas permanently? Will the current migration flow continue or reverse? The answers depend on a few factors.

One determinant of the future flow of population is the extent to which work will return to the physical office locations over the long run. Studies have shown that while a return to offices may start to pick up once the pandemic weakens, a large portion of the workforce may continue to telecommute or adapt to a hybrid model due to the widespread adoption of work-from-home technologies such as Zoom and Slack.[12]

This could imply that more people may continue to migrate to Texas and that a significant portion of the transplants who have moved here may stick around long term.

Another factor is whether Texas' cost advantage over states such as California and New York can be maintained as more people move in. Timely expansion of affordable housing could certainly help relieve those price pressures.

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Notes

[1] "Gone to Texas: Migration Vital to Growth in the Lone Star State," by Pia Orrenius, Alexander T. Abraham and Stephanie Gullo, Federal Reserve Bank of Dallas *Southwest Economy*, First Quarter, 2018; "Texas Top-Ranked State for Firm Relocations," by Anil Kumar and Alexander T. Abraham, Federal Reserve Bank of Dallas *Southwest Economy*, Fourth Quarter, 2018.

[2] The five-quarter prepandemic net migration is calculated as the average between: first quarter 2018–second quarter 2019; second quarter 2018–third quarter 2019; third quarter 2018– fourth quarter 2019; and fourth quarter 2018–first quarter 2020.

[3] This panel is a nationally representative random anonymous sample of individuals drawn from the Equifax credit report data. The data report consumers' address changes over time as their billing addresses change. Based on the aggregated statistics of these changes of addresses, researchers can study how the direction of migration changes with fine geographic detail at a high frequency (quarterly).

[4] See *Data Point: Credit Invisibles*, by Kenneth P. Brevoort, Philipp Grimm and Michelle Kambara, Consumer Financial Protection Bureau, Office of Research, May 2015.

[5] Many Florida in-migrants are retirees, while migrants to Texas tend to be workers.

[6] The migration patterns in the consumer credit panel show that metros with a higher share of workers with telework options saw a much-larger outflow of population. See also "How Many Jobs Can Be Done At Home?" by Jonathan I. Dingel and Brent Neiman, *Journal of Public Economics*, vol. 189, September 2020.

[7] "The Geography of Remote Work," by Lukas Althoff, Fabian Eckert, Sharat Ganapati and Conor Walsh, National Bureau of Economic Research, working paper 29181, August 2021.

[8] To look more into the spatial sorting and housing cost research, see "Real Wage Inequality," by Enrico Moretti, *American Economic Journal: Applied Economics 2013*, vol. 5, no. 1, pp. 65–103, and "The Determinants and Welfare Implications of U.S. Workers' Diverging Location Choices by Skill: 1980–2000," by Rebecca Diamond, *American Economic Review*, vol. 106, no. 3, pp. 479–524, March 2016.

[9] The migration patterns seen in the consumer credit panel indicate that less-populous metros have been gaining population, while the more populous metros have been losing population since the start of the pandemic. "Remote Workers Can Live Anywhere. These Cities (and Small Towns) Are Luring Them with Perks," by Jon Kamp, *Wall Street Journal*, Oct. 9, 2021.

[10] The movement of population toward the suburbs is consistent with the evidence documented in "COVID-19 Fuels Sudden, Surging Demand for Suburban Housing," by Laila Assanie and Yichen Su, Federal Reserve Bank of Dallas *Southwest Economy*, Fourth Quarter, 2020. The authors show a significant outward shift in housing demand at the onset of the pandemic.

[11] "Gentrification Transforming Neighborhoods in Big Texas Cities," by Yichen Su, Federal Reserve Bank of Dallas *Southwest Economy*, Fourth Quarter, 2019.

[12] "Hybrid Is the Future of Work," by Nicholas Bloom, Policy Brief, Stanford Institute for Economic Policy Research, June 2021.

Texas Joblessness Persists Above U.S. Rate, Weighing on Black, Hispanic Workers

By Anil Kumar

ABSTRACT: Texas lost proportionately fewer jobs than the nation during the pandemic, yet the unemployment rate rose above the national rate—a gap that has persisted. Women and minorities were affected disproportionately at the outset. While the gender unemployment gap has largely dissipated, the gaps between white workers and both Black and Hispanic workers have persisted above pre-COVID-19 levels.

In April 2020, the U.S. unemployment rate surged to a postwar-record 14.7 percent, a side effect of the arrival of COVID-19 and the lockdowns and shelter-in-place orders accompanying it.

Joblessness began receding two months later as restrictions eased and mobility improved, though the pace of progress then slowed markedly. The pandemic's endurance and its economic impact were largely to blame (*Chart 1*). More than a year later, in September 2021, the U.S. unemployment rate was 4.8 percent—1.3 percentage points above the prepandemic rate in February 2020.

