Federal Reserve Bank of Dallas

FOURTH QUARTER 2022

Southwest Economy

Less-Tight Labor Market Helps Texas Grow Faster than U.S. During Pandemic

PLUS

GO FIGURE

If Texas Were a Country ...

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State conducts business on an international scale

15th largest world economy*

5th largest oil producer

19th largest global exporter

Texas is comparable to entire countries—and so are some of its urban areas.

GDP*

Texas **$2.02** trillion

Canada **$1.99** trillion

Dallas–Fort Worth **$535** billion

Austria **$523** billion

Exports

Texas **$342** billion

Taiwan **$350** billion

Houston **$94.8** billion

Norway **$92.8** billion

Oil

Texas **4.8** million b/d

Iraq **4.1** million b/d

Permian Basin **3.5** million b/d

Mexico **1.9** million b/d

Population

Texas **29.5** million

Venezuela **28.7** million

Houston **7** million

Libya **6.9** million

*Ranking is based on purchasing-power-parity adjusted 2021 GDP, a way of comparing economically differing nations.
NOTES: State and global data are as of 2021. Metro and regional data are as of 2021 for population, GDP and oil production. The abbreviation b/d refers to barrels per day. Permian Basin calculation is for Texas only. For population and GDP, Houston and Dallas–Fort Worth refer to the respective metropolitan statistical areas.
SOURCES: GDP—Bureau of Economic Analysis and the World Bank; exports—International Monetary Fund, Census Bureau, and the Federal Reserve Bank of Dallas; oil production—Energy Information Administration; population—Census Bureau, American Community Survey and the World Bank.

Less-Tight Labor Market Helps Texas Grow Faster than U.S. During Pandemic

By Anil Kumar

ABSTRACT: Data from the Job Openings and Labor Turnover Survey (JOLTS) indicate that Texas and the U.S. have more openings than people to fill to them. However, the vacancy–unemployment ratio suggests that the state's labor markets are less tight than the nation's. Amid widespread reports of worker shortages, Texas' not-so-constricted labor markets have helped the state outpace the nation in job growth.

The Texas economy continues to grow faster than the U.S. economy, even though the state unemployment rate often exceeds that of the nation—an apparent paradox.

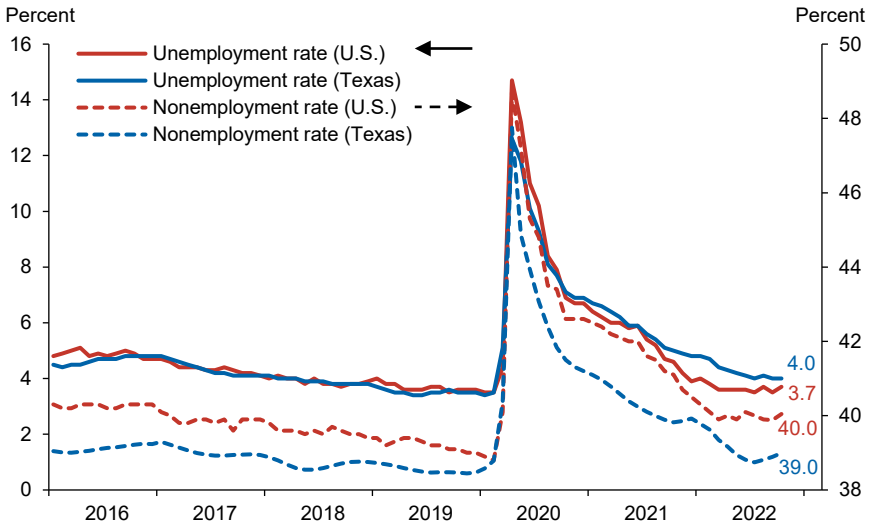
Payroll employment expanded at a 5.3 percent annual rate through the first 10 months of 2022, compared with 3.3 percent for the nation, according to the Bureau of Labor Statistics. Thanks to its significantly faster job growth, Texas is 5.1 percent above its prepandemic employment levels, while the U.S. is 0.5 percent above its prepandemic peak.

Despite the state's less-severe COVID-19-related economic contraction in early 2020 and stronger recovery, the Texas unemployment rate was 4.0 percent in October—0.3 percentage points above the U.S. rate of 3.7 percent (*Chart 1*). While the higher unemployment rate suggests that labor market conditions in Texas are somewhat less favorable than in the nation, the jobless measure may be too narrow. Specifically, it doesn't account for workers outside the labor force, such as retirees and discouraged workers.[1]

Texas' unemployment rate may be higher partly because workers, encouraged by more robust job growth, have entered the labor force at a faster clip than in the nation. Due to a stronger economy, Texas also attracts workers from other states in search of jobs, adding to the size of the labor force.[2]

Not surprisingly, the labor force participation rate, which was 63.4 percent in both Texas and the U.S. before the pandemic, has improved to 63.6 percent in Texas, while nationally it still lags behind at 62.2 percent. In fact, counting both unemployed workers and those out of the labor force as a

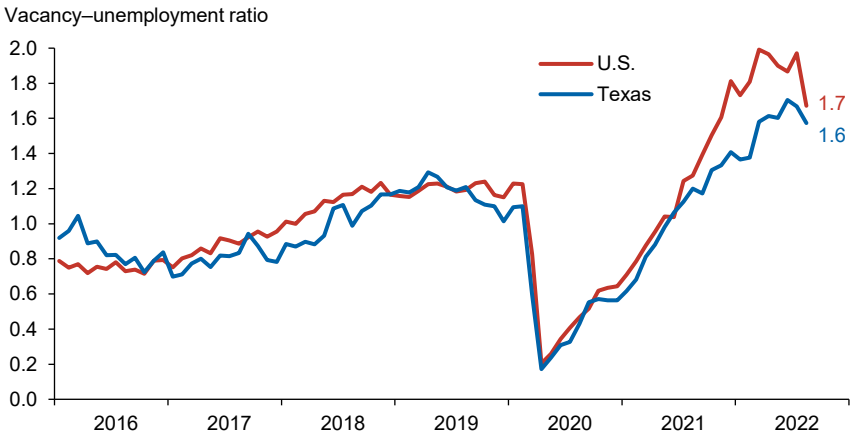
CHART 1 Unemployment Rate Higher in Texas, Nonemployment Rate Lower



NOTES: Data are through October 2022. Nonemployed workers are individuals either unemployed or out of the labor force.

SOURCE: Bureau of Labor Statistics.

CHART 2 Fewer Vacancies per Unemployed Worker Reflects Less-Tight Labor Market in Texas



NOTE: Data are through August 2022.
SOURCE: Bureau of Labor Statistics.

share of the population, the nonemployment rate for October 2022 is lower in Texas at 39.0 percent than in the U.S. at 40.0 percent.

Gauging Worker Demand

The unemployment rate and the nonemployment rate are imperfect measures of labor market tightness because they mainly represent the supply of workers and do not capture the demand side of the labor market. For the same number of job seekers, the labor market with a larger number of job openings would be considered tighter.

A more precise measure of labor market tightness should incorporate both the demand and supply sides of the labor market. Previous research has considered a number of potential measures of labor market tightness.[3]

One that stands out as a predictor of wage growth is the ratio of job vacancies to the number of unemployed, also known as the vacancy–unemployment ratio. A higher vacancy–unemployment ratio indicates greater demand for labor relative to the supply of available workers.

The vacancy–unemployment ratio for Texas and the U.S. exceeds 1, suggesting that there are more job openings than unemployed workers looking for jobs and that labor markets have been very tight (*Chart 2*). Still, the Texas vacancy–unemployment ratio is lower than the national figure, which means that labor markets are less tight and worker shortages have been less severe in Texas.

