

At the *Heart* of **TEXAS**

Cities' Industry Clusters
Drive Growth



**Featuring Four
Additional Metros**

Amarillo, Beaumont–Port Arthur, Lubbock and Tyler–Longview

A **special report** of the Federal Reserve Bank of Dallas
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At the Heart of Texas:

Overview

With five metropolitan areas of 2 million or more residents, Texas has more big cities per capita than most large U.S. states.¹ Dallas–Fort Worth and Houston rank among the top six largest metropolitan areas in the U.S. in terms of both population and economic output. In fact, Texas is the only state to have two metros in the top 10 for both measures.

The abundance of large cities is an important growth advantage on the state’s list of favorable economic factors: central location, rich oil and gas deposits, well-placed sea and land ports, proximity to Mexico, rapid population growth, low cost of living and relatively light regulatory burden. Thus, it is no surprise that employment has grown a percentage point faster in Texas than in the nation on average and that state gross domestic product growth was nearly twice that of the nation during the economic recovery following the Great Recession.²

Amid this economic expansion and a near 40-year low in unemployment, this second edition of *At the Heart of Texas*, a special report on the historical, economic and demographic profiles of Texas and its key metropolitan areas, builds upon the first edition released in February 2016.

Four smaller Texas metros are new to this edition—Amarillo, Beaumont–Port Arthur, Lubbock and Tyler–Longview. Collectively, they highlight the economic contributions of smaller cities and more rural areas, as well as the importance within the state of certain industries, including agriculture and refining and petrochemicals.

This edition also moves forward the time period under study, focusing on economic developments within Texas and its metros in the 2010–17 post-Great Recession period—a stretch that includes the fracking boom but also the 2015–16 energy bust, which slowed the state’s economic expansion relative to its nonenergy peers. As the state economy slowed notably in 2015–16 due to collapsing oil prices and related exploration activities, metros such as Dallas and Austin with a more diversified industrial base offset weakness in Houston, Midland–Odessa and other energy-producing regions.

Importance of Cities

It is the age of the city. Paradoxically, as globalization put everything and everywhere seemingly within reach, attention has been drawn from national boundaries to these smaller units of civilization. This is not new when taking a longer perspective; after all, cities have been the rock stars of history before, whether it’s Babylon, the cradle of civilization; Athens, the birthplace of democracy; Florence, the origin of the Renaissance; or Birmingham, home of the Industrial Revolution.

Cities were centers of population, commerce, learning, wealth and economic opportunity long before economists explained why agglomeration matters to growth.

Cities are dense areas, with relatively high productivity and wages compared with noncities. The productivity advantage stems from agglomeration, which means firms that co-locate have ready access to a deep labor pool, the easy exchange of ideas and low transportation costs.³ When firms in like industries cluster, they can further leverage the benefits of agglomeration. Examples are Silicon Valley, de facto headquarters of the U.S. high-tech industry, and Houston, home to the bulk of the nation’s oil and gas sector. Harvard economist Ed Glaeser calls cities “mankind’s greatest invention” and argues in a 2011 book that cities have led human progress through the ages by acting as engines of innovation.⁴

Dominant Clusters Power Texas

Characteristics such as location, natural resources and labor force contribute to an area’s long-run economic performance. Industry mix and industry agglomeration are additional important factors. Geographically, groups of firms are concentrated based on the technologies they employ, the markets they serve, the goods and services they produce and the labor skills they require. Such industry clusters are important because they provide their participants (firms) with access to specialized knowledge and/or resources, enhancing

productivity, spurring innovation and attracting new business and investment in the area.⁵

An area typically has an economic base that consists of several dominant industry clusters. These clusters typically exceed the national average in their share of employment, output or earnings. Location quotients (LQs), which compare the relative concentration of industry clusters locally and nationally, are one way of assessing these key drivers in an area's economy. An LQ exceeding 1 indicates that a specific industry cluster is more dominant locally than nationally. In this report, LQs are calculated using industry cluster employment, and industry cluster growth is measured by the percentage-point change in its share of local employment between 2010 and 2017.⁶

The presentation here uses annual employment data from the Quarterly Census of Employment and Wages to compute location quotients. These data are readily available at the metropolitan statistical area (MSA) level and by three-digit-or-higher North American Industry Classification System (NAICS) code, facilitating analysis. Industry cluster definitions are taken from Stats America, with some modifications that are detailed in the appendix. Clusters generally comprise multiple interdependent or interrelated industries or

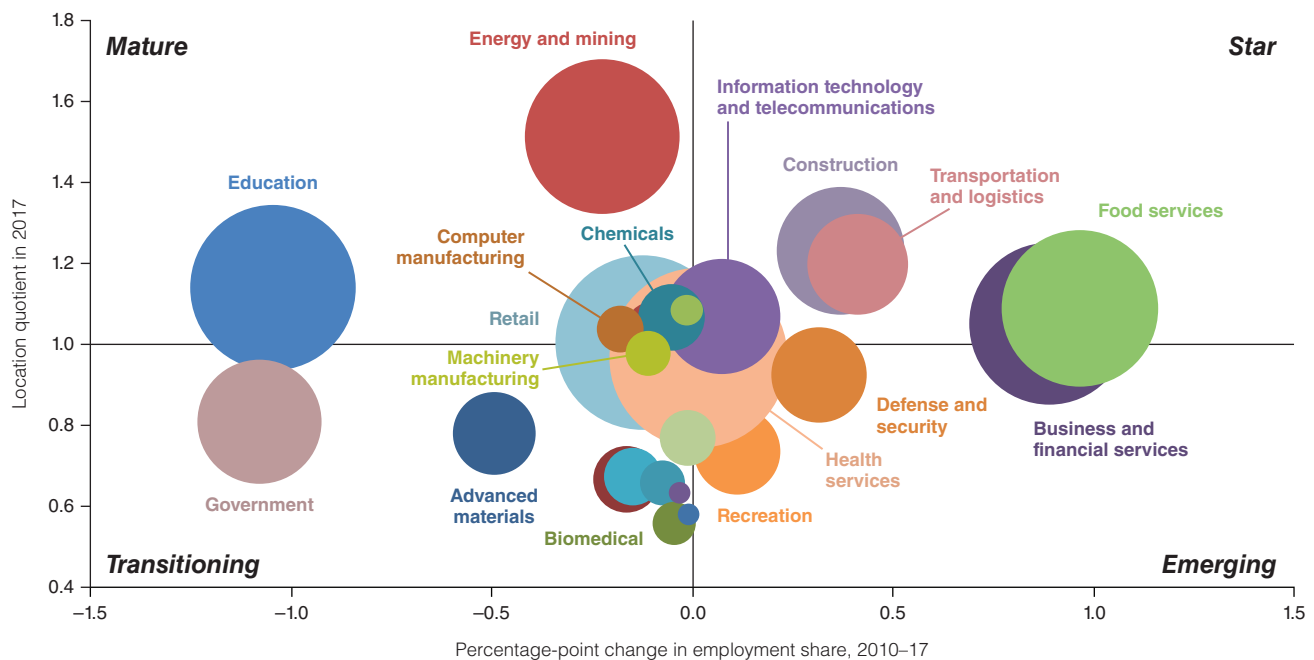
NAICS classifications. The entertainment cluster in Los Angeles and the auto manufacturing cluster in Detroit are examples of such broad groupings that include the main industry and its suppliers and service providers.

Chart 1.1 plots industry cluster LQs and growth for Texas. Clusters in the top half of the chart, such as energy and mining, information technology, business and financial services, construction, and transportation and logistics, are referred to as base clusters. They have a larger share of state employment relative to the nation and, thus, an LQ exceeding 1. A base cluster is usually vital to an area's economy and can be expanding relatively rapidly (star) or growing slowly or declining (mature).

Those in the bottom half are less-dominant locally than nationally. They generally produce services or goods for local consumption and, hence, have an LQ below 1. "Emerging" clusters, such as defense and security, are relatively fast growing, while those growing slowly or declining are termed "transitioning."

Education and health services clusters combine public and private sector employment. Thus, apart from the government cluster, all others comprise only private sector employment.

Chart 1.1: Energy, IT and Business and Financial Services Help Set Texas Apart from Nation



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

Texas' Leading Clusters

Texas has several dominant clusters. An abundance of oil and gas has traditionally made energy-related industries a major cluster—it employs 8.6 percent of the state's workforce and has an LQ of 1.5. Texas' geological makeup includes four shale formations—the Permian Basin, Barnett, Haynesville and Eagle Ford—helping make the state the No. 1 producer of oil and gas in the nation. Texas produces 39 percent of all U.S. crude oil and 23 percent of U.S. natural gas and employs 12.6 percent of the workers in the nation's energy and mining cluster. The employment share of the cluster was little changed from 2010 to 2017, with the head count rising 15 percent (*Chart 1.2*). The slower growth relative to other sectors is due to the time period, which included both the ongoing shale oil boom and 2015–16 energy bust.

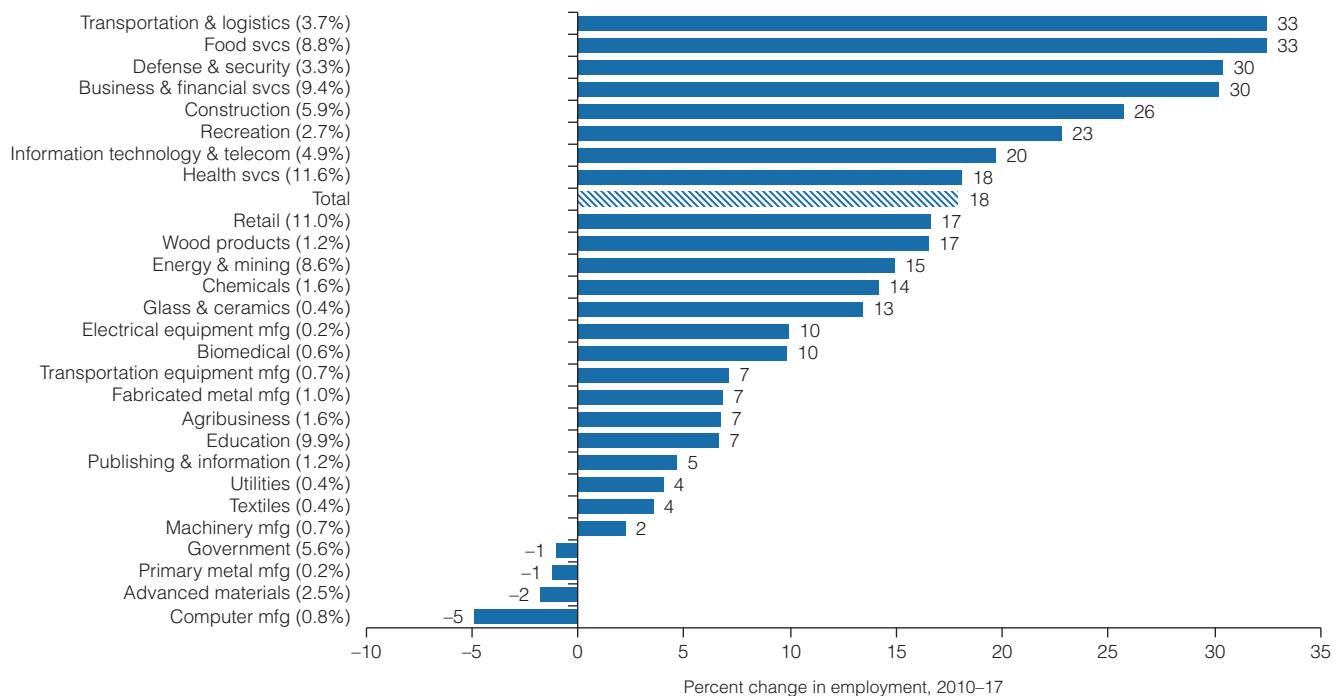
Employment in construction (LQ of 1.2 in 2017) grew rapidly over the period, supported by the energy sector and overall strong economic performance that increased demand for office, industrial and residential space. The downstream energy sector also plays a meaningful role in Texas, which isn't surprising given

the significant presence of refineries and petrochemical plants near the Gulf Coast.

Texas has evolved into a major high-tech hub (LQ of 1.1 in 2017). The industry took off after World War II, as Dallas-based Texas Instruments and other military-electronics manufacturers branched into civil electronics. Texas also flourished during the 1990s high-tech boom, when the IT and telecommunications industries expanded in Austin and Dallas. Employment in the IT and telecom cluster grew about 20 percent in 2010–17 and now represents 5 percent of the state's workforce. Employment in defense and security, with complementary ties to the state's high-tech and energy sectors, also rapidly expanded, rising 30 percent during the period.