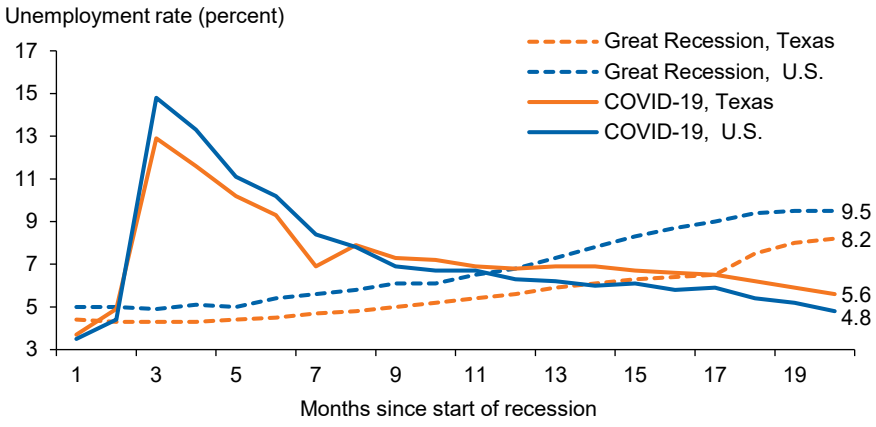
In Texas, the unemployment rate also declined but has remained persistently higher than in the U.S. at 5.6 percent in September. The COVID-19 impact was later to arrive in the state, where unemployment topped out at 12.9 percent and has exceeded the U.S. rate since August 2020.

Underlying Texas' weaker performance are demographic-based unemployment disparities, particularly affecting Black and Hispanic workers. The differences in Black and white unemployment rates and Hispanic and white rates remain well above pre-COVID-19 levels.

The Texas–U.S. unemployment rate differential during the COVID-19 downturn has followed a very different pattern than during the 2007–09 Great Recession, when Texas' rate remained well below that of the nation. Indeed, a strong Texas economy and typically higher job growth than the nation meant that the state's jobless rate consistently trailed the nation's until the 2015 oil bust.

The subsequent emergence during the pandemic of a persistent gap—Texas unemployment exceeding the U.S. rate—appears to suggest that COVID-19 has taken a greater toll on the state labor market. This runs counter to other data that point to a less-severe economic downturn in Texas. For example, payroll employment data indicate that

CHART 1 Unemployment Rate During COVID-19 Recession Surged More Quickly than in Great Recession



NOTES: The chart plots the unemployment rate in months after each recession. The Great Recession was December 2007–June 2009, while the COVID-19 recession was February 2020–April 2020.

SOURCES: Bureau of Labor Statistics, Current Population Survey; author's calculations

Texas proportionately lost fewer jobs in the pandemic than the nation overall. As of September 2021, Texas payroll employment was 1.7 percent below pre-COVID-19 employment, while the U.S. was 3.3 percent short.

A host of explanations could account for Texas' relatively higher unemployment rate—among them, the state's higher labor force participation rate, policies that encouraged Texans to go back to work sooner, and COVID-19-driven changes in the way the official jobless rate is calculated.

Seeking Work in Texas

A simple, albeit mechanical, reason for the elevated Texas unemployment rate could be that a greater proportion of people are looking for work. The state's labor force participation rate exceeded the nation's during the recovery from COVID-19, even though their employment-to-population ratios are similar (*Chart 2*).

The two measures affect the unemployment rate in opposite ways. More workers looking for jobs adds to unemployment, while a higher employment-to-population ratio reduces the ranks of the unemployed. Thus, the change in the unemployment rate roughly equals the change in the labor force participation rate less the change in the employment-to-population ratio.

The higher labor force participation rate in Texas suggests that the state has a relatively larger pool of workers available to fill job openings, helping firms here to somewhat better navigate pandemic-era labor shortages than businesses nationally. Nonetheless, the labor force participation rate and employment-to-population ratio remain well below prepandemic levels, signaling that the labor market remains a long way from healing completely.

Additional Factors

Other factors may be contributing to the unemployment rate differential between Texas and the U.S. Business closures and social-distancing policies mandated by state and local governments differed widely across states. Earlier resumption of work search requirements to maintain eligibility for pandemic unemployment benefits in Texas may have kept more state residents in the labor force looking for jobs relative to states without such mandates.

While the initial surge in COVID-19 cases and deaths in Texas was less pronounced, per capita cases and deaths in Texas exceeded the national average by summer 2020, likely slowing improvement in the state unemployment rate. The persistence of the higher unemployment rate in Texas is puzzling because subsequent waves of COVID-19 similarly affected the state and nation.

There could be another technical explanation for some of the gap between Texas and the U.S. It could be an artifact of significant changes to the model-based estimation method for producing reliable state-level unemployment rates and to seasonal smoothing adjustments that the Bureau of Labor Statistics (BLS) implemented in response to sharp swings in labor force numbers after the initial COVID-19 outbreak. If such a measurement issue is the cause, some of the gap may disappear once annual revisions to civilian labor force estimates are made before the release of January 2022 data.