Filling Jobs in Texas

Given less-acute worker shortages in Texas, the job-filling rate (the number of hires relative to job openings) has been consistently higher in the state than in the nation (*Chart 3*). The job-filling rate is also considered a proxy for labor market tightness because it indicates how easy it is for employers to fill job vacancies—a lower rate is indicative of tighter labor markets.[4]

Just like the vacancy–unemployment ratio, the job-filling rate rose dramatically at the onset of the pandemic as job vacancies disappeared. But then the ratio fell sharply when the job-openings rate outpaced the hiring rate.

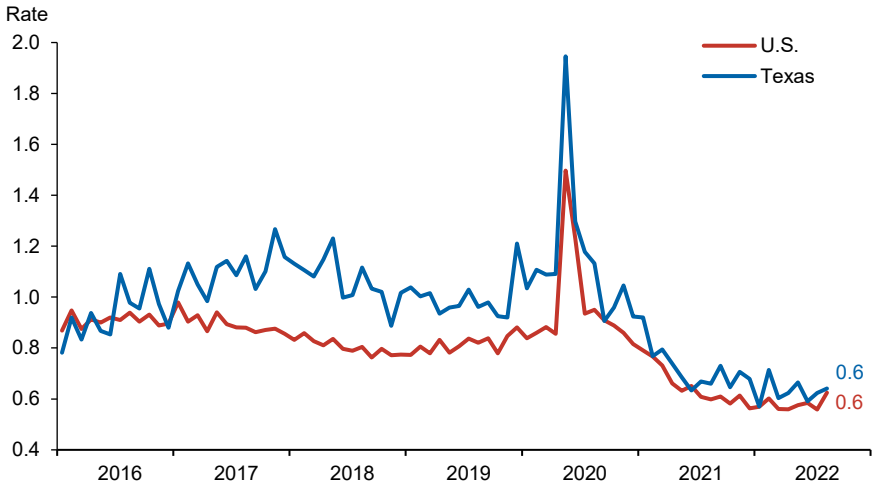
Once again, as with most other indicators, a slightly overall higher job-filling rate in Texas since the pandemic began confirms that labor markets have been less tight than in the nation as a whole. However, the Texas–U.S. gap in the job-filling rate has narrowed relative to prepandemic levels.

Steeper Beveridge Curve

The current level of labor market tightness can provide useful insights into the efficient functioning of the labor market—how well workers are matched to jobs. The ease with which job matching results in job creation depends on the number of vacancies, the number of job seekers and the efficiency of the matching process.

Summarizing this relationship is the Beveridge curve, which depicts the interaction of job vacancies and unemployment that results in the same number of jobs created at a given matching efficiency. The downward slope of the curve reflects the tradeoff between job vacancies and unemployment—when economic activity strengthens, job postings typically rise and unemployment falls.

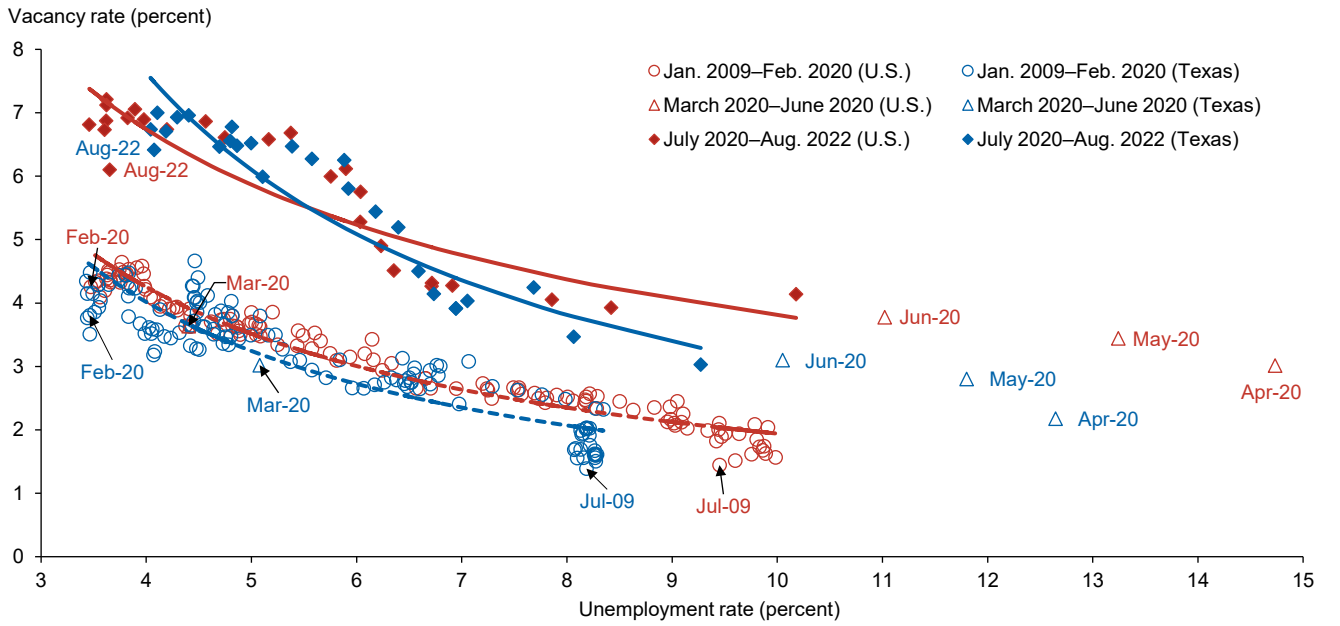
CHART 3 Texas Job-Filling Rate Historically Exceeds U.S. Rate



NOTE: Data are through August 2022.
SOURCE: Bureau of Labor Statistics.

CHART 4

Beveridge Curves for Texas and U.S. Shift Upward with Pandemic



NOTES: Dashed lines show the Beveridge curve before/at the onset of the pandemic; solid lines show the pandemic impact beginning in mid-2020. Data are through August 2022.
SOURCE: Bureau of Labor Statistics.

While movements along the curve capture the impact of cyclical changes in economic activity, shifts are symptomatic of structural changes in the labor market. The position of the curve depends on the matching efficiency and the hiring rate.

Increased hiring due to greater reallocations of workers across sectors would require more vacancies as well as more job seekers, shifting the curve upward. A decline in matching efficiency can similarly lead to an upward shift, resulting in the need for more vacancies amid higher unemployment.

Both these factors have been at play in the large upward shifts in the Beveridge curve during the pandemic in the U.S. and Texas (*Chart 4*). The job-search-and-matching process encountered significant frictions following the labor market churn during COVID-19, leading to more vacancies as well as higher unemployment than before the pandemic (the shift from the dashed to the solid line).

Prolonged weakness in sectors such as leisure and hospitality created a large pool of workers either out of work or looking to switch to other sectors. The resulting reallocation of labor across sectors contributed to the upward shift in the curve.

The sectoral mismatch, among other factors such as an increase in long-term unemployment during the pandemic, also diminished matching efficiency, further amplifying the upward shift in the Beveridge curve.

An estimate of matching efficiency can be obtained from the Beveridge curve relationship using the hiring rate available from JOLTS data and the vacancy–unemployment combinations (*Chart 5*). Before the pandemic, Texas labor markets more efficiently matched workers to jobs than the U.S. market, but the gap narrowed significantly during the pandemic.

With significant frictions remaining in the job-search-and-matching process since the COVID-19 outbreak, matching efficiency remains below prepandemic levels in Texas and the U.S.