Additionally, Texas' central U.S. location and its border with Mexico have boosted the concentration of the transportation and logistics industry (LQ of 1.2). Texas is the largest exporting state in the nation, and it is home to two large commercial airlines, a major railroad and two of the nation's busiest ports—Houston, a seaport, and Laredo, an inland port of entry. Education,

Chart 1.2: Defense and Business Services Among State's Fastest-Growing Clusters



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 1.1: Most Dominant Clusters Pay Better in Texas than in U.S.

Cluster	Texas					U.S.
	2010	2012	2014	2016	2017	2017
Energy and mining	92,568	96,000	96,769	95,219	94,459	80,900
Construction	55,346	57,915	60,684	63,024	63,224	60,742
Transportation and logistics	59,586	62,194	61,913	60,621	60,887	53,761
Education	43,879	42,411	43,504	45,093	45,144	49,322
Utilities	101,073	105,494	103,939	107,291	111,503	107,188
Food services	17,757	17,658	17,798	18,533	18,655	18,963
Glass and ceramics	51,499	53,930	57,653	58,283	60,338	55,398
Information technology and telecommunications	93,485	95,293	95,717	99,732	101,583	106,629
Chemicals	80,600	83,663	85,827	86,810	88,128	72,887
Business and financial services	86,153	87,672	90,182	92,106	92,445	100,785
Fabricated metal manufacturing	58,593	60,538	61,305	60,056	60,736	55,830
Computer manufacturing	111,364	114,313	114,392	123,805	130,458	120,226
Retail	30,496	30,776	31,075	31,531	31,591	31,216
Clusters with location quotient > 1	60,615	66,501	67,712	61,527	61,858	–
Clusters with location quotient < 1	56,206	50,620	51,267	60,812	61,243	–
Average earnings (total)	52,779	53,998	55,102	55,490	55,800	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

which includes elementary and secondary schools, also has a slightly higher-than-average presence in the state, likely due to a younger population.

Several of Texas' dominant clusters, such as energy and mining, computer manufacturing, chemicals, and IT and telecommunications boast high pay (*Table 1.1*). In fact, the average pay of workers in most clusters with an LQ greater than 1 exceeds the comparable U.S. figure. Earnings in dominant clusters are also 11 percent more than the overall average for the state (\$55,800).

The Texas earnings premium in dominant industry clusters is consistent with theory. Productivity should be higher in dominant industries for the reasons previously noted, such as demand for workers' specialized skill sets; hence, employers should pay an earnings premium over the same industry cluster in locations where the cluster is not dominant. While the data for the state mostly bear this out, it isn't always the case for the metros. Industry earnings at the metro level reflect myriad local considerations that distort comparisons

with the nation, including cost of living and workforce demographics and skill levels.

Popular Migrant Destination

Migration has played an important role in sustaining the state's long-term economic growth premium. Nearly half of workers in the state are not native Texans. Since 2000, population gains from net migration (domestic and international) and natural increase (births minus deaths) have been roughly equal (*Chart 1.3*).⁷

Texas was among the first states to bounce back from the Great Recession, and its booming economy attracted many workers, particularly from other parts of the U.S. where growth was still languishing. In fact, Texas was the second-largest net recipient of domestic migrants (after Florida) among the 50 states from July 2010 to July 2017, receiving 916,000 people—3.6 percent of the state's 2010 population. Domestic migrants to Texas come from a variety of states, with transplants from

California accounting for the largest share during this period. Arrivals from other countries also contributed strongly to the state's population growth during the period, with immigrants from Mexico making up the largest share of inflows. Texas was the recipient of 658,000 net international migrants from 2010 to 2017, amounting to 2.6 percent of its 2010 population.⁸

The migrant inflow propelled the state's population growth rate to more than double that of the U.S. Texas is younger and boasts a larger share of foreign born relative to the rest of the nation.

Texas Again Outperforms Nation; More Growth Likely

With the last plunge in oil prices, the economic landscape in the region changed, and employment growth slowed to 1.2 percent. Payroll employment in energy-dependent metros such as Houston and Midland–Odessa was flat or declined during the downturn. With a strong rebound in 2017, activity in the state's energy and

manufacturing sectors came roaring back. Texas was the nation's ninth-fastest-growing economy in 2017.

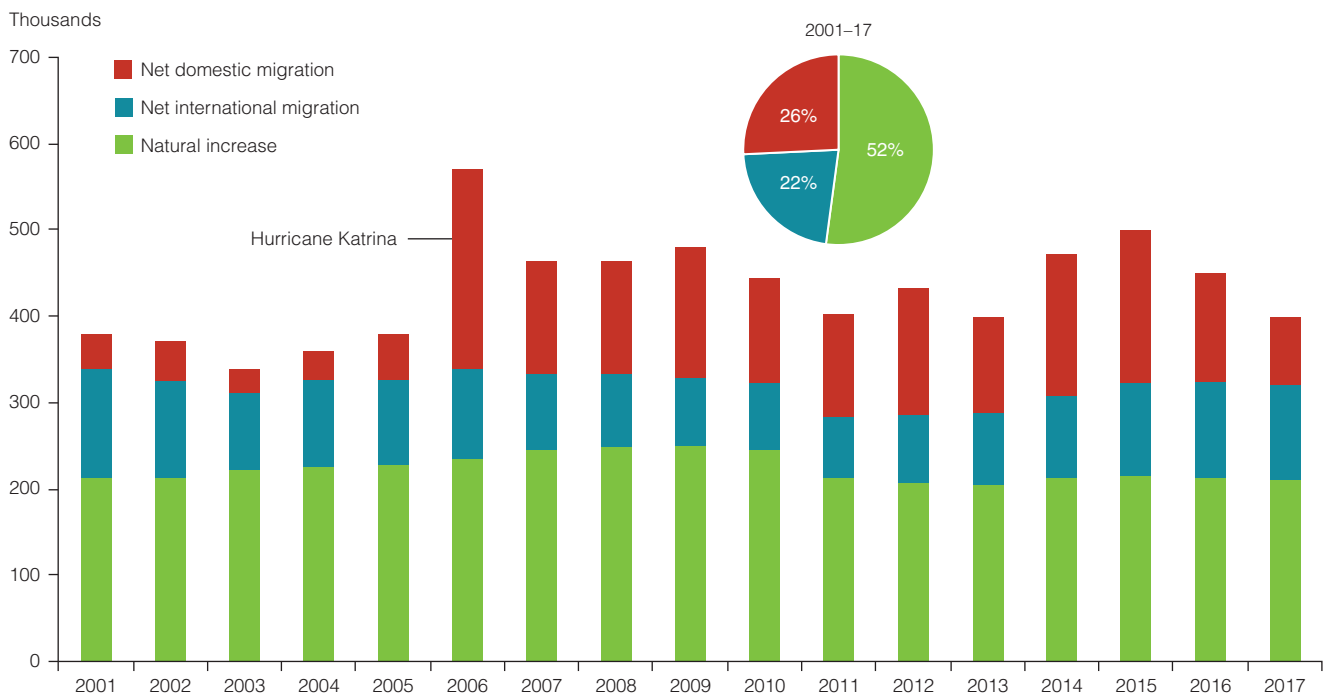
The Texas expansion has continued into 2018. Annualized job growth in the first nine months of 2018 was a robust 2.4 percent—well ahead of the nation's 1.7 percent annualized increase. Areas of the state tied to oil and gas have grown at their strongest pace since 2014. The construction sector remains solid, the service sector is experiencing widespread expansion and manufacturing activity is near multiyear highs.

With this strength, the Federal Reserve Bank of Dallas projects employment growth around 2.4 percent for 2018, well above the state's long-term average of 2 percent. A tight labor market threatens to constrain future growth, however.

Federal tax law changes that took effect in 2018 will likely benefit Texas, while tariffs and uncertainty regarding future U.S. and world trade policies could cool activity and investment plans and, ultimately, economic growth.

This decade on the whole has been good for Texas and its metros despite the two-year energy bust. From

Chart 1.3: Migration, Natural Increase Contribute Equally to Texas Population Growth



NOTE: Census Bureau estimates approximate the population on July 1 of the year indicated and, thus, capture changes from the previous year.

SOURCE: Census Bureau.

December 2010 to December 2017, Texas on average grew faster than the nation, with job gains in the state averaging 2.4 percent per year, compared with 1.7 percent for the nation. Texas output expanded at nearly twice the U.S. pace from 2010 to 2017.

New to the Second Edition

This edition has an expanded geographical breadth, revises some cluster definitions for improved clarity and updates economic analyses.

Modifications to the cluster methodology, used to determine key sectors within metros, are explained in detail in the appendix. Among the changes, the government sector covers only employment within local, state and federal governments and excludes publicly funded health care and education. Food services employment, previously included in the recreation cluster, is now its own cluster.

While such an aggregate view tells part of the story, the industry clusters of each area define a metro's distinctive place in the state's economy and explain how its individual metros contribute to Texas job growth and income gains. Conversely, the state as a whole provides useful context with which to examine the individual metros.

Notes

¹ Among large states, only Ohio and Pennsylvania have more big cities per capita. Big cities refer to metropolitan statistical areas or metro divisions of over 2 million residents in 2017.

² Texas job growth averaged 2.0 percent per year, compared with 1.1 percent for the nation during 1990–2017. Inflation-adjusted state gross domestic product growth averaged 3.5 percent per year, compared with 1.9 percent for the U.S. during 2010–17.

³ "The Wealth of Cities: Agglomeration Economies and Spatial Equilibrium in the United States," by Edward L. Glaeser and Joshua D. Gottlieb, National Bureau of Economic Research, NBER Working Paper no. 14806, March 2009.

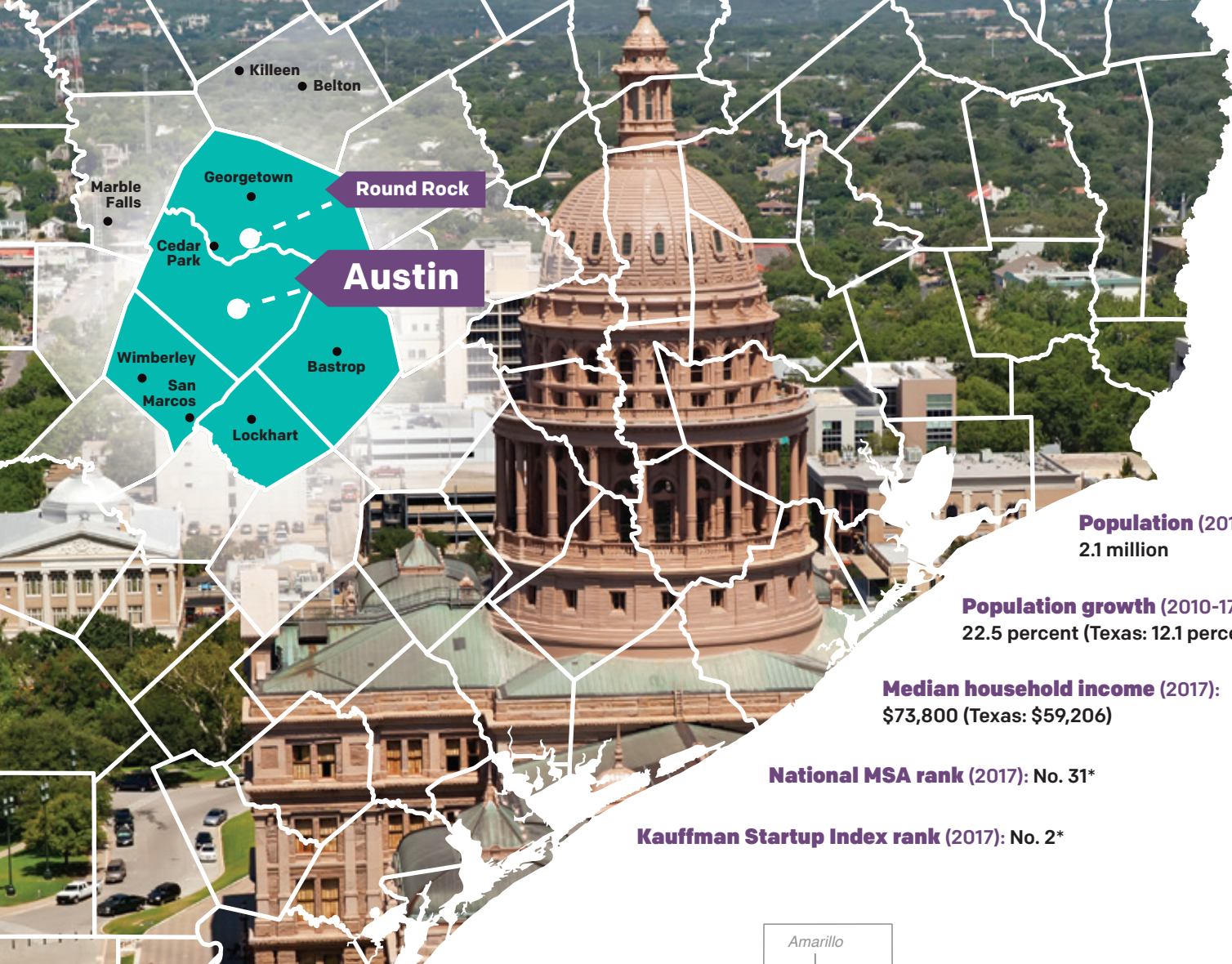
⁴ *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier*, by Edward L. Glaeser, New York: Penguin Press, 2011.