Notably, the unemployment rates calculated from household responses in Current Population Survey data and seasonally adjusted using a simpler procedure reveal that, while the gap between Texas and the nation fluctuated after August 2020, it has not been nearly as persistent as the gap in the official BLS rate. In fact, these simpler calculations suggest that the unemployment rate in Texas has been lower than in the U.S. in recent months.

Demographic Differences

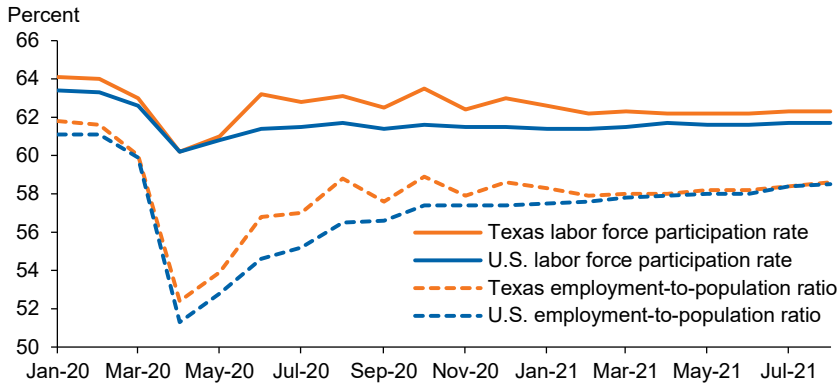
Demographic differences could also account for a portion of the gap. Texas exceeds the U.S. in the share of Hispanics, younger workers and those without a college degree. These groups were disproportionately affected by COVID-19.

Comparing changes in average unemployment rates in the months before COVID-19 (December 2019 to February 2020) to the period after the initial outbreak (March 2020 to September 2021), most demographic groups in Texas experienced a smaller jobless rise than their counterparts nationally (*Chart 3*).[1]

However, larger unemployment increases among Black workers and those without a high school education in Texas stand out and suggest that the pandemic took a greater toll on the labor market prospects of some vulnerable groups.

On a positive note, the gender gap in the unemployment rate, which inched up nationally, actually contracted in Texas.

CHART 2 Texas Labor Force Participation Exceeds U.S. Rate



NOTES: Data are through September 2021. The labor force participation rate is the number of people in the labor force as a percentage of the civilian noninstitutional population age 16 and older.

SOURCE: Bureau of Labor Statistics, Current Population Survey.

Evolving Gender Gap

More disaggregated data, however, suggest a broader gender gap in the initial phase of the pandemic and significant heterogeneity during subsequent phases of COVID-19.[2] The gender gap in Texas widened from 0.8 percentage points just before the pandemic (the female unemployment rate exceeded the male rate) to a whopping 1.4 percentage points in the first phase of COVID-19 (March to May 2020). At the national level, there was an even bigger increase, to 1.7 percentage points.

The gender gap in the state narrowed sharply in phase 2 of the pandemic (June 2020 to December 2020) and reversed in phase 3 (January 2021 to September 2021), with the female unemployment rate improving to an average rate of 5.7 percent so far in 2021—lower than the 6.3 percent rate for men in Texas.

Labor demand factors, such as differences between men and women in the occupations and industries in which they work, led to the sharp rise in the unemployment-rate gap in the initial phase of the pandemic, recent research on the impact of COVID-19 has shown.[3]

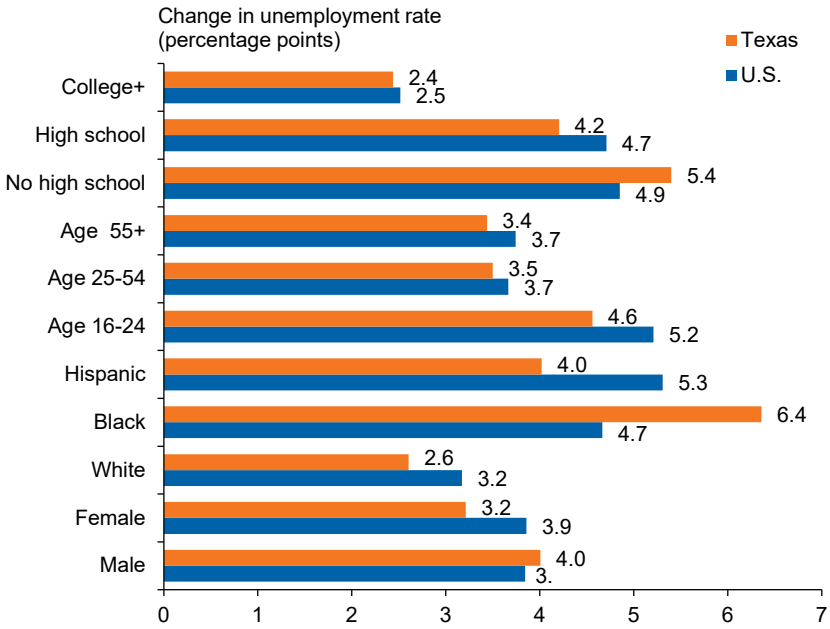
Texas' slightly smaller rise in the unemployment gender gap partly reflects that relatively more women work in industries such as professional and business services, and financial activities—among industries with the lowest unemployment rates immediately after the pandemic's onset.