Rising Interest Rates

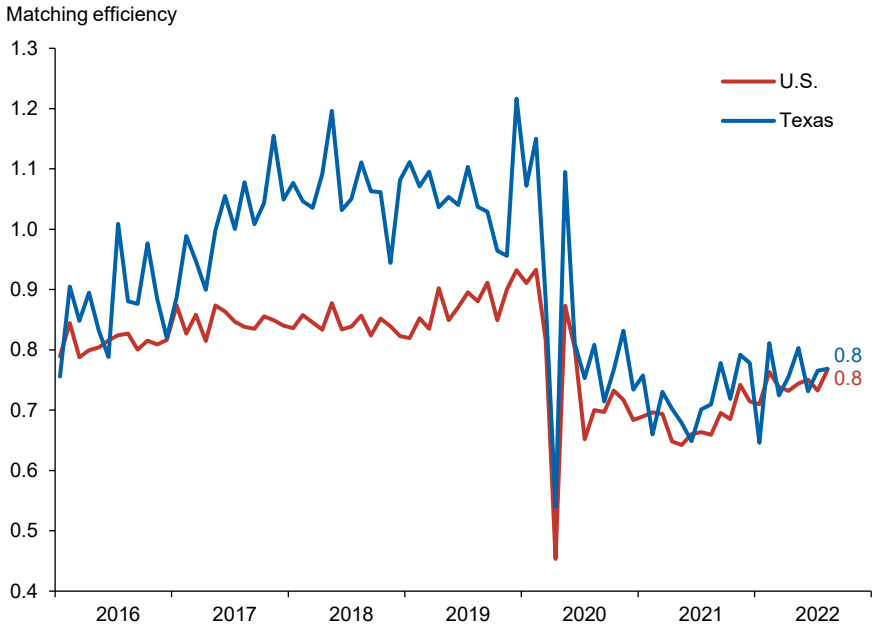
The comparison of the U.S. and Texas Beveridge curves in *Chart 4* suggests that the slope for Texas has been notably steeper than that of the U.S. during the pandemic. The steeper slope in Texas has important implications for the potential impact of recent interest rate increases on the state labor market relative to the U.S.

The sharp rise in interest rates needed to slow inflation has led to concerns that economic activity may weaken significantly, causing large unemployment rate increases and potentially tipping the economy into a recession. However, just how much the economy could weaken and whether a severe downturn can be avoided have been matters of intense debate among economists.

One view holds that with such high vacancy rates and historically low unemployment rates, a decline in vacancies may not trigger a large increase in unemployment.[5] The extent to which unemployment rises as vacancies decline depends on the slope of the Beveridge curve. Thus, a steeper slope in Texas means that for a given decline in vacancies, the rise in Texas unemployment should be less-pronounced, improving the prospects of a soft landing in Texas relative to the nation.

CHART 5

Job-Matching Efficiency Declines with COVID-19 Pandemic



NOTES: The widespread COVID-19 impact began in March 2020. Data are through August 2022. "Matching efficiency" is an index in which higher values indicate more efficient matching; lower vaues less efficient matching. The index is meaningful only in a relative sense.

SOURCE: Bureau of Labor Statistics.

The alternative view is somewhat less-optimistic about the prospects of a soft landing should interest rates continue rising. This is because matching efficiency remains well below pre-COVID levels.[6] Another reason for the less-optimistic view is that Beveridge curve relationships during past monetary tightening cycles do not support relatively muted increases in unemployment following declines in vacancies.

Efficient Unemployment Rate

Recent research has pioneered the concept of a socially efficient unemployment rate to assess whether a given vacancy–unemployment combination on the Beveridge curve should be considered efficient.[7]

Socially efficient unemployment is relevant because both unemployment and vacancies are costly to the economy—the unemployed need to spend time and resources seeking jobs, and firms incur recruiting costs to fill vacancies. Therefore, reducing both unemployment and vacancies would clearly make the economy better off. Unfortunately, the downward sloping Beveridge curve implies that it is not possible to reduce both.

Given the tradeoff, there must exist an efficient unemployment rate that maximizes economic welfare. If unemployment is inefficiently high, the gains from reducing unemployment would exceed the costs of having more vacancies. Conversely, if unemployment is inefficiently low, the costs of higher unemployment would be less than the gains from fewer vacancies.

The efficient unemployment rate is the only rate for which neither an increase nor a decrease in the rate would make the economy better off.

The socially efficient unemployment rate is inversely related to the slope of the Beveridge curve. This means that, all else equal, an economy with a steeper Beveridge curve can have relatively higher efficient unemployment because the additional costs of higher unemployment are offset by a relatively larger decline in vacancies.

The Beveridge curve during the pandemic in Texas has been steeper, so the socially efficient unemployment rate is likely higher in the state than in the nation. This also means that the state's labor market during the pandemic did not need to be as tight as the nation's for the Texas economy to operate efficiently.

This helps explain why job growth in Texas has consistently exceeded U.S. growth despite the state's higher unemployment rate through much of the recovery from the COVID-19 downturn.

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

Notes

[1] "Texas Joblessness Persists Above U.S. Rate, Weighing on Black, Hispanic Workers," by Anil Kumar, Federal Reserve Bank of Dallas *Southwest Economy*, Fourth Quarter, 2021, www.dallasfed.org/research/swe/2021/swe2104/swe2104c.aspx.

[2] "Migration to Texas Fills Critical Gaps in Workforce, Human Capital," by Diego Morales-Burnett, Pia Orrenius and Madeline Zavodny, *Dallas Fed Economics* (blog), Federal Reserve Bank of Dallas, Nov. 29, 2022.

[3] "What's the Best Measure of Economic Slack?" by Regis Barnichon and Adam Hale Shapiro, Federal Reserve Bank of San Francisco *FRBSF Economic Letter*, no. 4, 2022, www.frbsf.org/economic-research/publications/economic-letter/2022/february/what-is-best-measure-of-economic-slack/.

[4] "Measuring Job-Finding Rates and Matching Efficiency with Heterogeneous Job-Seekers," by Robert E. Hall and Sam Schulhofer-Wohl, *American Economic Journal: Macroeconomics*, vol. 10, no. 1, 2018, pp. 1–32, www.aeaweb.org/articles?id=10.1257/mac.20170061.

[5] "What Does the Beveridge Curve Tell Us About the Likelihood of a Soft Landing?" by Andrew Figura and Chris Waller, Federal Reserve Board of Governors *FEDS Notes*, July 29, 2022, www.federalreserve.gov/econres/notes/feds-notes/what-does-the-beveridge-curve-tell-us-about-the-likelihood-of-a-soft-landing-20220729.html.

[6] "Bad News for the Fed from the Beveridge Space," by Olivier Blanchard, Alex Domash and Lawrence H. Summers, *Policy Briefs*, Peterson Institute for International Economics, July 2022, pp. 22–7, www.piie.com/sites/default/files/documents/pb22-7.pdf.

[7] "Beveridgean Unemployment Gap," by Pascal Michaillat and Emmanuel Saez, *Journal of Public Economics Plus 2*, vol. 2, 2021, https://doi.org/10.1016/j.pubecp.2021.100009.

Texas Economy Rides Wave of Changing Technology and Diffusion of Know-How

By Laila Assanie and Yichen Su

ABSTRACT: Data on patents and employment show that Texas is a major center of innovation and high-tech employment. Texas firms are also intensive adopters of disruptive technologies. The emerging importance of technology has been accompanied by a rapid rise in the skill profile of the Texas workforce. Newcomers contributed to the skills improvement.

When an economy expands, it typically adds workers, capital or both. Texas has grown more rapidly than other states and faster than the nation mostly because it keeps adding people and firms.

Another way to grow an economy is by increasing productivity. Innovation and technological advancement—how people do things—drive productivity growth and, with it, wages and the standard of living.

While Texas is known for its large size and relatively faster growth, its standing as a player in the knowledge economy may not be as readily recognized.

Major High-Tech Player

To many, the Texas story is one of oil magnates and real estate tycoons. But in recent decades, the state has emerged as an innovation and high-tech hub. Defense-related manufacturers turned to civilian applications after World War II, among them the predecessor to Dallas-based Texas Instruments. Electronic Data Systems, founded in 1962, was among the first firms in the U.S. to offer data processing services.

The state grew further during the 1990s internet bubble, when information technology and telecommunications firms flourished in Austin and Dallas. Today, Texas is home to numerous tech firms, including Dell and Oracle, with Austin and Dallas ranking among the most vibrant high-tech centers in the nation.