⁵ For more information on what clusters are and how they affect competition and innovation, see "Location, Competition and Economic Development: Local Clusters in a Global Economy," by Michael E. Porter, *Economic Development Quarterly*, vol. 14, February 2000, pp. 15–34. Also, see "Clusters, Convergence, and Economic Performance," by Mercedes Delgado, Michael Porter and Scott Stern, National Bureau of Economic Research, NBER Working Paper no. 18250, July 2012.

⁶ Individual industry cluster shares do not add to 100 because some smaller industries at the three-digit-or-higher level in the North American Industry Classification System (NAICS) are included in multiple clusters, while some industries are not part of any of the clusters shown. Clusters include other related industries. For instance, semiconductor manufacturing (NAICS 3344) is included in both the advanced materials and information technology and telecommunications clusters.

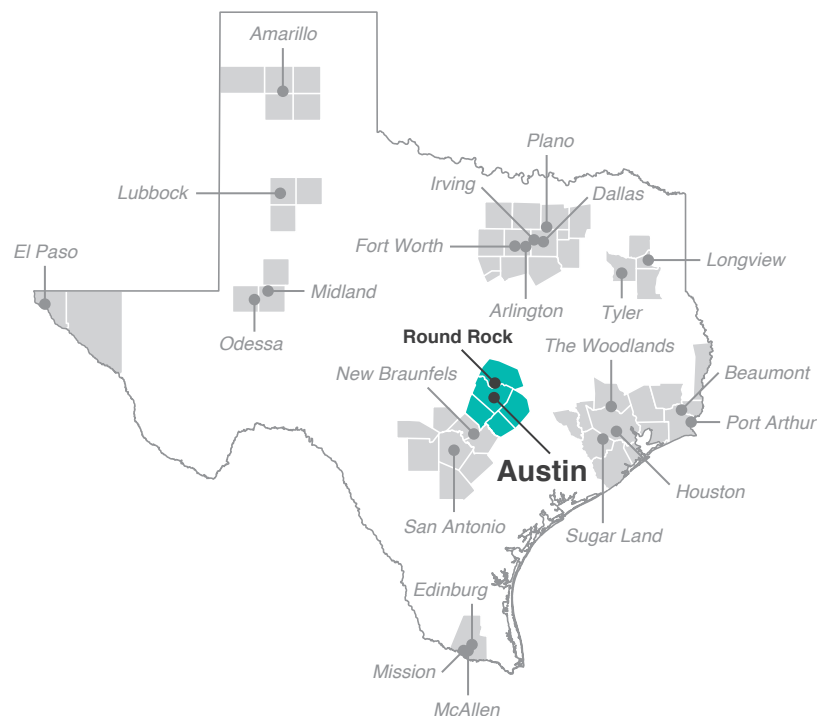
⁷ "Gone to Texas: Migration Vital to Growth in the Lone Star State," by Pia Orrenius, Alexander T. Abraham and Stephanie Gullo, Federal Reserve Bank of Dallas *Southwest Economy*, First Quarter 2018.

⁸ Data are from the Census Bureau.



At a Glance

- Austin's political and educational influence arose from its position as the state capital and home to the University of Texas.
- Today, the region is a major high-tech hub for both the state and the U.S. and home to numerous large and small technology companies.
- Fueling Austin's rapid economic expansion is its young and well-educated workforce.
- Austin's employment growth remains solid, although very tight labor markets threaten to constrain growth in the near term.



*The Austin–Round Rock metropolitan statistical area (MSA) encompasses Bastrop, Caldwell, Hays, Travis and Williamson counties. The Kauffman Startup Activity Index, a measure of business creation in the 40 largest U.S. metropolitan areas, is further explained in the appendix.

Austin–Round Rock:

Government and High Tech at the State's Center

HISTORY: A Government, Education and Technology Hub

Austin was established in 1839 as the capital of the Republic of Texas. The city became the westernmost railroad station along the Houston and Texas Central Railway in 1871, and with no other railroad towns for miles in most directions, it became a trading center.¹

Austin's status as Texas' political center remained uncertain until 1872, when the city was chosen as the permanent capital in a statewide referendum. In 1881, it was selected as the site for the new University of Texas.

Oil-boom growth in the early 20th century largely bypassed Austin, and the city fell from its fourth-place population ranking in Texas in 1880 to 10th place in 1920. Completion of two dams in the early 1940s greatly aided the area's subsequent growth.

Expansion of Austin's key education and government sectors supported the region in the 1950s and 1960s. Buoyed by chamber of commerce efforts to

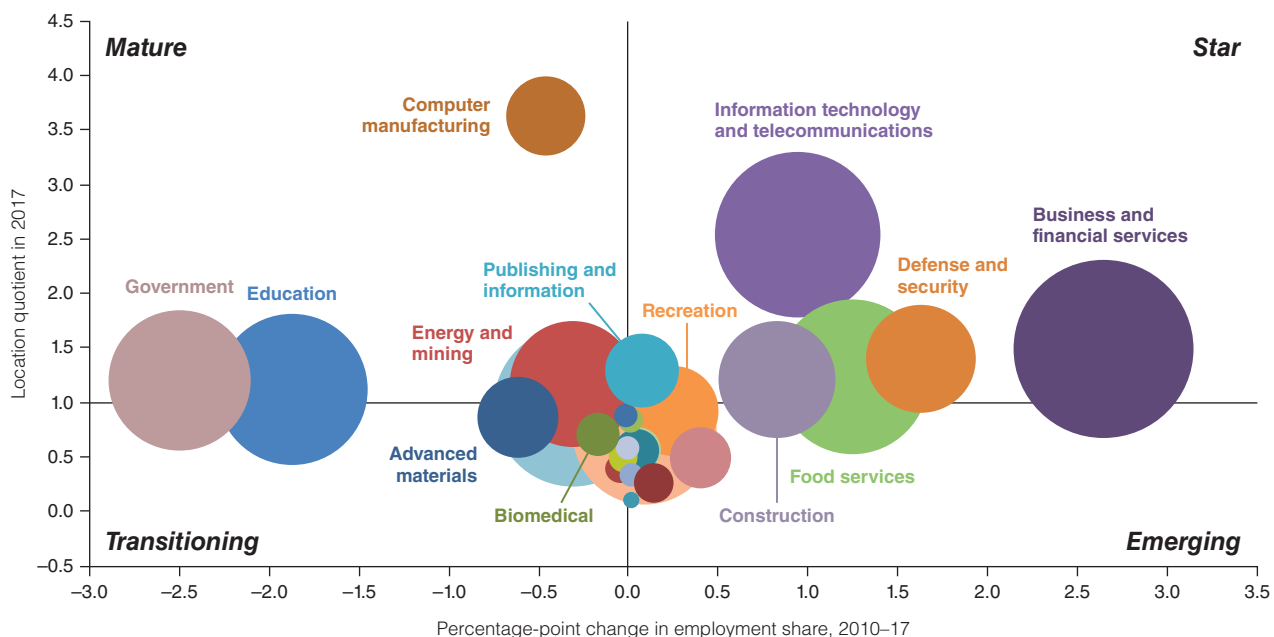
expand the economic base and by a flourishing research program at UT, major technology firms such as IBM, Texas Instruments and Motorola began locating in the area in the late 1960s and early 1970s. Austin gradually emerged as a high-tech center. Of the 108 largest employers in the area in 2016, 56 were high-tech firms.²

INDUSTRY CLUSTERS: Hotbed for High Tech

Cluster concentration is measured by location quotients (LQs), which compare the metro-area and U.S. economies. Growth in a cluster is measured by the percentage-point change in its employment share between 2010 and 2017.³

Chart 2.1 displays the composition of industry clusters in Austin–Round Rock. The top two quadrants—"mature" and "star"—display industry clusters with a larger share of employment relative to the

Chart 2.1: Austin Thrives as a High-Tech Hub



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.
 SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

nation (LQs exceeding 1). These clusters are vital to the metro-area economy and can be expanding relatively rapidly (star) or growing relatively slowly (mature). Clusters shown in the bottom two quadrants—such as advanced materials and biomedical—are smaller relative to the nation (LQs below 1). These less-concentrated clusters are labeled either “emerging” if they are fast growing or “transitioning” if they are slow growing.

The underpinnings of Austin’s economy are government, education and the technology industry. Computer manufacturing boasts nearly four times the concentration in Austin than in the U.S., reflecting the significant presence of manufacturers of personal computers and related goods and services such as Dell, Apple, Advanced Micro Devices and Applied Materials.

Dell, with 13,000 local workers, and Apple and IBM, each with 6,000 employees, are among the area’s largest employers.⁴ Additionally, a sizable footprint from numerous hardware, software, computing and systems design companies—including tech giants Samsung, Intel and Hewlett-Packard—make the concentration of Austin’s information technology and telecommunications cluster 2.5 times that of the nation.⁵

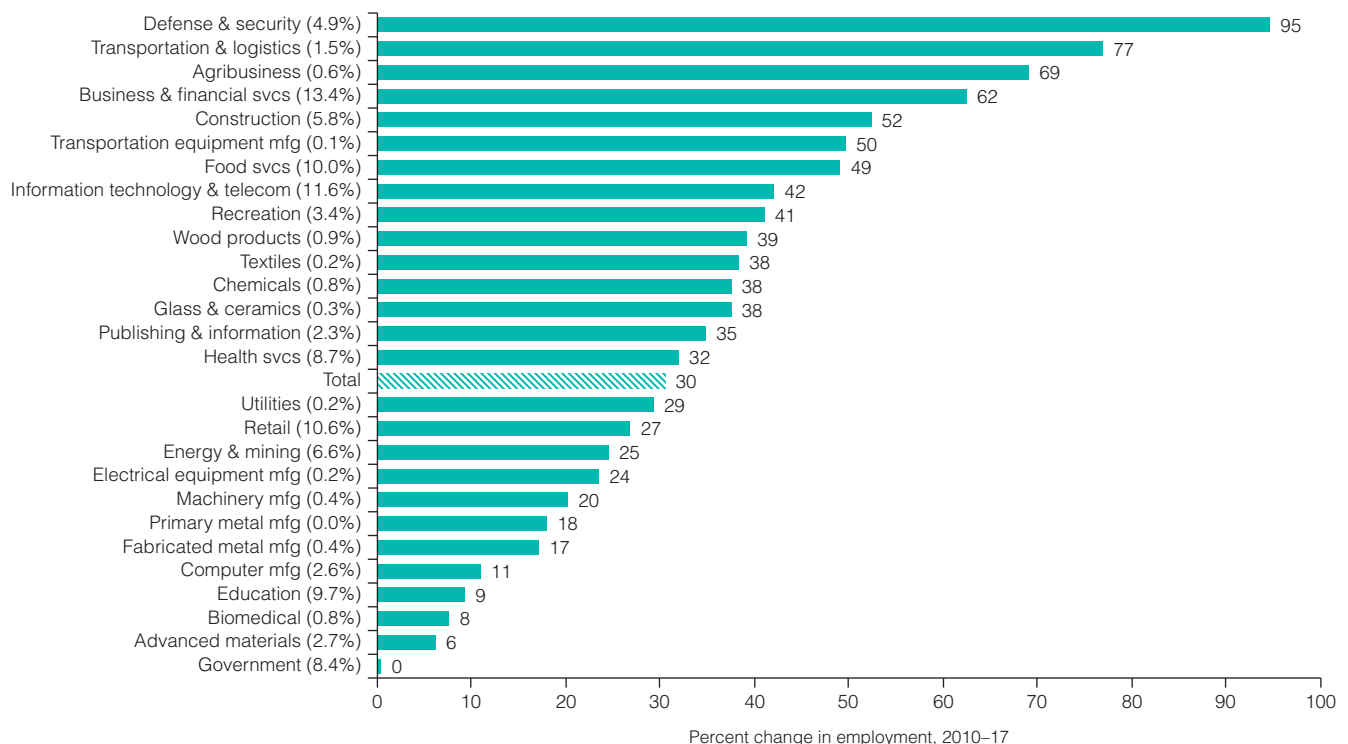
As the state capital and home to the flagship UT campus—a highly regarded research institution—Austin’s government and education sectors are large. Both the federal and state governments and the university are top area employers.