Black–White Jobless Gap

Pandemic-era changes in the unemployment rate have been uneven across racial groups whose labor market prospects are known to be highly sensitive to economic downturns (*Chart 4*).

After widening during the Great Recession, the Black–white unemployment-rate gap had narrowed to 2.2 percentage points in Texas just before the arrival of COVID-19—somewhat lower than the 3.4 percentage points for the nation. But the gap in Texas nearly quadrupled to 8.4 percentage points, the unemployment rate breaching postwar records as the pandemic unfolded. Compared with Texas, the increase in the gap for the nation was relatively modest.

CHART 3 Black Unemployment Rate Rises Especially Sharply in Texas After COVID-19 Onset



NOTES: The chart plots the change in the average unemployment rate between the pre-COVID-19 period (December 2019–February 2020) and COVID period (March 2020–August 2021). "White" includes non-Hispanic white workers only. "Black" includes all Black workers and Black Hispanic workers.

SOURCES: Census Bureau, Current Population Survey; author's calculations

The Black–white unemployment-rate gap in Texas is cyclically more sensitive than in the nation and has remained stubbornly elevated. It continues to exceed pre-COVID-19 levels even in later phases of the pandemic.

Hispanic Gap in Texas

The Hispanic–white unemployment gap is not as pronounced as that for Black workers in both Texas and the U.S.[4] One reason is a larger prevalence of undocumented Hispanic immigrants who do not qualify for jobless benefits. Thus, generous unemployment benefits, which can damp job search efforts and contribute to higher unemployment, were less of a factor in pushing up the Hispanic unemployment rate.

During the initial phase of the pandemic, the Hispanic–white gap exceeded the Black–white gap nationally but not in Texas (*Chart 5*). The outsized impact for Hispanics nationally as the pandemic began is attributable to their greater employment concentration relative to white workers in especially impacted industries and occupations.

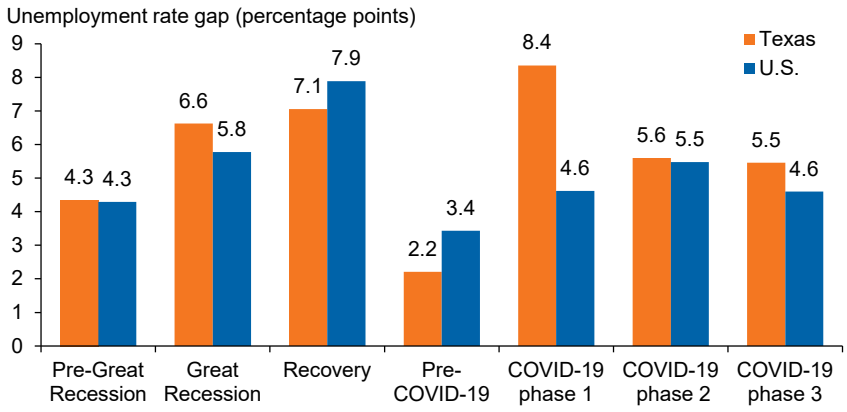
In Texas, the Hispanic–white gap initially remained well below the national gap because relatively fewer Hispanics were employed in the hard-hit leisure and hospitality sector—10.9 percent in Texas versus 12.6 percent nationally. Hispanics also have a larger presence in the state's financial activities sector, which was among those with an especially low unemployment rate following COVID-19's onset.

Persistent Inequities

Charts 4 and 5 show that, unlike the gender gap situation, racial differences in unemployment are more persistent. Each additional spell of joblessness affecting long-term labor market prospects feeds into more persistent wage and income gaps.

Racial minorities—in particular, those who are Black and Hispanic—generally face greater financial hardship relative to those who are white even during periods of relative economic prosperity. Just 14 percent of Black families and 10 percent of His-

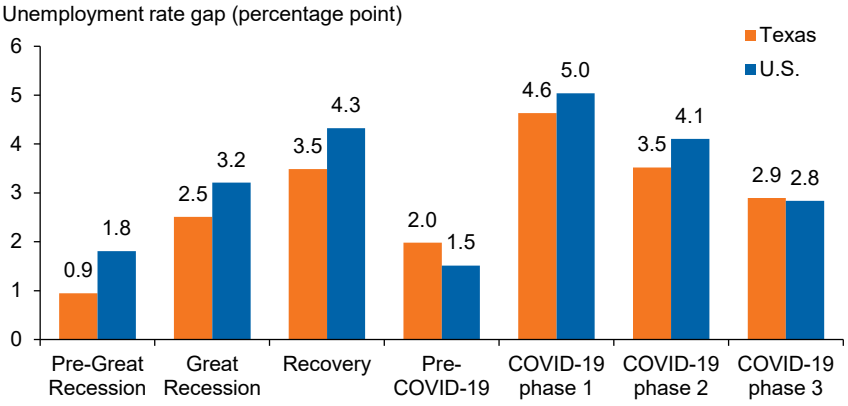
CHART 4 Black–White Unemployment Rate Gap Widens More in Texas than U.S at COVID-19 Onset