To many, the Texas story is one of oil magnates and real estate tycoons. But in recent decades, the state has emerged as an innovation and high-tech hub.

Assessing Innovation

Innovation and technological development are challenging to measure, so researchers typically turn to patent- or employment-based metrics to gauge the intensity of such activities.

Patents grant exclusive rights to an inventor for a product or a process that provides a novel way of doing something. Thus, they represent the creation and dissemination of new knowledge. While patents do not capture all forms of innovation, they provide tangible evidence for a wide range of breakthrough activities.

Texas-based inventors accounted for 7 percent of total U.S. patent applications from January 2018 to September 2020, according to U.S. Patent and Trademark Office data (*Chart 1A*). Based on the share of patent filings, Texas ranked second among U.S. states, though the gap between it and No. 1 California is wide.

California accounted for one-fourth of the U.S. total. Moreover, other large states such as Massachusetts and New York rank above Texas after accounting for population-size differences.

Employment-Based Measures

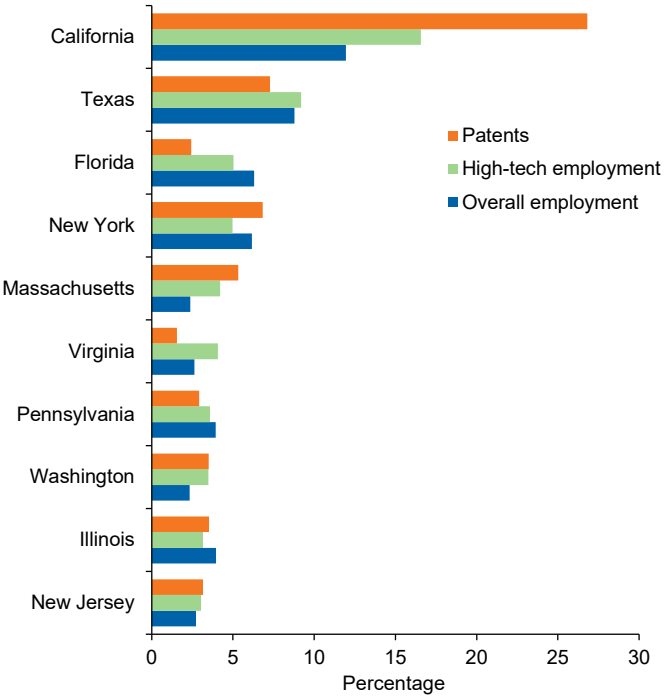
The concentration of high-tech employment within a geographic region provides a second measure of innovation. Research has established the benefits and significance of productivity spillovers from agglomeration—when similar or complementary firms and people locate near one another.

The Bureau of Labor Statistics defines high-tech industries as those with high concentrations of workers in

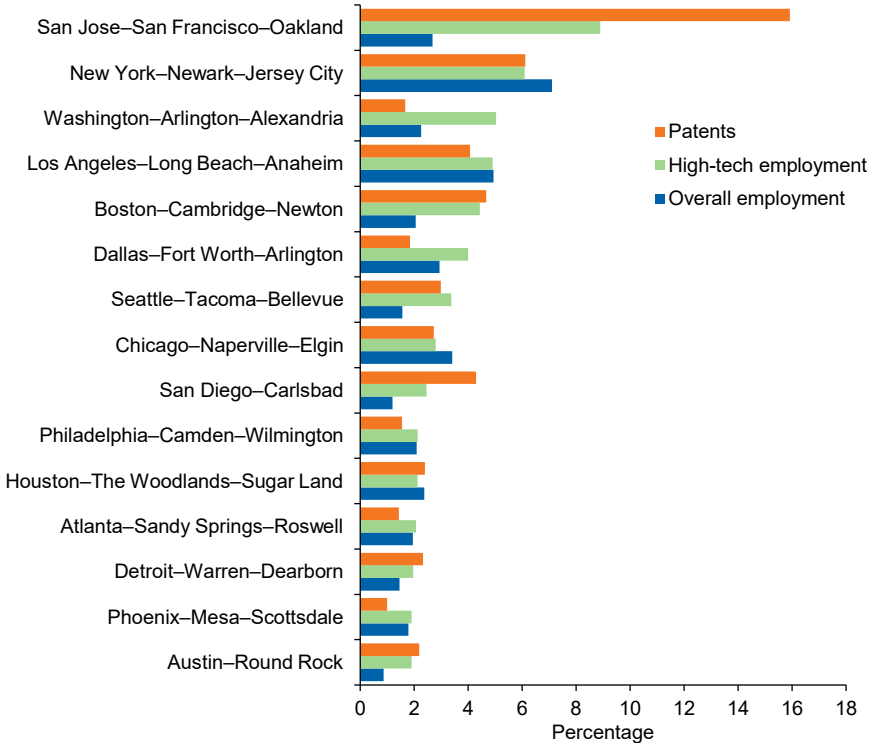
CHART 1

Texas Ranks Second in Patent Filings, High-Tech Employment

A. States with Most Patent Filings, High-Tech Employment



B. Metros with Most Patent Filings, High-Tech Employment



NOTES: Orange bars denote the percentages of patents filed by inventors in the state out of all patents filed nationwide from 2018 to September 2020. Green bars denote the percentage of high-tech employment of all high-tech employment nationwide. Blue bars show the percentages of employment in each locality as a share of the national total.

SOURCES: Patentview; United States Patent Trademark and Office; Quarterly Census of Employment and Wages; Bureau of Labor Statistics.

STEM occupations—science, technology, engineering and mathematics—such as in software development, computer engineering and semiconductor manufacturing.[1]

Texas made up 9 percent of nationwide high-tech employment, slightly exceeding its overall share of U.S. employment. At the metro level, Dallas–Fort Worth (4 percent), Houston (2 percent) and Austin (2 percent) are major centers of high-tech employment (*Chart 1B*).

Most notably, innovation plays an outsized role in Austin as evidenced by the metro's share of both patent filings and high-tech employment relative to its size. Austin makes up less than 1 percent of U.S. employment, but its share of the nationwide patent filings and high-tech employment is twice as large.

Role of Disruptive Technologies

A third measure of technological progress is adoption of disruptive technology—a groundbreaking innovation that either radically changes the way consumers or businesses work or creates a completely new industry. Examples include personal computers that replaced typewriters and transformed the workplace and email, which transformed written communication.

Research shows that even though disruptive technologies tend to be invented and initially used by firms concentrated in a few hot spots such as Silicon Valley, over time, these technologies slowly become available to companies elsewhere amid more widespread adoption.

Texas has been a major beneficiary of these highly disruptive technologies' diffusion. Online job ads that include keywords such as "cloud computing," "neural networks," "antibody-drug conjugate" and "autonomous cars" are one way to measure the degree to which Texas companies adopt new technologies.[2]

By this measure, Texas businesses tend to adopt cutting-edge technologies quickly, even if they are initiated elsewhere. Chart 2 shows the share of the nation's jobs associated with the

selected set of disruptive technologies (initiated around the 2010s decade) at the state and metro level. (For more information about job categories, see sidebar, "Leading Industries Accounting for High-Tech Employment.")

In 2012, a sizeable share of disruptive tech jobs nationwide was located in California (29 percent), particularly in the San Francisco Bay Area (13 percent). Over time, jobs requiring familiarity with or usage of these same technologies became more prevalent in Texas (*Chart 2A*).

As California's share of these jobs dropped to 16 percent in 2022, the share in Texas doubled from 5 percent in 2012 to 10 percent in 2022. Among the major Texas metros, DFW benefited the most with its share of these job ads rising from 2 percent in 2012 to 4.5 percent in 2022 (*Chart 2B*).