Other concentrated clusters include publishing and information, defense and security, energy and mining, and business and financial services. The defense and security sector nearly doubled in size from 2010 to 2017, making it the fastest-growing cluster in terms of job growth and complementing both UT and the significant technology presence in the region (*Chart 2.2*). The transportation and logistics, agribusiness, and business and financial services sectors take the following three spots among rapidly growing clusters.

Food services is important to the local economy, and along with recreation services, this cluster highlights the tourist draws of such events as Austin City Limits and South by Southwest (SXSW). An Austin slogan, “Live Music Capital of the World,” is a nod to the numerous live music venues.

The health cluster, which employs 8.7 percent of Austin’s workforce, has also grown significantly in

Chart 2.2: Austin Job Gains Led by Defense, Business Services and Transportation Clusters



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 2.1: Annual Earnings in Austin Higher than U.S. Average in Several Dominant Clusters

Cluster	Austin					U.S.
	2010	2012	2014	2016	2017	2017
Computer manufacturing	134,849	134,613	127,210	137,120	141,034	120,226
Information technology and telecommunications	110,531	110,169	104,068	110,332	115,479	106,629
Business and financial services	90,174	90,887	91,559	97,649	99,067	100,785
Defense and security	86,112	88,731	93,620	105,400	107,064	91,226
Publishing and information	81,350	79,867	83,672	82,886	87,536	96,127
Food services	18,277	18,724	19,164	20,393	20,847	18,963
Construction	52,051	52,445	55,686	59,481	60,828	60,742
Government	57,686	57,398	60,279	62,491	62,749	60,568
Energy and mining	88,610	90,357	87,958	91,692	93,701	80,900
Education	45,912	42,576	44,937	46,272	46,589	49,322
Clusters with location quotient > 1	70,689	71,949	72,915	76,727	78,638	–
Clusters with location quotient < 1	53,813	51,373	51,900	54,111	53,946	–
Average earnings (total)	55,013	55,501	56,118	58,497	59,742	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

recent years. The second- and third-largest private employers in the city are the Seton Healthcare Family, with 10,270 employees, and St. David's HealthCare, with nearly 8,600 employees. The summer 2017 opening of the Dell Seton Medical Center, a significant component of the new Dell Medical School at UT, has also expanded opportunities for health care workers in the area. Though the concentration of health industry employment remains below that of the U.S. (LQ is 0.73), cluster employment has increased 32 percent since 2010.

Austin's star and mature clusters pay considerably higher wages than their less-concentrated counterparts (*Table 2.1*). Computer manufacturing, information technology and telecommunications, and business and financial services boast some of the region's best-paying jobs. In fact, the average earnings within computer manufacturing were around \$141,000 in Austin in 2017, more than double the metro's average of about \$59,700 across all sectors. Overall, Austin residents employed in the base clusters (those with LQs greater than 1) earn 46 percent more on average—\$78,600 versus \$53,900—than those employed in less-concentrated clusters.

Moreover, wages in three of Austin's top four most-concentrated clusters—computer manufacturing (LQ of 3.6), information technology (LQ of 2.5) and defense and security (LQ of 1.4)—were significantly higher than the national average for those clusters in 2017.

DEMOGRAPHICS: Young, Highly Skilled Talent Pool

The Austin metro area's strength is its young and well-educated workforce—its median age is 3.5 years below the U.S. median. The area ranks No. 1 in college education among the major Texas metros (*Chart 2.3*).

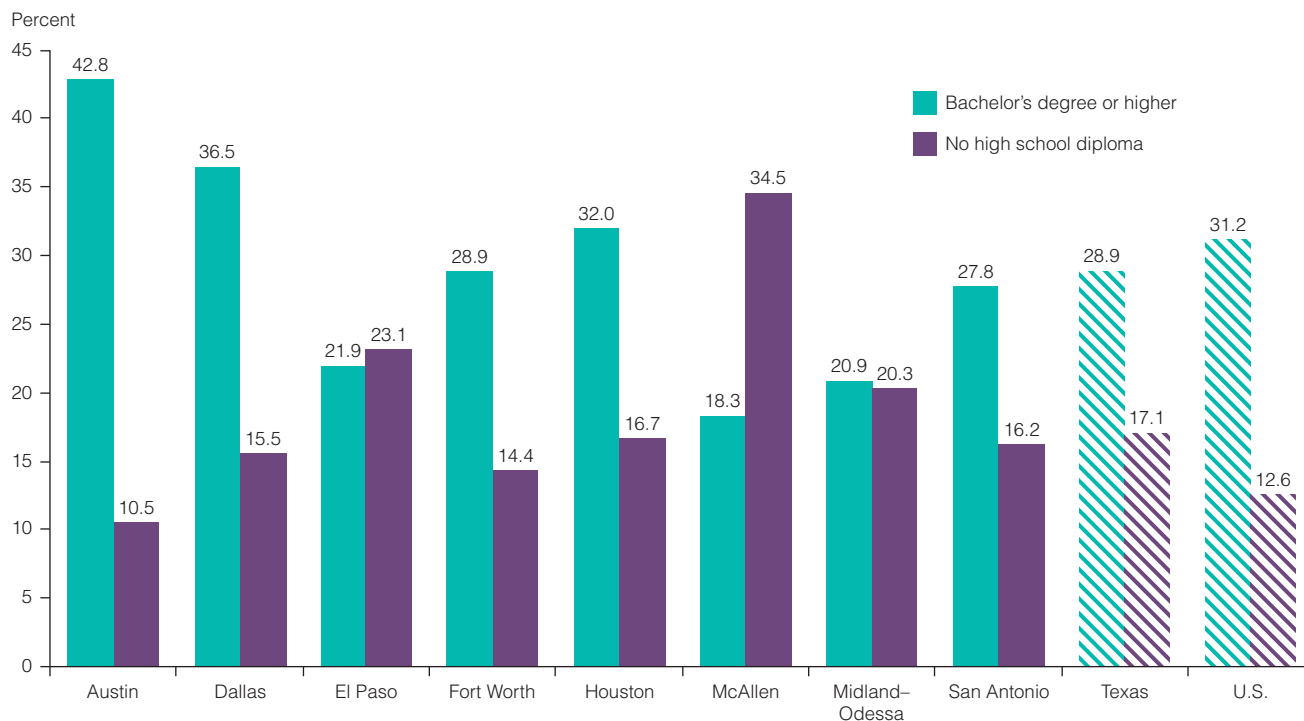
Austin placed eighth on the list of the most-educated U.S. metros, according to a study by WalletHub.⁶ Nearly 43 percent of adults (25 years and older) in the metro area have at least an undergraduate degree, compared with 28.9 percent in Texas and 31.2 percent nationally in 2016. This is one reason the metro area has attracted many high-tech companies and boasted a median household income of \$73,800 in 2017, significantly higher than that of the state and nation.

Hispanics make up 32.2 percent of the area's inhabitants, less than the share in Texas overall. Foreign-born residents constitute 14.4 percent of the metro population, lower than their share in Texas but slightly higher than the national average.

EMPLOYMENT: Strong Rebound, Unrelenting Growth

Employment declines in Austin during the Great Recession were steep. However, the area was the first major metro to bounce back, regaining all lost jobs 26

Chart 2.3: Austin Has Most Educated Population Among Texas Major Metros



NOTE: Share of population age 25 and over.

SOURCE: Census Bureau, 2016 American Community Survey 1-year estimates.

months after the beginning of the downturn. In December 2017, total nonfarm employment was 31 percent over its previous peak in September 2008.

Austin's rapid postrecession expansion has benefited from its outsized concentration of high-tech jobs—both in information technology and telecommunications and in business and financial services. From December 2009 to December 2017, employment in professional, scientific and technical services increased 81 percent, and payrolls in information services grew 60 percent.⁷

Even as the Texas economy slowed through the 2015–16 oil bust, Austin's job growth remained vigorous. Austin added to its payrolls at a 3.3 percent rate in 2016 and by 2.8 percent in 2017. Unemployment in Austin was more than a percentage point below the Texas rate in 2017; it dropped to a 17-year low of 2.7 percent in October 2017. The unemployment rate, which subsequently ticked up to 2.8 percent in October 2018, remains low, a testament to both the strength of Austin's economy and the challenges that lie ahead for businesses in finding workers to fill positions. Austin is also a hotbed of entrepreneurial activity, ranking second among U.S. metro areas, according to the Kauffman Startup Activity Index in 2017.⁸

OUTLOOK: No Slowing in Sight

Austin's economy is dependent on the technology industry, with 6 percent of its 2016 gross domestic product generated from the information services sector. Global semiconductor sales, a barometer for the technology sector, are expected to grow strongly through 2018, according to World Semiconductor Trade Statistics.⁹ This bodes well for the Greater Austin economy.

Still, the region remains unable to attract significant amounts of venture capital relative to other high-tech hubs such as San Francisco and Boston. Venture capital funding in 2017 declined 16 percent compared with 2016—from more than \$900 million to just over \$760 million. This compares with a 17 percent increase in national venture capital and a 56 percent funding increase—or \$300 million—across the rest of Texas. While Austin remains attractive to startups and tech workers, small businesses looking for capital to expand may face challenges.

Some of the area's technology jobs are tied to the energy industry. Examples are those in the production of high-tech instruments and computer equipment for hydraulic fracturing of shale formations. Employment

in the area's manufacturing industries declined in 2014 and 2015, in part due to depressed oil prices. However, with strengthening in energy activity in 2017, manufacturing employment rose 4.7 percent.

UT's presence provides stability and growth to the education, biomedical and health sectors. The opening of the Dell Medical School at UT should further expand the capacity of medical research in the region.

The U.S. Army's recent announcement that its Futures Command will be headquartered in Austin will further boost the region's ties to the defense and security sector. Also, the area's vibrant and educated work-

force will likely continue to attract employers, providing new growth opportunities.

Both the commercial real estate and housing markets in the metro area are healthy, although there are some signs of softening. Conversely, strong home prices and rent appreciation over the past several years have continued to weaken home affordability for lower-wage workers. While this trend in prices is moderating, continued in-migration of high-wage earners will keep the pressure on living costs.

—*Laila Assanie and Christopher Slijk*

Austin–Round Rock Growth Outlook

Drivers

- A pickup in global semiconductor demand will drive employment gains in Austin's large technology sector.
- The presence of the state government and UT provide stability to the area's economy.
- Austin's vibrant and educated workforce will further attract employers, fueling additional growth.

Challenges

- The area's low unemployment rate will restrain job growth.
- Rising rents and home prices will make living in Austin unaffordable for many low- and mid-wage employees who are part of Austin's base clusters.
- General difficulty in attracting significant venture capital may leave small startups with limited avenues for growth relative to other technology hubs.

Notes

¹ The history of Austin has been adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hda03.

² Detail about the largest Austin metro-area employers is provided by the Austin Chamber of Commerce, [www.austinchamber.com/economic-development/austin-profile/business-industry#Region's Largest Employers](http://www.austinchamber.com/economic-development/austin-profile/business-industry#Region's%20Largest%20Employers).

³ The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

⁴ See note 2.

⁵ The information technology and telecommunications cluster includes firms categorized in North American Industry Classification System code 334, computer and electronic product manufacturers.

⁶ Data are from the "Most and Least Educated Cities in America" list published by WalletHub. The study ranked the 150 largest U.S. metros based

on 11 metrics, including the percentage of adult residents with a high school diploma, associate degree, bachelor's degree and graduate or professional degree; quality of public schools and universities; and students per capita enrolled in the top universities in the U.S. See www.wallethub.com/edu/most-and-least-educated-cities/6656.