NOTES: The unemployment gap is calculated by subtracting the white unemployment rate from the Black unemployment rate. Pre-Great Recession refers to June 2007–November 2007. Great Recession refers to December 2007–June 2009. Recovery refers to July 2009–June 2012. Pre-COVID-19 refers to December 2019–February 2020. COVID-19 phase 1 refers to March 2020–May 2020. COVID-19 phase 2 refers to June 2020–December 2020. COVID-19 phase 3 refers to January 2021–September 2021.

SOURCES: Census Bureau, Current Population Survey; author's calculations.

CHART 5 Hispanic–White Unemployment Rate Gap Widens Less in Texas than in U.S. During COVID-19



NOTES: The unemployment gap is calculated by subtracting the white unemployment rate from the Hispanic uemployment rate. Pre-Great Recession refers to June 2007–November 2007. Great Recession refers to December 2007–June 2009. Recovery refers to July 2009–June 2012. Pre-COVID-19 refers to December 2019–February 2020. COVID-19 phase 1 refers to March 2020–May 2020. COVID-19 phase 2 refers to June 2020–December 2020. COVID-19 phase 3 refers to January 2021–September 2021.

SOURCES: Census Bureau, Current Population Survey; author's calculations.

panic families had enough liquid savings to cover six months of household expenses in case of a potential job loss, compared with 36 percent of white families, according to a recent study based on 2016 data from the Survey of Consumer Finances.[5]

Such stark differences in liquid savings have long existed alongside a persistent wealth gap between white and Black/Hispanic households. Median household wealth was $24,100 for Black families and $36,200 for Hispanic families in 2019, significantly less than the $188,200 for white families, according to a Federal Reserve Board report.[6]

Higher rates of joblessness for minorities during economic downturns can compound such financial disparities. A renewed public policy focus to reduce the unemployment-rate gap could be beneficial because most of the economic and fiscal stimulus programs that supported vulnerable Americans during the COVID-19 economic crisis have ended even as Black and Hispanic households still face considerable financial challenges absent rapidly improving labor market prospects.

What's Behind the Gap?

The occupational distribution of employment for Black and Hispanic workers is the most important factor affecting racial disparity in pandemic unemployment rates in the U.S. and Texas.[7] There's a greater prevalence of Black and Hispanic workers in low-skill jobs, typically the most vulnerable positions.

At the same time, minorities had more limited access to remote-compatible jobs and worse health outcomes from COVID-19. Even after accounting for these factors, a substantial part of the Black–white and Hispanic–white wage gap remains unexplained. Discrimination may also play a role.

A larger increase in the Black–white unemployment-rate gap due to COVID-19 in Texas is difficult to reconcile with differences in industry/occupational distribution or educational attainment of Black workers in Texas vis-à-vis the U.S. In Texas, Black workers are less likely to be employed in industries hard hit by COVID-19's impact and have higher educational attainment than in other states on average.

For example, a relatively smaller share of Black workers in Texas were employed in the three major sectors with the highest COVID-19-related unemployment rates—leisure and hospitality, other services, and wholesale and retail trade.

Other employment characteristics—notably, fewer Black workers in essential services or remote-compatible jobs and a greater number in high-contact industries in Texas—could explain the sharper rise in unemployment rates, though state-level data on these job attributes by demographic segment are scarce.

There are, however, signs that the Black–white unemployment-rate gap in Texas has narrowed considerably. In the most recent three months ended in September, the gap was smaller in the state than in the U.S.—an indicator of improvement amid ongoing job growth here.

(Continued on the back page)

A Conversation with Tyson Tuttle

Semiconductors Key to Global Growth; Geographic Supply Risks Loom

After nearly 25 years with Silicon Labs in Austin, Tyson Tuttle will retire at year-end 2021. He began his career as a chip designer, advancing through engineering and management positions to eventually lead the global semiconductor company. He shares his insights on current issues in the industry and the challenges and opportunities that lie ahead.

Q. To begin, what are semiconductors, and why are they so important?

Semiconductors are the heart of every electronic device and are critical components in the global economy. The U.S. has been a leader in the semiconductor industry ever since semiconductors were invented here, with Texas Instruments playing a key role. Semiconductors are the fourth-largest U.S. export, and this year, output in the industry will exceed $500 billion.

Moore's Law states that every two years producers can fit twice as many devices on a semiconductor chip. Essentially, this has played out ever since 1965. Today, producers can get a million times more devices on a semiconductor chip than in 1986. This has been driving computing power. Every year, however, this dramatic improvement gets more difficult to achieve, and some in the industry are questioning how long it can last.