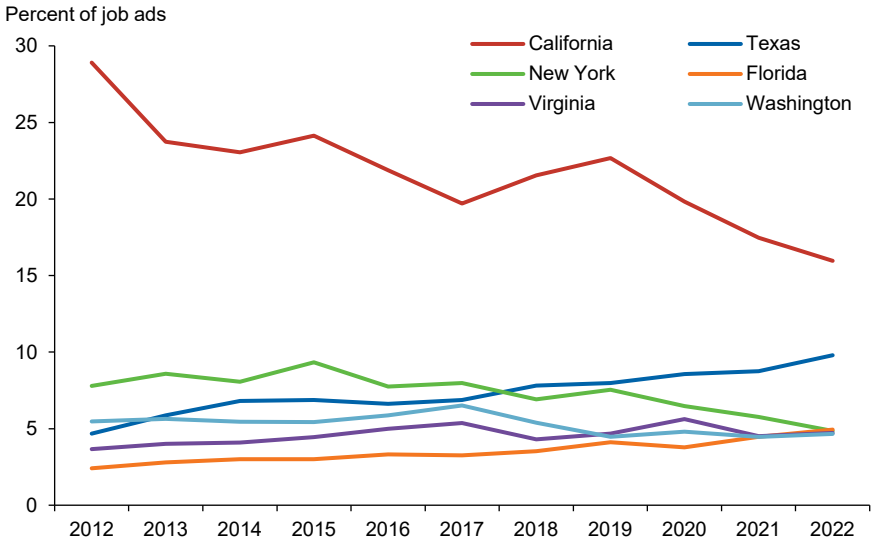
Cloud-computing technology provides an example of such knowledge migration. In 2012, one-third of the jobs associated with cloud computing were concentrated in just two states—California and Washington—while only 7 percent were in Texas. By 2022, as the application of cloud computing vastly expanded, California's and Washington's share of jobs associated with cloud computing fell to 17 percent, while Texas' share increased to 11 percent.

Such diffusion may be organic as companies in Silicon Valley and Seattle specialize in designing and marketing the cloud-computing infrastructure, while many telecommunication, professional and business services, and advanced manufacturing companies in Texas are major users of these technologies.

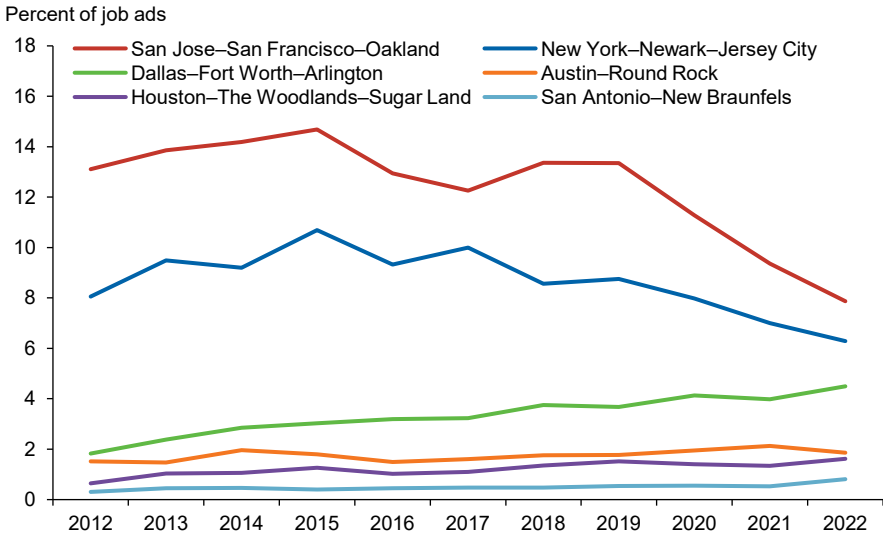
Besides technological diffusion, the relocation and expansion to Texas of numerous high-tech firms such as Oracle, Google and Apple and the opening of new plants and factories in Texas account for some of the growth over the past decade. The state's central location and proximity to Mexico, access to commuter and cargo transportation, relatively low costs of living and of doing business, and clustering have all helped make Texas an attractive place for high-tech firms.

CHART 2 Disruptive Technologies Move from Innovation Centers

A. Disruptive Technologies Disperse from Innovation Center States



B. Disruptive Technologies Move from Metro Innovation Centers to Texas



NOTES: Lines show the percentages of job postings that contain selected keywords indicative of disruptive technologies during the 2010s. Shown values are the annual percentages.

SOURCES: Burning Glass/Lightcast; "The Diffusion of Disruptive Technologies," by Nicholas Bloom, Tarek Alexander Hassan, Aakash Kalyani, Josh Lerner and Ahmed Tahoun, NBER Working Paper no. 28999, 2021.

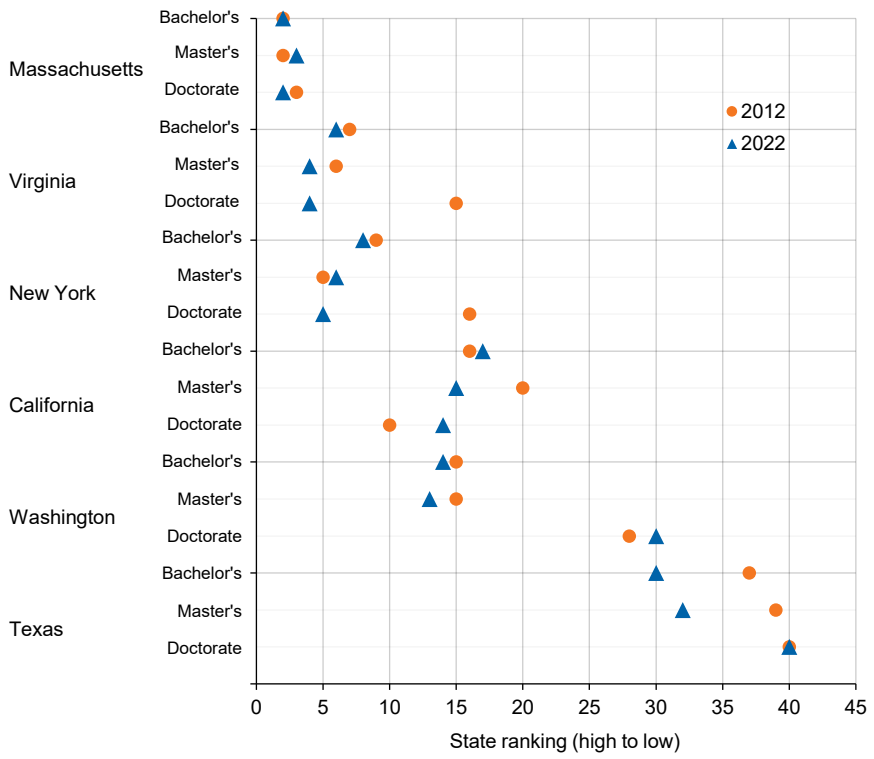
Rising Skill Profile in Texas

With the Texas economy's increasing ties to high-tech, how has the state's workforce kept up with the rising demand for skilled workers? High-tech workers typically have advanced degrees in engineering, mathematics and other STEM fields.

Texas' skill profile has improved over the past decade, though the state still ranks among the bottom half based on the educational attainment of workers ages 25 through 65 (*Chart 3*). Texas ranked 30th among states in the share of such workers with a college degree in 2022, up from 37th in 2012.

The state's ranking for workers with a master's degree also climbed seven places from 2012 to 2022, but its position was unchanged at 40th for those

CHART 3 Texas Labor Force Skill Profile Lagging, but Rising in National Ranking



NOTES: The markers are the state-level rankings of the state share of the workforce ages 25 through 65 with bachelor's, master's and doctoral degrees out of 50 states and the District of Columbia. Blue triangles are rankings based on the average percentages of 2020, 2021 and the first five months of 2022. Orange dots are the rankings based on the average percentages of 2010, 2011 and 2012.