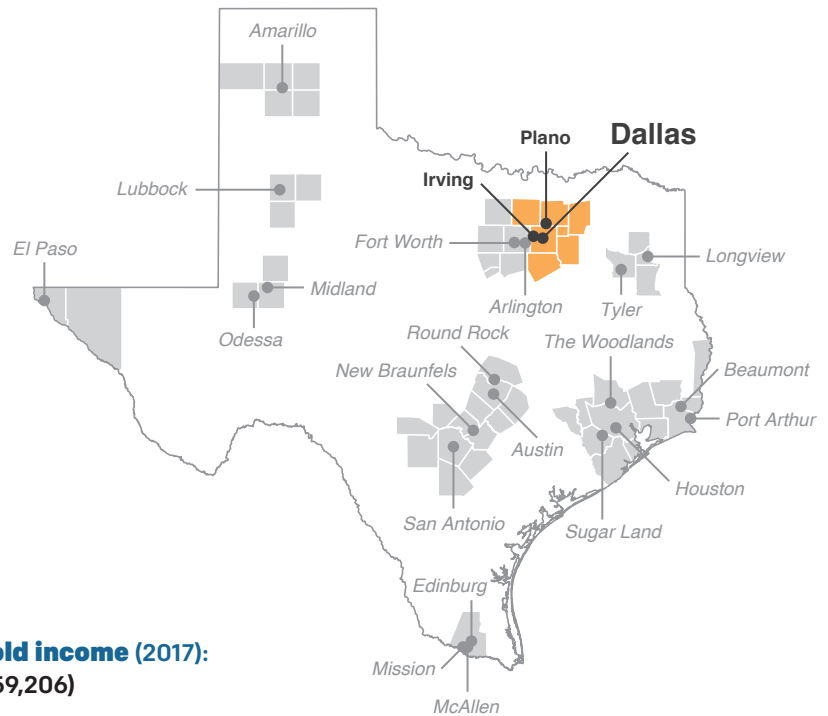
⁷ Employment data are from the Texas Workforce Commission and are early benchmarked and seasonally adjusted by the Federal Reserve Bank of Dallas.

⁸ Data are from the 2017 Kauffman Startup Activity Index, which is based on three indicators: the rate of new entrepreneurs starting businesses, opportunity share (a measure of the percentage of new entrepreneurs not coming out of unemployment) and startup density.

⁹ The "World Semiconductor Trade Statistics" August 2018 release projects that the worldwide semiconductor market will grow by 15.7 percent to \$477 billion in 2018 following a 21.6 percent increase in 2017. See www.wsts.org/76/Recent-News-Release.

At a Glance

- Dallas' prominence arose from its importance as a center for the oil and cotton industries and its location along numerous railroad lines.
- Today, Dallas serves as the business and financial services center for the state and has evolved into a major high-tech hub.
- Dallas has become a popular migrant destination, attracting residents from abroad as well as from other states.
- The metro's finance, insurance and transportation sectors are expected to see continued expansion following an earlier national consolidation that increased the sectors' local concentration.



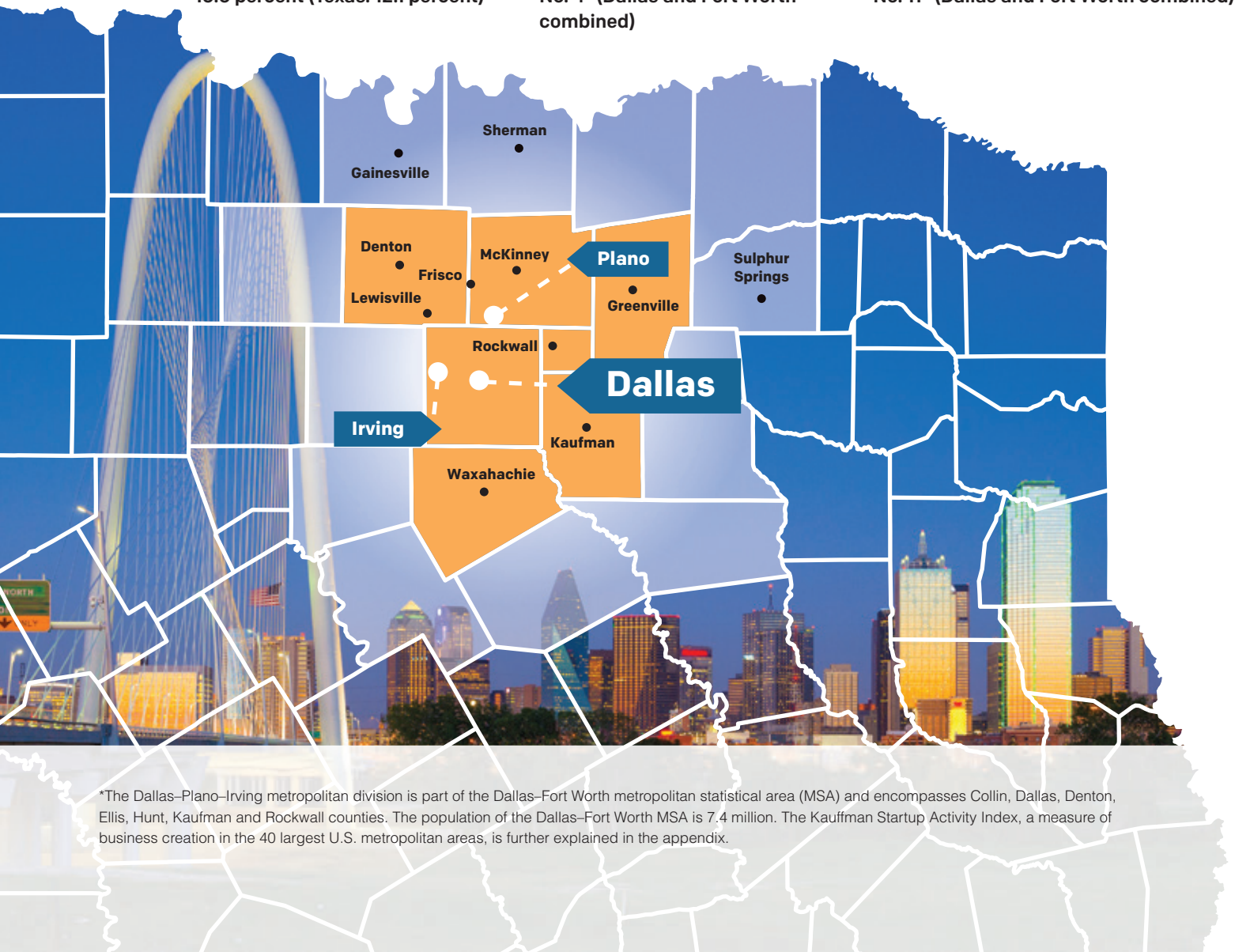
Population (2017):
4.9 million

Median household income (2017):
\$68,734 (Texas: \$59,206)

Population growth (2010–17):
15.6 percent (Texas: 12.1 percent)

National MSA rank (2017):
No. 4* (Dallas and Fort Worth combined)

Kauffman Startup Index rank (2017):
No. 11* (Dallas and Fort Worth combined)



*The Dallas–Plano–Irving metropolitan division is part of the Dallas–Fort Worth metropolitan statistical area (MSA) and encompasses Collin, Dallas, Denton, Ellis, Hunt, Kaufman and Rockwall counties. The population of the Dallas–Fort Worth MSA is 7.4 million. The Kauffman Startup Activity Index, a measure of business creation in the 40 largest U.S. metropolitan areas, is further explained in the appendix.

Dallas–Plano–Irving:

Texas' Business and Financial Services Hub

HISTORY: Business Center Rises from Rail Crossroads

Dallas quickly became a service center for the surrounding countryside after its founding in 1841. By the 1870s, Dallas had attracted two major rail lines, making it one of the first rail crossroads in Texas and establishing the city as a strategic location for the transport of regional products to manufacturers to the north and east.¹

Dallas became the world's leading inland cotton market at the beginning of the 20th century. It also rapidly evolved into a center of petroleum financing; Dallas bankers were among the first in the nation to lend money to oil companies using oil reserves as collateral.

The growth of companies such as Texas Instruments Inc. helped make Dallas the nation's third-largest technology center during the 1950s and '60s. The opening of Dallas/Fort Worth International Airport in 1974 provided a major selling point, bringing corporate headquar-

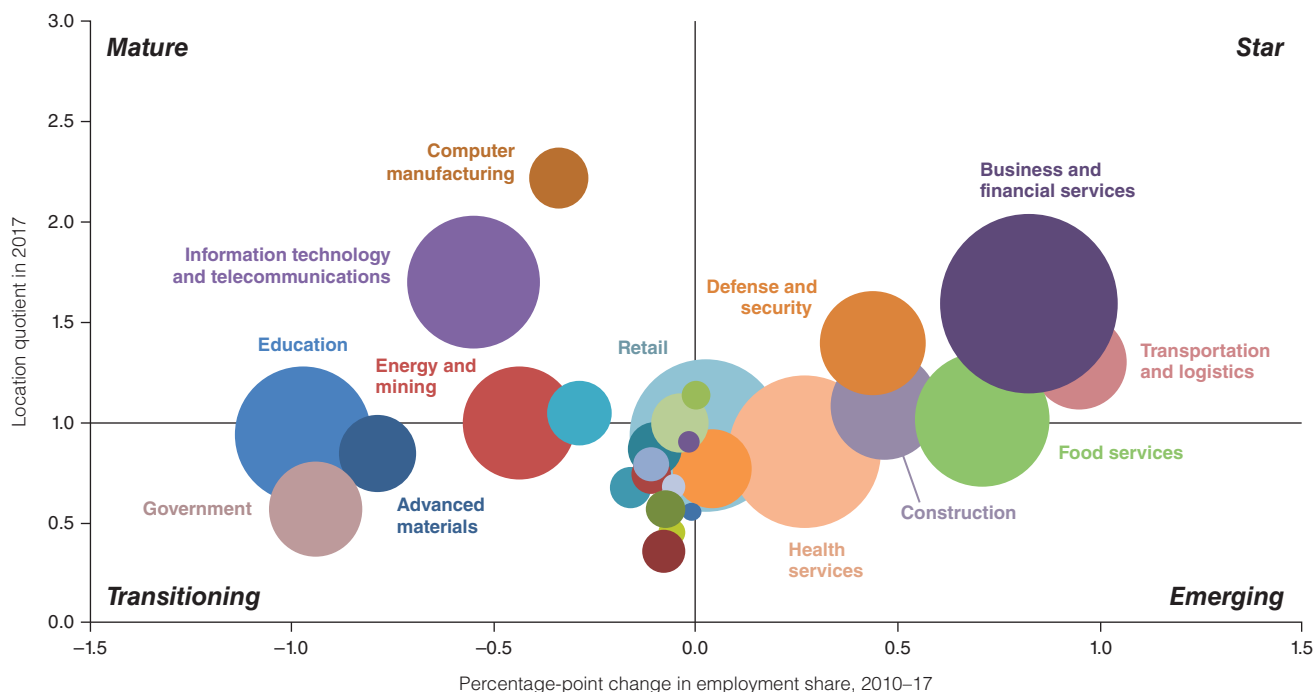
ters to Dallas and further increasing the area's prominence as the state's business and financial center.

INDUSTRY CLUSTERS: Business and Finance Loom Large

Industry cluster concentration is measured by location quotient (LQ), which compares the metro-area economy with the national economy (*Chart 3.1*). Growth within an industry cluster is measured by the percentage-point change in its share of local employment between 2010 and 2017.²

Clusters in the top half of *Chart 3.1*, such as business and financial services and computer manufacturing, have a larger share of employment relative to the nation and, thus, an LQ greater than 1. These clusters are generally vital to the area's economy and can be expanding relatively rapidly ("star") or slowly ("mature").

Chart 3.1: Business and Finance, IT and Telecom Dominate Dallas



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

Those in the bottom half, such as advanced materials (semiconductors and fiber optics) and government, are less dominant locally than nationally and, hence, have an LQ below 1. “Emerging” clusters are fast growing, while those expanding slowly or declining are “transitioning.”

Not surprisingly, Dallas’ most important star clusters are business and financial services and defense and security. Business and financial services is the largest cluster, employing around 14 percent of the workforce in 2017. Some of Dallas’ largest employers are banking companies, such as JPMorgan Chase & Co. and Bank of America.

Liberty Mutual Insurance and State Farm Insurance have consolidated operations into the Dallas area, bringing thousands of jobs and making insurance one of the metro’s fastest-growing industries. The relocations are contributing to growth in the already large business and financial services cluster. The cluster has grown rapidly since 2010, increasing its employment share 0.8 percentage points from 2010 to 2017.