Whether it's cars, industrial machines, computers, mobile phones, data centers, computer networks or appliances, the internet of things is connecting just about everything in our lives and economy, making devices smarter and more useful. For at least the past several decades, this [transformation] has been spreading across the world and driving a global transformation of the economy and improving lives and productivity.

Q. There have been notable shortages of products that rely on semiconductors in the past year. What happened, and when will shortages likely ease?

Coming into the pandemic, semiconductor capacity was nearly full. Once the pandemic hit, there was increased need for automation and connectivity, which led to a surge in demand for things like personal computers, mobile devices and data centers. The pandemic basically accelerated the demand for semiconductors by two to five years.

The February deep freeze in Texas also played a role in the shortage, as four large semiconductor plants in the state shut down, causing about two to three months of lost production and resulting in more than $100 billion in lost gross domestic product globally. This downtime impacted many industries, but it hit the U.S. automotive industry particularly hard. Currently, the semiconductor industry is only able to ship about two-thirds of demand, and this shortage will likely persist until we get more capacity built.

It takes about 18 months to expand a semiconductor factory and more than three years—at a cost of early $20 billion—to build an advanced semiconductor factory. It will be the end of 2022 before we see a significant increase in semiconductor manufacturing capacity. Due to the large capital expenditures needed and a slowing of Moore's Law, semiconductor prices, which typically fall 5 to 7 percent a year, are increasing 20 to 30 percent. Given the amount of products that use semiconductors, the rise in semiconductor prices is a concern for overall inflation over the next year or so.

Q. You have been with Silicon Labs since 1997. How has the industry changed, and where is it headed?

Overall, we are in an era where semiconductors are becoming more and more important. They are becoming an ever-increasing share of the economy and a larger portion of the content of many products. If you look at how things have changed, there are a couple of key trends: consolidation—moving production from components to systems—and vertical integration.

As the industry has matured and mergers and acquisitions have occurred, there are half as many public companies as there were 10 years ago. Also, a lot of companies in the '60s, '70s and '80s divested their semiconductor businesses, including Motorola (Freescale), AT&T (Agere, Broadcom), Philips (NXP) and Siemens (Infineon).

Now, we are seeing more large companies producing their own semiconductors. For example, Apple, Google, Facebook, Amazon and Tesla are producing their own semiconductors where they control the whole system, including the software and hardware. This is leading to a lot of system-level integration and innovation, focusing on how the entire product is built versus just individual components.

Q. When you think about the industry and its challenges, what tends to worry you the most? What gives you the most hope?

The biggest challenge is related to geopolitics—in particular, how it relates to China. The question is, are we going to separate our industry supply chains and standards from China? Our industry has worked hard on global standards so that components work with each other and

Technology increases the access to and lowers the cost of information and brings opportunity to the masses—not just the wealthy. Technology can bring a lot of people out of poverty.

parts are interchangeable across a global environment. If we separate Chinese production and there is bifurcation of components, depending upon where the product is built, it will be a big challenge.

Another issue is the concentration of manufacturing in Taiwan. Taiwan has about 50 percent of the world foundry capacity and 90 percent of the most-advanced processing technology. The weakest link in the global supply chain is a few semiconductor factories in Taiwan.

If you think about the Cold War, it was nuclear missiles that were our mutually assured destruction; today, it is the semiconductor manufacturing base in Taiwan. If we lose access to Taiwan or China loses access to Taiwan, it could lead to a global depression where the production of homes, autos, computers and other products containing electronics would be dramatically reduced. It would make the current semiconductor shortage pale by comparison. We need to work with China in a judicious and constructive way; the global economy is at stake.

Cybersecurity is also a big concern as everything becomes interconnected. There are bad actors out there seeking to profit from hacking into communication and data systems. There are currently a lot of efforts to track these hackers and mitigate the risk, but it is something that everyone needs to be cognizant of. We need to have more regulation and policy to safeguard our systems and data.

In terms of hope, I am an optimist at heart. Technology and semiconductors have greatly improved our lives and enabled huge productivity gains. In the future, technology will play an even larger role in our economy and will continue to improve human enlightenment. Technology increases the access to and lowers the cost of information and brings opportunity to the masses—not just the wealthy. Technology can bring a lot of people out of poverty. We should continue to strive as a society to make sure that the benefits are well-distributed across income groups and other demographics.

The disruption of the economy is happening at a faster pace, and so we need to think about lifelong education, and how do we educate the workforce of the future? The increase in job churn over the current generation of workers will increase further and, thus, we must focus on education and making sure a high-quality education is available to all.

Q. Silicon Labs is among a host of technology companies that began in Austin. Why have so many high-tech companies started in or moved to Austin?

We just lost one of the pioneers of the high-tech industry in Austin; [Texas power broker and attorney] Pike Powers just passed away. He brought many high-tech companies to this area including Tracor, IBM and Motorola. A lot of companies that have come to Austin were attracted by the quality of life and the talent the University of Texas, Texas A&M and other universities in the region produce. The reasonable taxation, cost of living and regulatory environment in Texas have also played an important role in attracting firms and workers.