SOURCE: Current Population Survey.

with a doctorate degree. Despite the noteworthy progress, the educational skills gap between Texas and top-ranking states such as California, Massachusetts, New York and Washington remains significant, particularly for workers holding doctoral degrees.

Texas 'Brain Gains'

The remarkable rise in Texas' talent profile is driven partly by an increasing share of natives pursuing higher education but also from the migration of highly educated and trained workers to the state.

Currently, 37 percent of the Texas workforce ages 25 through 65 is college educated (a bachelor's degree or higher), a significant improvement from 31 percent in 2012. A sizable portion (26 percent) of the 6-percentage-point rise can be attributed to becoming a "net importer" of talent (*Chart 4*).[3]

The share is even higher when looking at those with a master's degree. Crucially, immigration to Texas significantly raised the skill profile of the state across all three education levels, particularly among those with advanced degrees. Recent Dallas Fed research shows that domestic and international migrants are filling critical workforce gaps for Texas.[4]

Expanding Knowledge Base

While Texas businesses have been quick to adopt disruptive technology and have made great strides in elevating the state's educational profile and its concentration of high-tech talent, Texas has yet to catch up with the high-tech frontier states.

Nonetheless, the future is promising, assuming that the state continues attracting high-skill workers (including immigrants) and innovative firms. Together, they will further bolster Texas' presence in the knowledge economy.

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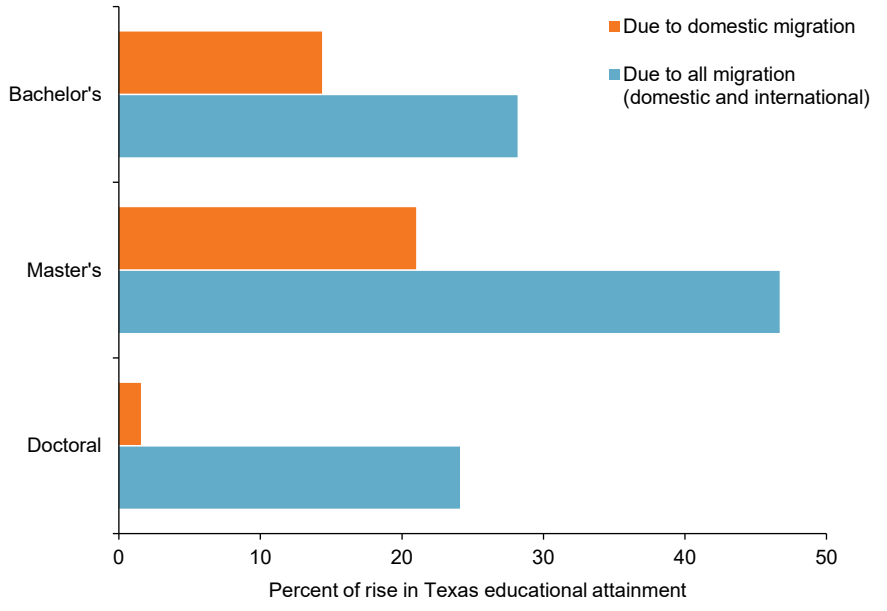
Su is a research economist in the Research Department at the Federal Reserve Bank of Dallas.

CHART 4 Texas 'Brain Gain' Due to Domestic, International Migration



NOTE: The shown values are the percent of the rise in Texas educational attainment shares from 2012 to 2020 that can be attributed directly to net migration to Texas during the period.

SOURCE: American Community Survey.

Notes

[1] The Bureau of Labor Statistics defines high-tech employment as the four-digit North American Industry Classification System (NAICS) code industries that have a high proportion of scientists, engineers and technicians. We only use the high-tech level I industries to compute the shares of high-tech employment (see sidebar, "Leading Industries Accounting for High-Tech Employment").

[2] For more information see "The Diffusion of Disruptive Technologies," by Nicholas Bloom, Tarek Alexander Hassan, Aakash Kalyani, Josh Lerner and Ahmed Tahoun, National Bureau of Economic Research Working Paper no. 28999, November 2021.

[3] The migration-driven rise in educational attainment is calculated by adding the annual net migration to Texas from 2012 to 2020 of the working-age population by education level to the observed Texas workforce in 2012. Since the American Community Survey does not include individuals who have moved abroad from the U.S., only U.S.-bound immigrants are included in the net migration calculation. Outbound emigrants are not included in the calculation.

[4] "Migration to Texas Fills Critical Gaps in Workforce, Human Capital," by Diego Morales-Burnett, Pia Orrenius and Madeline Zavodny, Federal Reserve Bank of Dallas *Dallas Fed Economics*, Nov. 29, 2022, https://www.dallasfed.org/research/economics/2022/1129.

Leading Industries Accounting for High-Tech Employment

The Bureau of Labor Statistics defines high-tech employment as the four-digit North American Industry Classification System (NAICS) code industries that have a high proportion of scientists, engineers and technicians. We only use the high-tech level I industries to compute the shares of high-tech employment. The industries included are:

3254: Pharmaceutical and medicine manufacturing
3341: Computer and peripheral equipment manufacturing
3344: Semiconductor and other electronic component manufacturing
3345: Navigational, measuring, electromedical and control instruments manufacturing
3364: Aerospace product and parts manufacturing
5112: Software publishers
5161: Internet publishing and broadcasting
5179: Other telecommunications
5181: Internet service providers and web search portals
5182: Data processing, hosting and related services
5413: Architectural, engineering and related services
5415: Computer systems design and related services
5417: Scientific research and development services

A job is associated with disruptive technologies if the skills requirements include any of the keywords below. These keywords reference disruptive technologies that arose in the 2010s and do not change over the duration of the analysis (2012–22).

Keywords are: cloud computing, platform as a service (PaaS), cloud security application, cloud security architecture, cloud security data protection and privacy, cloud security infrastructure, cloud security planning, cloud security strategy, cloud security strategy and planning, cloud strategy, object recognition, image recognition, social networking, machine learning, neural networks, natural language processing, unsupervised learning and artificial intelligence.

Also, mobile application design, mobile application programming, mobile applications, mobile platform development, search analytics, search engine optimization (SEO), search engine marketing (SEM), search marketing, video streaming, gaming industry knowledge, social gaming, solar energy, solar energy, hybrid vehicle, electric vehicle, radio frequency identification (RFID), computer vision, mobile banking, virtual reality (VR), augmented reality (AR), unmanned vehicle systems, fuel cell, software defined data center (SDDC), antibody conjugations, therapeutic monoclonal antibodies, monoclonal antibody production, 3D printing/additive manufacturing (AM).

A Conversation with Craig Boyan

H-E-B Seeks Path During Era of Consumer Wariness, Persistently Rising Costs

Craig Boyan is the president of San Antonio-based H-E-B, a south-central Texas grocery mainstay that has expanded to become a growing presence in metro Houston and Dallas–Fort Worth. Boyan joined the company in 2005 and sits on the board of the Food Marketing Institute. He discussed lingering pandemic challenges and operating in a difficult economic environment.

Q. What makes H-E-B different from its competitors?

The grocery industry is a very low-margin industry with real intense competition and some big players. The average grocer only makes one to two pennies on a dollar of sales. That means that the competition is intense. There's a lot of capital and not a lot of profit.

The average grocery company usually chooses to serve a [particular] customer segment. So, we know where Whole Foods is going to be, and which customers and which neighborhoods they're going to serve. We know where the Dollar stores are going to be, where Trader Joe's is going to be.

We've chosen to serve a state rather than a segment of customers; we are trying to serve everybody in areas of Texas (and Mexico). In our markets, that means being successful by reaching every different income level and demographic.

We do that by tailoring our stores, trying to have each store be the best store for a neighborhood with the items that the neighborhood will like most. We also believe we should be multiformat, meaning that in Dallas we have Central Market—and now H-E-B—or in Houston we have Mi Tienda and Joe V's.