The Dallas area is also home to major technology companies, including Texas Instruments and AT&T. The information technology and telecommunications cluster employed about 8 percent of the metro’s work-

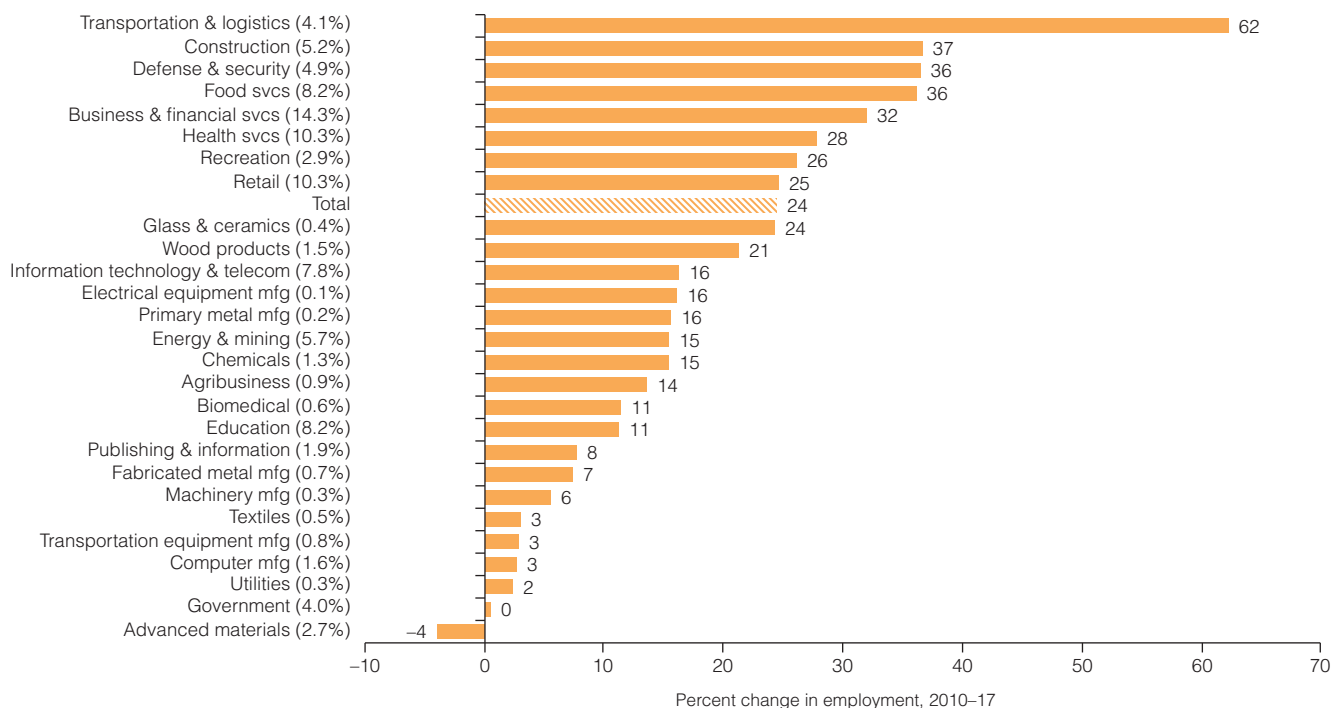
force in 2017, growing 16 percent from 2010 to 2017 (*Chart 3.2*). During the peak of the high-tech boom, the Telecom Corridor was an expansive part of the Dallas area’s economy. The region was hard hit by the 2001 dot-com bust, but recovered and subsequently added the operations of numerous companies in technology and other fields.

Dallas has experienced a real estate boom since the end of the Great Recession, fueling growth in its construction sector. Employment expanded 37 percent in 2010–17, in line with the increase in Fort Worth and ahead of other metros in this report except Austin.

Defense and security, employing 5 percent of the workforce, has gained standing in Dallas. Employment in the energy and mining cluster grew 15 percent from 2010 to 2017, but its overall significance has declined as many energy companies moved business operations to Houston. Drilling for natural gas in North Texas’ Barnett Shale has slowed because of low natural gas prices.

Dallas’ neighbor, the Fort Worth–Arlington metropolitan division, also has dominant defense and energy clusters. Fort Worth–Arlington serves as a logistics and distribution hub with activity spilling into Dallas, where

Chart 3.2: Dallas Posts Rapid Job Gains in Its Dominant Clusters



NOTES: Percent change in employment is shown in whole numbers. Each cluster’s share of jobs is shown in parentheses (rounded to one decimal place).

SOURCES: Texas Workforce Commission; authors’ calculations.

Table 3.1: Annual Earnings in Dallas Generally Exceed National Average in Dominant Clusters

Cluster	Dallas					U.S.
	2010	2012	2014	2016	2017	2017
Computer manufacturing	111,193	120,283	129,462	137,677	149,548	120,226
Information technology and telecommunications	102,959	105,195	109,767	114,238	114,619	106,629
Business and financial services	92,226	93,405	97,068	100,179	100,602	100,785
Defense and security	83,346	82,943	86,025	90,224	91,077	91,226
Transportation and logistics	53,813	53,451	53,615	52,764	51,432	53,761
Glass and ceramics	56,201	57,573	63,951	66,544	68,153	55,398
Construction	57,297	58,438	60,270	64,724	66,296	60,742
Publishing and information	79,800	83,359	85,528	87,018	83,874	96,127
Food services	20,135	19,708	19,202	20,165	20,433	18,963
Clusters with location quotient > 1	76,616	78,328	77,901	80,914	81,207	–
Clusters with location quotient < 1	54,099	53,724	58,910	59,787	60,245	–
Average earnings (total)	59,859	60,559	61,132	63,032	63,315	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

transportation and logistics was the fastest-growing cluster. Dallas and Fort Worth together are home to 22 Fortune 500 companies on the 2018 list.

Dallas' star and mature clusters are relatively high paying and boast annual average earnings (\$81,200) that are 28 percent higher than the annual average earnings in Dallas (\$63,300) (*Table 3.1*). While real (inflation-adjusted) wages in the star and mature clusters grew an average 6.0 percent since 2010, wages in other less-prominent industry clusters climbed 11.4 percent.

DEMOGRAPHICS: A Destination for New Arrivals

The Dallas–Fort Worth metroplex (Greater Dallas and Fort Worth components) has become a top domestic destination, although it has attracted many new residents from other countries as well. New arrivals from other parts of the U.S. accounted for 40 percent of DFW's population increase in 2017 (*Chart 3.3*). Among U.S. metro areas, the metroplex experienced the highest population gains through total net migration from 2010 to 2017.

Amid record migration, Dallas' unemployment rate has remained low, averaging 3.6 percent in 2017. Per capita income and median household income are higher than national and Texas figures, and Dallas' median household income increased 10.2 percent from 2014 to 2017 in real terms.

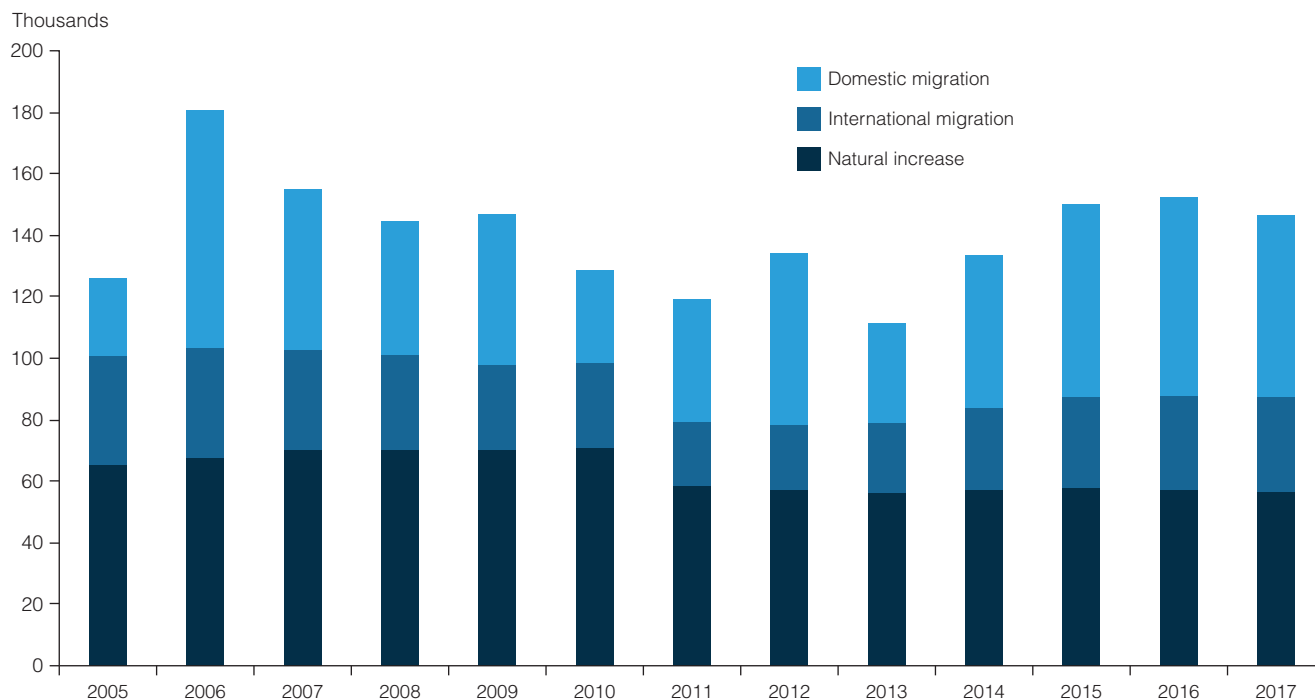
Dallas' population is 44.1 percent non-Hispanic white. Hispanics make up a significant share of the area's inhabitants, 29.7 percent. Foreign-born residents constitute 20.2 percent of the metro population, higher than their shares in Austin and San Antonio.

Dallas ranks second in educational attainment among the Texas metros in this report, with 36.5 percent of its adult residents holding a bachelor's degree or higher. This is likely because the business and financial services, health care, education, information technology, and defense and security sectors employ a large share of the workforce and most require a college degree.

EMPLOYMENT: Brisk Growth amid Oil Bust, Subsequent Moderation

The Dallas economy proved resilient during the oil bust period. Area employment grew an annualized 3.7 percent from December 2014 to December 2016—second only to Austin among the major Texas metros. Employment expansion was broad based, and nearly every major sector outpaced the state and nation over the two-year period. Trade, transportation and utilities; construction; professional and business services; and leisure and hospitality each grew at a more than 4 percent annual rate during the period. The Dallas area's spurt has been fueled in part by business relocations and consolidations.

Chart 3.3: Domestic Net Migration to Dallas–Fort Worth Solid Since 2005



NOTE: Census Bureau population estimates approximate the population on July 1 of the year indicated and capture changes from the previous year.
SOURCE: Census Bureau.

Dallas employment growth reached an annualized 2.6 percent in 2017, above its long-run (1990–2017) average growth of 2.2 percent and ahead of the state’s 2.1 percent increase. Job growth was particularly strong in the finance and insurance sector at 4.0 percent, primarily due to a 5.1 percent increase in insurance carriers and related activities employment. These gains are likely a result of the consolidation of employers such as State Farm, Liberty Mutual and JPMorgan Chase in the metro area. The Dallas unemployment rate dropped to 3.2 percent in October 2017—the lowest since 2000. It subsequently rose slightly and has averaged 3.5 percent in the first 10 months of 2018.

Amid the metro’s flourishing economy, the real estate market has boomed. Strong housing demand has boosted single-family homebuilding activity, with construction permits issued approaching or reaching double-digit growth every year from 2012 through 2015 and again in 2017. DFW placed first among the top markets for apartment deliveries in 2017.³

OUTLOOK: Faster Job Growth than the State

Dallas’ employment growth will likely continue to outperform the state and the nation in the medium term. The area still attracts business and financial services companies, which have reached a critical mass and can draw on a network of necessary support services. Overall growth is buoyed by a well-educated population, a competitive cost structure and the U.S. economy’s strength.

Dallas’ central location and its established network of highway, air and rail transportation will support expansion in its transportation and logistics sector, which makes up 4.1 percent of the region’s employment and is classified as a star among Dallas’ clusters. Denton and Collin counties are projected to be among the nation’s fastest-growing economies from 2017 to 2021, according to an Oxford Economics forecast.⁴ DFW will also benefit from ongoing expansion of firms such as Charles Schwab, which is expected to hire more than 2,000

additional workers at its Westlake Campus currently under construction in Tarrant County.⁵

Both the commercial real estate and housing markets in the metro area are expanding, but the pace of activity has begun to moderate. The rapid increase in home prices and rents over the past several years has

reduced housing affordability. While this trend in price appreciation has eased, continued in-migration will likely support the market.