The region has a strong entrepreneurial and start-up culture along with a thriving venture capital industry that helped create companies like National Instruments and Dell. The number of high-tech companies has grown dramatically with companies like Silicon Labs, AMD, Oracle and Tesla, and major outposts from Silicon Valley.

Q. What challenges does Austin face to keep attracting high-tech companies?

We face challenges in many areas including affordability, infrastructure, workforce issues and keeping Austin and Texas as attractive places to do business. Going forward, as population density and housing prices increase further, we will face greater challenges retaining our attractiveness. We must work hard to be a place where individuals and firms want to be.

Fundamentally, if the cost of living is too high and people can't get around, the growth will go somewhere else. While we have a transportation system that has worked up until now, we need to look at areas across the world for how to make the economy of the future work. If we build and improve the infrastructure and provide policies that ensure a certain amount of affordable housing, Austin's population could double in size in the next 25 years. It's going to be a challenge, but Austinites are proud, smart and determined to make sure we remain one of the greatest cities on the planet.

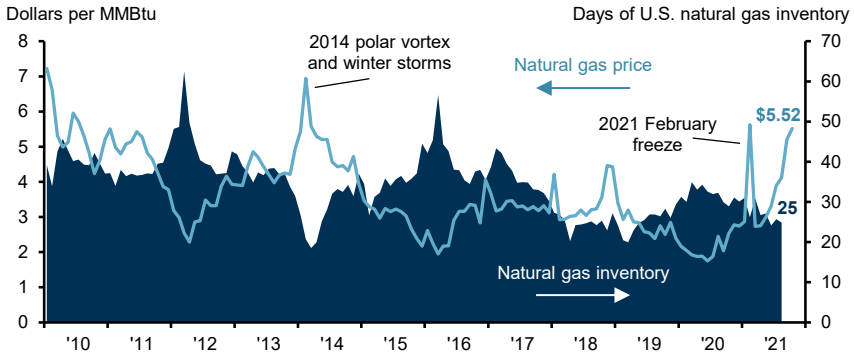
Natural Gas Demand Recovers, Lifts Prices

By Jesse Thompson

Global demand for U.S. natural gas has risen as many pandemic-induced limits on economic activity have been lifted, but domestic production has only slowly recovered.

Inventories of natural gas have fallen, while exports have risen. With domestic consumption and exports at or near record highs and capital spending by oil producers anemic, U.S. natural gas prices climbed to $5.52 per million British thermal units (MMBtu) in October, the highest sustained price level since 2010. Despite subsequent price weakening, U.S. consumers could face increased heating costs should winter temperatures plummet and inventories remain tight.

CHART 1 Real Natural Gas Price Jumps; U.S. Inventories Shrink, Demand Rises



NOTES: MMBtu is an abbreviation for million British thermal units, a measure of natural gas. Henry Hub natural gas price is adjusted to October 2021 prices using the Consumer Price Index. Days of inventory is total U.S. working gas inventories divided by daily domestic consumption and exports, seasonally adjusted. Numbers in parentheses are September inventories and October prices.

SOURCES: Energy Information Administration; Bureau of Labor Statistics.

Production Recovers Slowly

The global pandemic initially decimated oil demand, sending inventories sharply higher.[1] Energy prices subsequently collapsed, and U.S. oil and related gas production followed suit. Since the onset of the pandemic in February 2020, production expenditures have only slowly recovered. U.S. associated gas (natural gas co-produced with oil) remained 1.6 billion cubic feet per day (bcf/d) below prepandemic levels in September 2021, while crude oil production was down 2 million barrels per day (mb/d).

The pandemic only lightly damped U.S. natural gas consumption. Stay-at-home orders and limits on businesses shifted utility and heating demand from commercial users to residential customers. International demand, however, was not as resilient. Liquefied natural gas (LNG) exports fell 60 percent from March to July 2020 and did not recover until November 2020. Since then, demand for LNG has soared as European and Asian markets have struggled with tight energy markets.

A cold winter—punctuated by Texas' February deep freeze and power outage—slowed natural gas production while simultaneously spiking demand. Heat spells in the western U.S. were followed by hurricane-related disruptions to offshore gas production in August. Seasonally adjusted natural gas inventories declined, pushing prices higher.

The shale boom transformed the U.S. into a low-cost natural gas producer in the late 2000s, increasing the export market. Real (inflation-adjusted) U.S. natural gas prices fell from an average of $7.84 per MMBtu in the late 2000s to $3.77 per MMBtu in the 2010s. Prices in 2019 averaged just $2.55. Natural gas production from oil shale basins alone accounted for 35 percent of total U.S. gas supply (*Chart 1*).

Exports are commonly tied to long-term supply contracts—the volume of gas moved doesn't fluctuate much with the price.[2] Pipeline and LNG exports made up more than 18 percent of total U.S. production (18.5 bcf/d) in 2021, up from 5 percent in 2010. New capacity and increased pipeline flows will likely raise that to 22.4 bcf/d by December 2022. To meet further domestic and export demand growth over the next several months, oil production (and the natural gas that comes with it) will likely need to rise.