Many strategists will say you're either low price or you're differentiated. Whole Foods has high service and quality, but they're also high priced. That's the trade-off people often think of—cost or quality. The Dollar stores are theoretically lower price—although they're not that low—and the quality is not quite as good. Many people think that's the normal trade-off.

Q. Two major national grocery chains have announced plans to merge. What's the impact on a privately held, growing company such as yours?

I'm sure that the risk to many of the smaller companies is that two huge companies [Kroger and Safeway], trying to build on their already huge scale to be even larger, are trying to take advantage of purchasing scale, of headquarters consolidation, benefits and—also importantly in today's world—leveraging scale to invest in digital technology and building larger digital marketing platforms.

You know they're already way bigger than us, and that's only going to put more pressure on companies like H-E-B. That said, we can often find ways to compete locally and have local scale.

In a perishable business, there are also limits to scale. For example, you can't just have one warehouse in the middle of the country to serve food to every corner. So there are some benefits in a highly perishable business to being local.

Q. The pandemic prompted folks to rediscover home cooking and food preparation. How did you manage the increase in volume?

We were trying to handle the wave of extra sales and volume, while at the same time overcoming massive supply-chain shortages and out-of-stock goods. So we did some things that we would rethink in the future; some I think we would do again.

At the height of the pandemic, in some departments, we significantly reduced the amount of SKUs (stock keeping units) we shipped, and we did a lot more pallet shipments. We were able to push a lot more products, especially perishable produce and meat products and key grocery staples, out to the stores.

We also made some decisions that I regret. We shut some departments down, like floral and bakery, so we could use our shipping bandwidth to rush food and staples. We didn't think consumers needed flowers or baked goods immediately. Usually when you walk in, floral is right near the door and bakery and deli are close by. When you walked into our stores, seeing those closed departments added to the panic people felt. We hadn't been through this kind of a pandemic and the fear it created, so I believe that [closing those departments] was a mistake.

Q. How did you maintain a workforce during the pandemic?

We'd already been investing more in pay and benefits before the pandemic. We make all of our employees owners in the company if they're over 18 and have worked 500 hours in the prior six months. And so, those things really helped.

But we felt the "Great Resignation" and the surge of people leaving the workforce. The part of our business where we most felt the staffing crunch was warehousing. Those jobs require a lot of heavy lifting. Sometimes those jobs

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can be at night; we found that was where the staffing shortages hit us hardest.

To combat that, we not only increased our pay—which we had been doing anyway—we put in place hiring incentives, signing bonuses and attendance bonuses so that once you got hired, you would show up for your shift.

We also had to be much more aggressive in marketing our jobs. We've had a couple of big career fairs. People have a lot of choices, and we hadn't previously done as much marketing to urge people to apply, to show them how to apply and how to quickly respond.

We had a temporary worker program, especially for people who were displaced from hotels and hospitality and restaurants. We said, "We will just hire you on a temporary basis." That proved to be a really good program, and many ended up staying on.

Q. Since the pandemic, what has been the impact of rising prices?

This country and certainly our industry have not seen the level of inflation that we're now seeing since the early '80s. This isn't regular inflation; this has been a once-in-a-generation-type inflation.

We have [recently] seen some softening of prices in certain categories—like we all can see at the [gasoline] pump—and declines in cooking oil prices and a few other categories that are commodity based. Cost-of-goods increases are more than we have [previously] experienced, and we work hard to try to manage costs and prices for Texans. Our nexus is the Texan household and Texas families.

We have these high inflation levels, but we still see strong consumption in the U.S. economy and Texas economy.

The thing that gives us great concern is that savings rates have plummeted, and credit card use has skyrocketed. People are tapping into their 401(k)s for more emergency loans. People are getting more advances on their pay.

All economic signs are flashing red about what's coming in 2023—how deep, how long, I don't know. But we have a real concern about the impact on low-income Texans. I urge all economic folks out there to do what they can to help low-income Texans because that really is one of the main drivers of the Texas economy.

Q. What about product availability and costs?

On product availability, we saw the problems with baby formula. We have recently seen real issues with ramen noodles, which is a major staple. We've got a lot of products that are on allocation, where we're getting only a fraction of what we were hoping to get. In these cases, the vendor is not able to manufacture enough product to meet demand.

On costs, eggs are a great example right now. Our price on eggs was somewhere a little over $1 a year ago. Costs have now gone to over $4 for a dozen large eggs, but we have priced them [to consumers] below $4, which means we are losing millions of dollars a month selling eggs. But we do not feel like we can pass on the skyrocketing egg cost to the average Texas family.

Now our [egg] prices are higher; we are trying to be a shock absorber and buffer. This is an unbelievably important staple for all of us, especially for low-income Texans.

Q. How is consumer price sensitivity changing?

We have a very strong own store brand [private label] program. It has historically been what we would call a national brand equivalent. For example, it is our version of corn flakes but a little bit cheaper.

A decade or two ago, we worked hard to develop more unique and distinctive items as well as national equivalent items. We've also got multiple tiers of brands of H-E-B items.

What we have seen during the entire pandemic, and especially the last year with this level of inflation, is a migration from national brands to own brands, and we've grown our own brand share faster than we have grown it in any year that I can remember. We also see people trading down from thicker cuts to thinner cuts and to smaller packages.

Q. How is H-E-B preparing for changes in the economy in the coming year?

We are very concerned about what is coming in the next six to 12 months. We expect a recession or some level of a slowdown.

But we are continuing to invest. We believe in the Texas spirit. We believe in the Texas economy. We want to support our fellow Texans. We are continuing to build stores, and we are continuing to invest in new distribution centers and new manufacturing plants.

Increasing Texas Power Bills: Blame Costlier Natural Gas, Rising Fees

By Jesse Thompson

The cost of keeping the lights on in Texas homes has soared this year, as natural gas prices attained highs not seen since 2008. Real (inflation-adjusted) Texas electricity prices reached an average monthly high of 14.2 cents per kilowatt hour (kWh) in August, up more than 10 percent from the prior year.

By comparison, inflation-adjusted prices nationwide rose 7.7 percent to a high of 15.7 cents per kWh (*Chart 1*). U.S. prices have exceeded those in Texas since 2010.

The cost of fuel is a main reason for the faster growth of Texas power prices. Natural gas prices doubled over the 12 months ended in August to a monthly average of $8.58 per million British thermal units (MMBtu). They subsequently declined to $5.66 in October.

Natural gas provided 44 percent of the state's electric power this past year versus 37 percent nationally. The structure of Texas' power market also allows greater pass-through of costs to customers, as market pricing governs power producers and utilities. Prices are less flexible in more regulated markets that aren't as tied to supply and demand.

Summer power prices were also affected by unusually high temperatures and comparatively low output from renewables—principally wind and solar—resulting in greater amounts of natural gas and coal combustion to meet record demand.

The number of "cooling degree days" in Texas—a type of population-adjusted proxy for how hard air conditioning systems have to work—reached 684 in July, the highest since the devastating summer heat wave of 2011.

Meanwhile, wind and solar power output fell 30 percent from June to August 2022, partly due to normal seasonal patterns and high temperatures that can lower the output from wind and solar facilities.[1] In the 12 months ended August 2022, the two renewable power sources' combined share of Texas electricity production was double that of the nation, with 24 percent of the state's power coming from wind and 5 percent from solar.

However, it's not just fuel costs that have caused sticker shock for Texans as their residential power contracts have come up for renewal in 2022.

The Energy Reliability Council of Texas (ERCOT) has become more conservative in its approach to ensuring the stability of the power grid since it faltered badly during the freeze of February 2021. As a result, substantially more capacity has operated in reserve during high-demand episodes than in previous years.