–Laila Assanie and Stephanie Gullo

Dallas–Plano–Irving Growth Outlook

Drivers	Challenges
<ul style="list-style-type: none">• A diversified economy (less dependent on the energy sector) and ongoing corporate relocations and expansions will continue to boost job growth and buoy ongoing office and industrial development.• A relatively well-educated workforce and rapid growth should continue to attract businesses to the area.• Newcomers to the area will further drive demand for both single-family and multifamily housing.	<ul style="list-style-type: none">• Tight labor markets may restrain the opportunities for companies to grow.• A tight housing supply combined with rapid population growth and continued job gains will support home prices, eroding the area's cost-of-living advantage.• Rapid population growth will increase strain on existing infrastructure and public resources.

Notes

¹ The history of Dallas is taken from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdd01.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ See "Apartment Supply Volumes Peak at a 30-Year High in 2017," by Kim O'Brien, Jan. 22, 2018, www.realpage.com/analytics/apartment-supply-volumes-peak-30-year-high-2017/.

⁴ See "Dallas–Fort Worth Has Top Two Spots in U.S. Based on 5-Year Economic Forecast," by Tracy M. Cook, Aug. 10, 2017, www.dallasnews.com/business/economy/2017/08/10/two-dallas-fort-worth-counties-lead-nation-economic-growth-potential-next-five-years.

⁵ See "Charles Schwab to House 2,600 Employees with Initial Phase of Westlake Campus," by Candice Carlisle, Sept. 20, 2017, www.bizjournals.com/dallas/news/2017/09/20/charles-schwab-to-house-2-600-employees-with.html, and "Schwab Now Expects to Bring 2,600 Jobs to New Campus North of Fort Worth," by Gordon Dickson, Sept. 21, 2017, www.star-telegram.com/news/local/community/northeast-tarrant/article174565261.html.

At a Glance

- Retail is among the largest clusters in El Paso. Health services and food services as well as transportation and logistics are also important, reflecting El Paso's proximity to the border of Mexico and its trading relationship with neighboring Ciudad Juárez.
- Government is a major driver of the local economy, especially the federal government. Fort Bliss, the largest employer, is an important generator of local economic activity and is likely to continue to play that role in the foreseeable future.
- El Paso's job growth outpaced the state and nation in 2015 and 2016. Robust manufacturing activity in Ciudad Juárez boosted El Paso's service sector. However, moderating U.S. auto demand combined with uncertainty surrounding cross-border trade could slow manufacturing activity. In addition, a strengthening dollar will temper retail sales north of the Rio Grande.
- El Paso was the most-populous border metro in Texas until McAllen surpassed it in 2015.

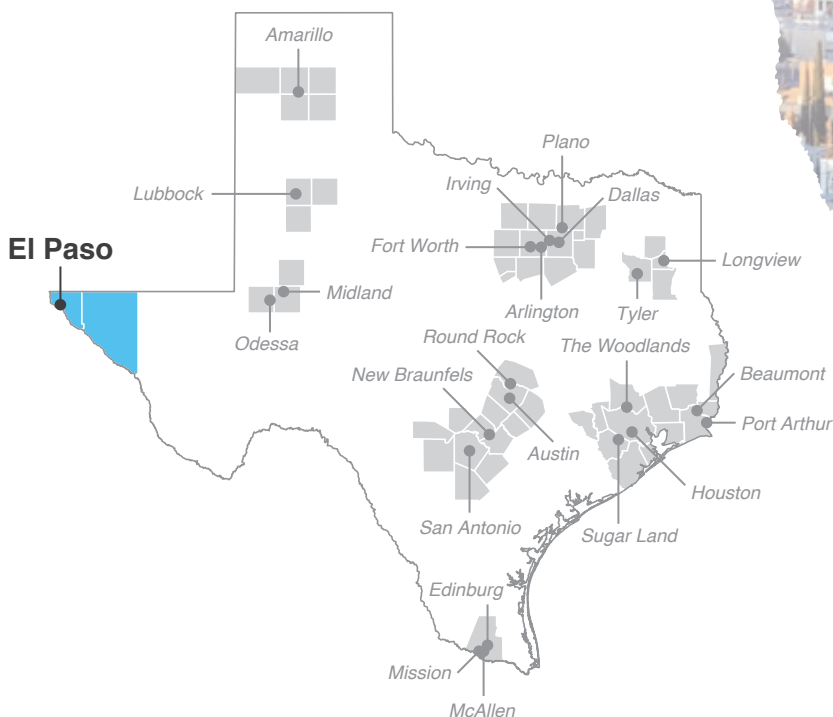
El Paso

Population (2017):
844,818

Population growth (2010–17):
4.7 percent (Texas: 12.1 percent)

Median household income (2017):
\$44,416 (Texas: \$59,206)

National MSA rank (2017): No. 68*



*The El Paso metropolitan statistical area (MSA) encompasses El Paso and Hudspeth counties.



El Paso:

Gateway to Mexico Relies on Commerce, Government

HISTORY: From Agriculture to Trade Hub

In 1848, before the Rio Grande marked the border between the United States and Mexico, the flags of Mexico and Spain flew over what would become El Paso. U.S. Army post Fort Bliss came into existence in 1854, five years before the city was formally established in 1859.

El Paso was a small, quiet village for several decades until the railroad arrived in 1881. It grew into a frontier boomtown called the “Six-Shooter Capital” and “Sin City” because of its saloons and gambling establishments.¹

Over the years, more conventional industries emerged. Augmenting cotton production, copper smelting and oil refining entered the area and expanded the economy in the late 19th and early 20th centuries.

Underscoring the region’s current commercial standing, El Paso is the second-largest port of entry between the U.S. and Mexico after Laredo with \$76.1 billion in total trade in 2017. Cross-border tourism, which drives

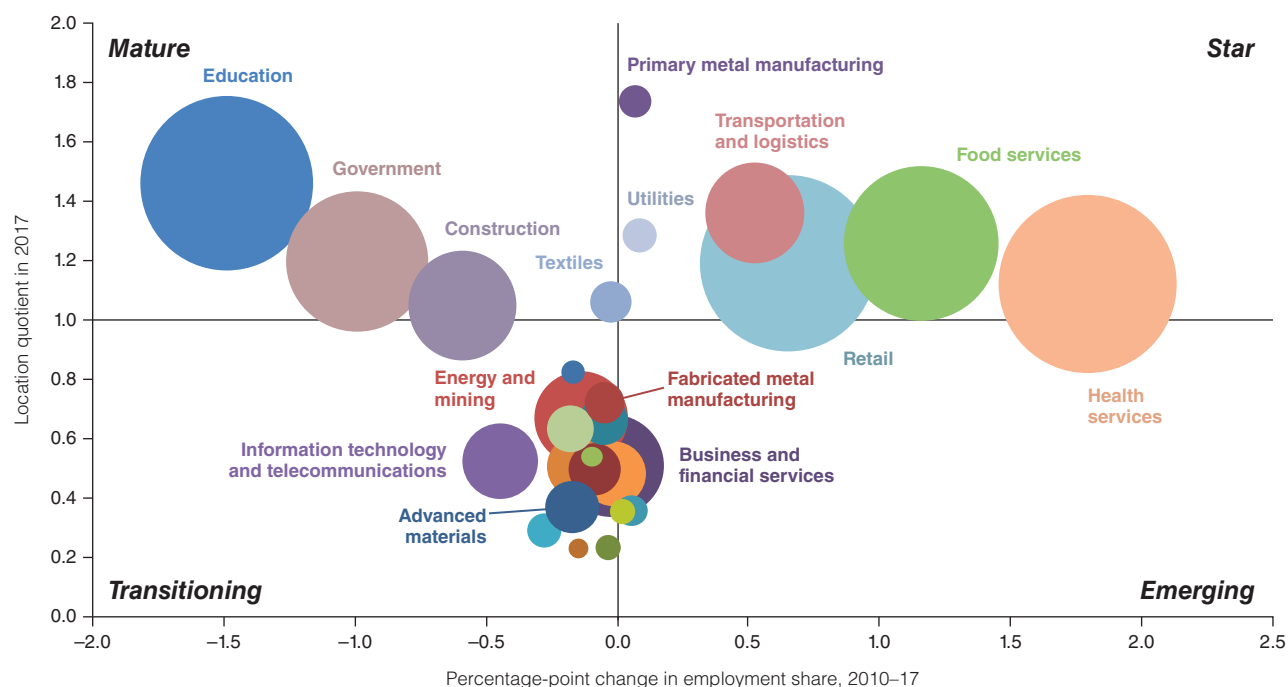
activity in retail, health and food services, is important to the local economy. Government, led by Fort Bliss and large Customs and Border Patrol operations, also plays a major role in the metro area.

INDUSTRY CLUSTERS: Prime Site for Government, Retail

Clusters in Chart 4.1 are organized by location quotient (LQ)—the share of local employment in each industry cluster relative to the nation—and the change in employment share between 2010 and 2017.²

“Star” quadrant clusters, such as transportation and logistics, retail, food and health services, have a large share of employment relative to the nation (an LQ exceeding 1) and are relatively fast growing; “emerging” industries are smaller relative to the nation (an LQ below 1) and fast growing. Industries in the “mature”

Chart 4.1: El Paso's Economy Dependent on Cross-Border Tourism, Government



NOTES: Bubble size represents cluster share of metropolitan statistical area employment. Cross-border tourism refers to activity in retail, health services and food services.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

quadrant, such as education and government, are more concentrated but slower growing or shrinking in size, and “transitioning” industries are smaller relative to the nation and slower growing or declining.

Retail and food services are star clusters of the El Paso economy, driven by the growing binational population and regional income gains. A strong relationship with neighboring Ciudad Juárez is important as Mexican shoppers account for 10 to 15 percent of El Paso’s retail sales.³ Employment in retail, the second-largest sector in El Paso, has grown 17 percent since 2010, to nearly 40,000 workers (*Chart 4.2*).

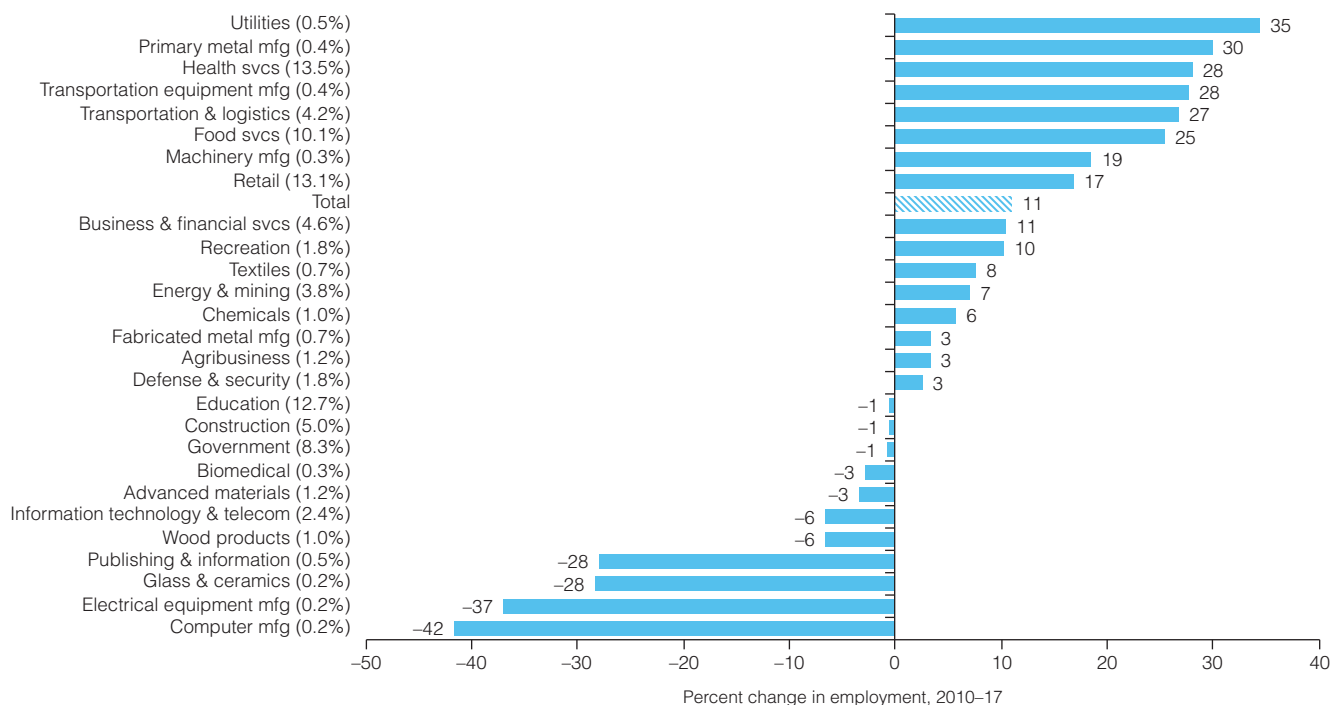
Health services, the largest sector, expanded 28 percent from 2010 to 2017, to more than 40,000 workers. Large, private health care providers such as Tenet Health and Las Palmas Del Sol Healthcare rank among El Paso’s top employers. Growth is also driven by rapidly growing medical programs at the University of Texas at El Paso (UTEP) and Texas Tech University Health Sciences Center. The sector’s expansion bodes well for the region as its wages are slightly higher than average.