Pipeline constraints will limit further production growth in the northeastern U.S. In contrast, gas pipelines are expanding to the Gulf Coast from oil-producing regions like the Permian Basin and gas-rich basins such as the Haynesville in East Texas and northern Louisiana.

Still, expenditures for new output remain limited among oil and gas producers recovering from losses incurred in recent years. The producers may be reticent to invest given their focus on investor returns, pending methane regulations to curb greenhouse gas emissions and other regulatory challenges.

The Energy Information Administration recently projected the U.S. would add nearly 4 bcf/d of gas production by fourth quarter 2022—half of that dedicated to export. The increase would provide some relief. Nonetheless, prices could remain elevated absent more moderate weather during 2022.

Notes

[1] "COVID-19 Tanks U.S. Fuel Consumption, Prices," by Olu Eseyin and Jesse Thompson, Federal Reserve Bank of Dallas *Southwest Economy*, Second Quarter, 2020.

[2] "LNG Markets Unleashed: How Texas Stands to Benefit," by Darcy Taj and Kunal Patel, Federal Reserve Bank of Dallas *Southwest Economy*, Third Quarter, 2017.

GO FIGURE

Pandemic, Remote Learning Undo STAAR Test Gains; Texas Student Scores Slide

Design: Justin Chavira, Olumide Eseyin; Content: Christopher Slijk, James Lee

Hispanic and Black students' scores on the 2021 exam fell more than those of white students and reversed previous years' gains.

State of Texas Assessments of Academic Readiness (STAAR) Results

2021 REPORT CARD

Percentage-point change in students who passed

	Remote*	In-person
Hispanic	**-20**	-5
Black	**-16**	-5.5
White	-8.4	-3.5
Other	-5	-1

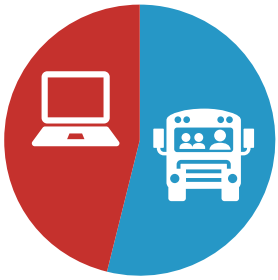
65%

of Texas students in grades 3-8 are Hispanic or Black.

Large share of students remote as of fall 2020

46% Remote

54% In-person



Factors affecting remote learners include:

- Reduced control over learning environment
- Inadequate technology/infrastructure

The decline in academic achievement due to the pandemic could affect the future of the Texas workforce and widen racial and ethnic inequality if losses are not quickly reversed.

*Remote (in-person) refers to students in school districts with less than 25% (more than 75%) of students on campus as of October 2020.
NOTES: STAAR scores are not available for 2019-20 school year due to the COVID-19 pandemic. The 2021 report card shows percentage-point change in students receiving an "approaches grade level" score or better as compared with 2019.
SOURCES: Texas Education Agency; "Pandemic Schooling Mode and Student Test Scores: Evidence from U.S. States," Clare Halloran, Rebecca Jack, James C. Okun and Emily Oster, National Bureau of Economic Research, Working Paper no. 29497, November 2021.

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Texas Joblessness Persists Above U.S. Rate, Weighing on Black, Hispanic Workers

(Continued from page 11)

Kumar is an economic policy advisor and senior economist in the Research Department at the Federal Reserve Bank of Dallas.

Notes

[1] The gap between Texas and the U.S. in the pre- versus post-COVID-19 average unemployment rates calculated directly from Current Population Survey data differs from the gap in averages based on the official unemployment rate.

[2] To avoid month-to-month volatility in the Texas unemployment rate for different demographic groups, the rates are averaged over multiple months.

[3] "Effects of the COVID-19 Recession on the U.S. Labor Market: Occupation, Family, and Gender," by Stefania Albanesi and Jiyeon Kim, *Journal of Economic Perspectives*, vol. 35, no. 3, 2021, pp. 3–24.

[4] "How Foreign- and U.S.-Born Latinos Fare during Recessions and Recoveries," by Pia Orrenius and Madeline Zavodny, *The Annals of the American Academy of Political and Social Science,* vol. 695, no. 1, 2021, pp. 192–206, https://doi.org/10.1177%2F00027162211028827.

[5] "Disparities in Wealth by Race and Ethnicity in the 2019 Survey of Consumer Finances," by Neil Bhutta et al., *FEDS Notes*, Sept. 28, 2020, www.federalreserve.gov/econres/notes/feds-notes/disparities-in-wealth-by-race-and-ethnicity-in-the-2019-survey-of-consumer-finances-20200928.htm.

[6] "Changes in U.S. Family Finances from 2016 to 2019: Evidence from the Survey of Consumer Finances," by Neil Bhutta et al., *Federal Reserve Bulletin*, vol. 106, no. 5, www.federalreserve.gov/publications/files/scf20.pdf.

[7] "Early Evidence of the Impacts of COVID-19 on Minority Unemployment," by Kenneth A. Couch, Robert W. Fairlie and Huanan Xu, *Journal of Public Economics,* vol. 192, no. 104287, 2020.

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