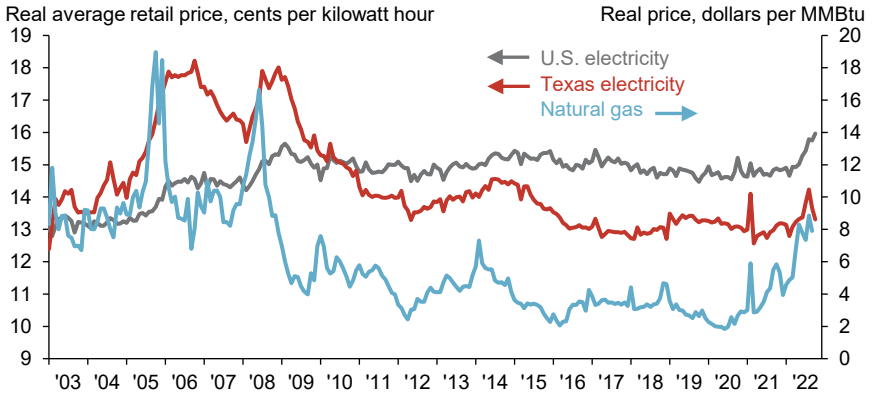
While this strategy can lower the risk of outages, consumers must now pay for it. There were also significant costs associated with losses incurred during the 2021 freeze, which utility companies and ERCOT are attempting to recoup via higher service fees.

Movements in the average retail price paid for power tend to lag big shifts in fuel costs because only a subset of customers enter into new utility contracts at a given time. This means that current prices do not yet fully reflect recent increases in natural gas costs, and the prices Texans pay for power may increase further.

Additionally, a fire at a Freeport liquefied natural gas facility kept nearly 20 percent of U.S. export capacity offline from June through November 2022, which *lowered* the price of U.S. natural gas and helped rebuild domestic inventories.

The return of that export capacity this winter will put more U.S. gas into the high-priced global market. With modest expected U.S. production growth, those exports are likely to keep pressuring higher the amount Texans will pay for heat and power through the winter.

CHART 1 Retail Residential Power Prices Rising as Fuel Costs Jump



NOTES: Electricity data are seasonally adjusted. Prices are deflated to October 2022 prices using the chained-Personal Consumption Expenditures inflation index. Data are for the period from January 2003 to October 2022 and may be subject to revision. MMBtu refers to million British thermal units, a standard unit of measure.

SOURCES: Energy Information Administration; Bureau of Labor Statistics; adjustments by the Federal Reserve Bank of Dallas.

Note

[1] "Wind Generation Seasonal Patterns Vary Across the United States," Energy Information Administration, Feb. 25, 2015, accessed Dec. 1, 2022, www.eia.gov/todayinenergy/detail.php?id=20112.

Texas Metro Unemployment Rates Drop but Remain Above Early 2020 Levels

By Ana Pranger and Pia Orrenius

Unemployment rates across Texas metros have come down quickly since the pandemic recession of 2020, though they remain above preoutbreak levels.

The Texas unemployment rate shot up to 12.6 percent in April 2020 after the sudden loss of over 1.4 million jobs following shutdowns implemented to limit the spread of COVID-19. While the pandemic peak unemployment rate was higher than during the Great Recession, the recent recovery has been faster, with the jobless rate dropping 8.6 percentage points in 29 months (*Chart 1*).

The overall state jobless rate was 4.0 percent in September.

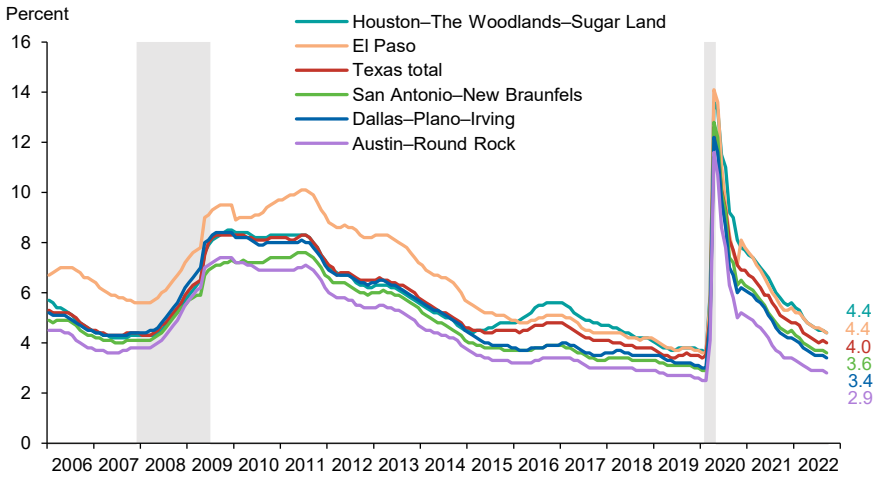
Workers are classified as unemployed when they don't have a job but are actively seeking one. The most cited unemployment rate, U-3, is the number of unemployed workers divided by the labor force (the sum of all workers—employed and unemployed).

The unemployment rate falls as unemployed workers either find jobs or leave the labor force. In Texas' case, the decline is due to the unemployed returning to work, with job growth being very strong. Employment in September was 4.5 percent above the prepandemic level.

Among all Texas metros during the month, McAllen had the highest unemployment rate, 7.1 percent, while Amarillo tied with Austin for the lowest at 2.8 percent.

Before the pandemic, in February 2020, McAllen also had the highest unemployment rate (6.3 percent), while Austin (2.5 percent) had the third-lowest rate and Amarillo (2.4 percent) the second lowest. Midland, in the heart of the oil-rich Permian Basin, had the lowest unemployment rate in February 2020 (2.2 percent). The Midland rate has since risen to 3.2 percent, the fourth lowest in the state and trailing No. 3, College Station, at 3.0 percent.

CHART 1 Texas Unemployment Falls Fast After Pandemic Spike



NOTES: Data are through September 2022. Shaded bars indicated U.S. recessions.

SOURCES: National Bureau of Economic Research; Bureau of Labor Statistics; seasonal and other adjustments by the Dallas Fed.

Assessing Differences

Industry composition and demographics explain many regional unemployment rate differences. Metro areas with large concentrations of thriving, high-wage industries tend to have faster job growth and lower unemployment. Conversely, jobless rates tend to be higher among young and less-educated workers than those who are relatively older or highly educated. Unemployment among Black and Hispanic workers also tends to be higher.[1]

Austin's tech boom has added new high-skill jobs, keeping unemployment low. The border metros, on the other hand, skew younger and less educated, with lots of retail jobs and a lower share of high-tech and professional services employment.

Houston's concentration of energy jobs explains its relatively high unemployment rate. The oil and gas sector is one of two sectors statewide that have not bounced back to prepandemic employment levels. (Government was the other laggard.)

Though Texas employment returned to its prepandemic level by November 2021, the unemployment rate remains above where it stood before COVID. Even with employers continuing to report difficulty finding qualified workers, the jobless rate in all major Texas metros still exceeds February 2020 levels.

One reason is rapid labor force growth through natural increase and migration. Employers are hiring at a rapid rate, attracting still more people to the workforce.[2, 3]

Notes

[1] "Spotlight: Black Workers at Risk for 'Last Hired, First Fired,'" by Aquil Jones and Joseph Tracy, Federal Reserve Bank of Dallas *Southwest Economy,* Second Quarter, 2020, www.dallasfed.org/research/swe/2020/swe2002/swe2002e.aspx.

[2] "Texas Joblessness Persists Above U.S. Rate, Weighing on Black, Hispanic Workers," by Anil Kumar, Federal Reserve Bank of Dallas *Southwest Economy,* Fourth Quarter, 2021, www.dallasfed.org/research/swe/2021/swe2104/swe2104c.aspx.

[3] "Largest Texas Metros Lure Big-City, Coastal Migrants During Pandemic," by Wenli Li and Yichen Su, Federal Reserve Bank of Dallas *Southwest Economy,* Fourth Quarter, 2021, www.dallasfed.org/research/swe/2021/swe2104/swe2104b.aspx.

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