Education is the third-largest cluster with more than 38,000 jobs. The sector is fueled by the 12 school districts and private and charter schools, UTEP, El Paso Community College and Texas Tech University Health Sciences Center. Although the sector is one of the area’s largest, employment has changed little since 2010.

Government (excluding public sector health care and education employment) accounts for 8 percent of workers. Fort Bliss is the largest employer in the metro area and, according to the Texas Comptroller of Public Accounts, contributed \$23.1 billion to the Texas economy in 2017.⁴ The Department of Homeland Security’s Customs and Border Protection agency, the city of El Paso and El Paso County, which together employ over 10,700 workers, are also among top government employers.⁵

El Paso is a historically important gateway from both Mexico and the Southwest to the rest of Texas. Border crossings, trade with Mexico and the Interstate 10 corridor through El Paso make transportation and logistics an important sector. About 22.1 million personal-vehicle passengers, 7 million pedestrians and more

Chart 4.2: Growth in Cross-Border Trade and Tourism Drives Job Gains



NOTES: Percent change in employment is shown in whole numbers. Each cluster’s share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors’ calculations.

Table 4.1: Low-Paying Sectors Depress Annual Average Earnings in El Paso

Cluster	El Paso					U.S.
	2010	2012	2014	2016	2017	2017
Primary metal manufacturing	56,644	57,371	60,038	55,076	56,285	67,868
Education	42,122	40,480	41,153	41,447	41,568	49,322
Transportation and logistics	44,005	43,011	42,661	42,946	43,490	53,761
Utilities	83,506	89,976	74,994	84,146	86,716	107,188
Food services	15,088	14,861	14,500	15,207	15,106	18,963
Government	57,457	57,264	57,786	59,094	58,626	60,568
Retail	25,595	25,328	25,435	26,139	26,435	31,216
Health services	43,860	42,782	42,109	44,012	43,957	56,001
Textiles	38,244	36,459	37,605	33,623	33,681	50,601
Construction	38,461	37,715	39,481	41,477	41,555	60,742
Clusters with location quotient > 1	36,613	36,885	36,743	37,688	37,769	–
Clusters with location quotient < 1	44,158	43,875	44,924	46,684	46,278	–
Average earnings (total)	37,550	37,176	37,111	37,833	37,924	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

than 530,000 loaded containers crossed the border in 2017.⁶ Additionally, cross-border manufacturing through the maquiladora industry stimulates employment in transportation.⁷ A 10 percent increase in maquiladora output has been shown to increase El Paso's transportation employment 5.3 percent.⁸

Business and financial services have gained importance since 2010. Sector jobs increased 11 percent between 2010 and 2017. Large service employers include staffing firms such as T&T Staff Management, customer service providers such as Alorica and GC Services, and other services providers such as ADP and Datamark.

The dominant sectors do not pay as well as their less-concentrated counterparts, partly because of the type of industries most represented in El Paso (*Table 4.1*). Retail and food services generally employ a large number of part-time workers, driving down overall average earnings, and even full-time employees in these industries are paid low wages. However, inflation-adjusted wages have increased much faster than overall wages in some high-concentration industries. While average wages have grown about 1.0 percent since 2010, wages rose 8.0 percent in construction, 3.3 percent in retail and 2.0 percent

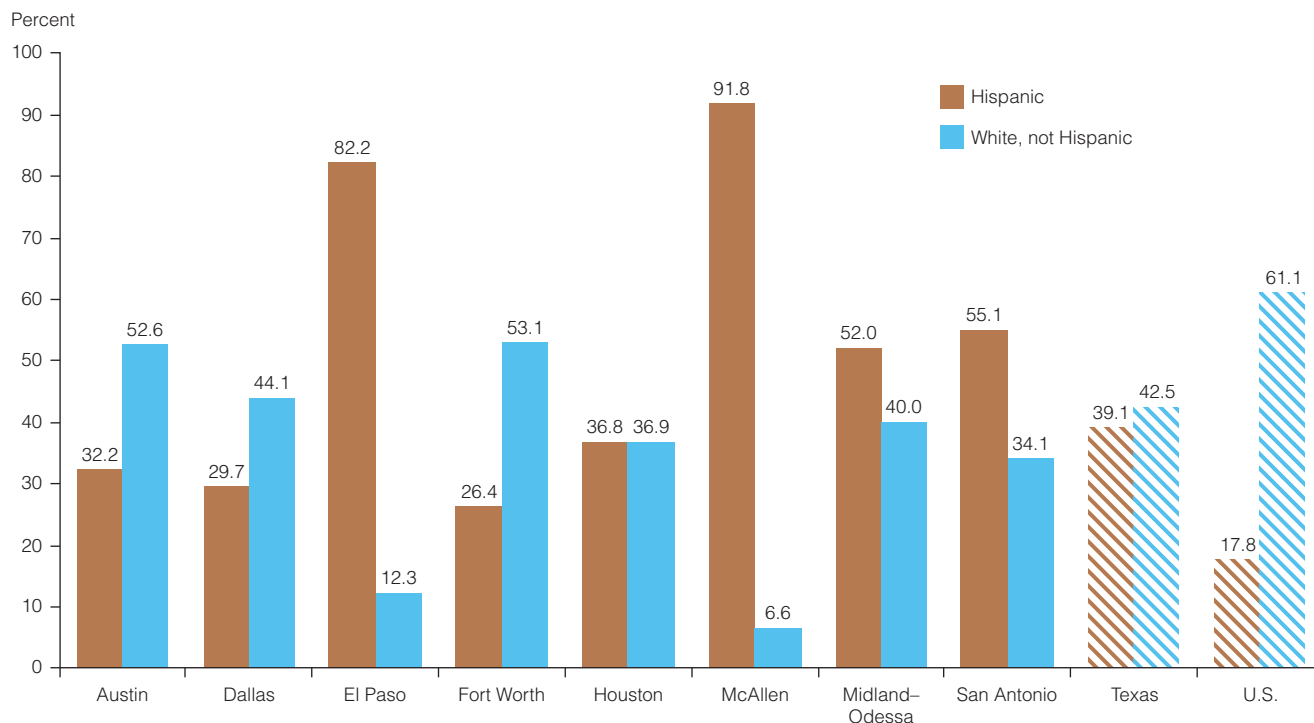
in government. Still, wages in El Paso remain below the national average for each cluster, though cost-of-living differences compensate for some of the disparity.

DEMOGRAPHICS: Population Reflects Border Proximity

El Paso's population is predominantly Hispanic, with 82.2 percent of residents self-identifying as Hispanic, the second-highest percentage among the metros in this report behind McAllen (*Chart 4.3*). A quarter of El Paso's population in 2016 was foreign born and migrated to the U.S., with 90 percent of these immigrants born in Mexico.

El Paso residents trail those of other Texas metros in measures of education. Seventy-seven percent of El Paso adults age 25 and older had at least a high school diploma in 2016. That figure is more than 6 percentage points lower than the Texas average. Only 22 percent of adults had a bachelor's degree or higher, compared with 29 percent for Texas. These education levels are in line with the large immigrant population in El Paso and the composition of its industry clusters; some of the most concentrated clusters do not require highly educated workers.

Chart 4.3: El Paso's Population Is Largely Hispanic



SOURCE: Census Bureau, 2016 American Community Survey 1-year estimates.

Labor force participation in El Paso is relatively low. About 61 percent of the population age 16 and older is in the labor force, 3.2 percentage points lower than the Texas average. This is likely due to demographic differences; for example, El Paso has a higher share of young people 15 to 24 years old who are enrolled in school and, hence, less likely to work.

EMPLOYMENT: Solid Growth Driven by Maquiladora Activity

El Paso's employment grew only 11.4 percent between December 2010 and December 2017, compared with Texas' 17.9 percent increase. However, El Paso outperformed the rest of Texas more recently, in 2015 and 2016, suggesting that the slump in the energy sector that suppressed employment growth in the state had little effect on El Paso.

El Paso's economy is heavily tied to Mexico due to the cross-border trade of goods and services, exemplified by maquiladora activity. Manufacturing in Ciudad Juárez grew robustly from 2014 to mid-2017, when it reached record employment levels. The boom in Ciudad

Juárez manufacturing has in turn boosted El Paso service sector jobs. Increases in trade, transportation and utilities and professional and business services payrolls accounted for 37 percent of the 17,000 jobs El Paso added from December 2014 to December 2017.

Other drivers were education and health services, which added 3,800 jobs from December 2014 to December 2017, representing 22 percent of total job growth. Health services accounts for nearly 1-in-7 area jobs.

With these labor gains, the unemployment rate, which averaged 6.4 percent in 2014, slid to 4.6 percent in 2017, well below the long-term average of 8.5 percent.

OUTLOOK: Ties to Mexico Bring Risks, Benefits

El Paso's close economic ties to Mexico may be a downside risk in the near future. A relatively strong dollar (weak peso) may continue to negatively affect retail, recreation and food services, which benefit from cross-border tourism. Conversely, a weak peso could boost trade from Mexico by making imported goods cheaper. The exchange rate rose from about 13 pesos

to the dollar in mid-2014 to almost 22 at year-end 2016 before settling at 20 pesos to the dollar by the end of 2018. In addition, improving security in Juárez may shift spending from El Paso to Juárez.

El Paso's economy is heavily reliant on maquiladora activity and international trade. As uncertainty about U.S. trade policy lingers, border investment may slow. Moreover, much of Juárez's manufacturing is auto related, making it vulnerable to tariffs and softening U.S. demand for vehicles.⁹ On the upside, health services, one of the fastest-growing clusters in El Paso, is expected

to continue expanding given the aging population and expansion of local medical programs such as the Texas Tech University Health Sciences Center dental school expected to open in 2020. Fort Bliss is an economic generator, and the recent increase in defense spending should buoy local base operations.

—Kristin Davis and Marycruz De León

El Paso Growth Outlook

Drivers	Challenges
<ul style="list-style-type: none">• El Paso's economy is heavily dependent on maquiladora activity, and manufacturing across the border will continue to boost jobs in El Paso.• A burgeoning health services industry will continue to expand to meet the needs of both an aging local population and Mexicans who cross the border to acquire health services.• El Paso's education sector will expand with the growth of health-care-related professional schools in the region.• Fort Bliss is a major contributor to the El Paso economy with little indication that its role will change in the foreseeable future.	<ul style="list-style-type: none">• Uncertainty regarding U.S. trade policy, tariffs and relations with Mexico may damp investment in the region.• Since roughly half of maquiladoras in Ciudad Juárez are auto related, change in U.S. vehicle demand may affect manufacturing activity south of the border with a ripple effect on El Paso employment.• A weak peso relative to the dollar poses a risk for the local retail sector and deters Mexican visitors but could boost trade by making Mexican goods relatively cheaper.

Notes

¹ The history of El Paso has been adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hde01.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ "Dollar-Sensitive Mexican Shoppers Boost Texas Border Retail Activity," by Roberto A. Coronado and Keith R. Phillips, Federal Reserve Bank of Dallas *Southwest Economy*, Fourth Quarter, 2012, www.dallasfed.org/research/swe.aspx.

⁴ See Texas Comptroller's report on impact of Fort Bliss to the Texas economy in 2017, accessed May 25, 2018, www.comptroller.texas.gov/economy/economic-data/military/fort-bliss.php. Fort Bliss employment was 48,000 in 2017.

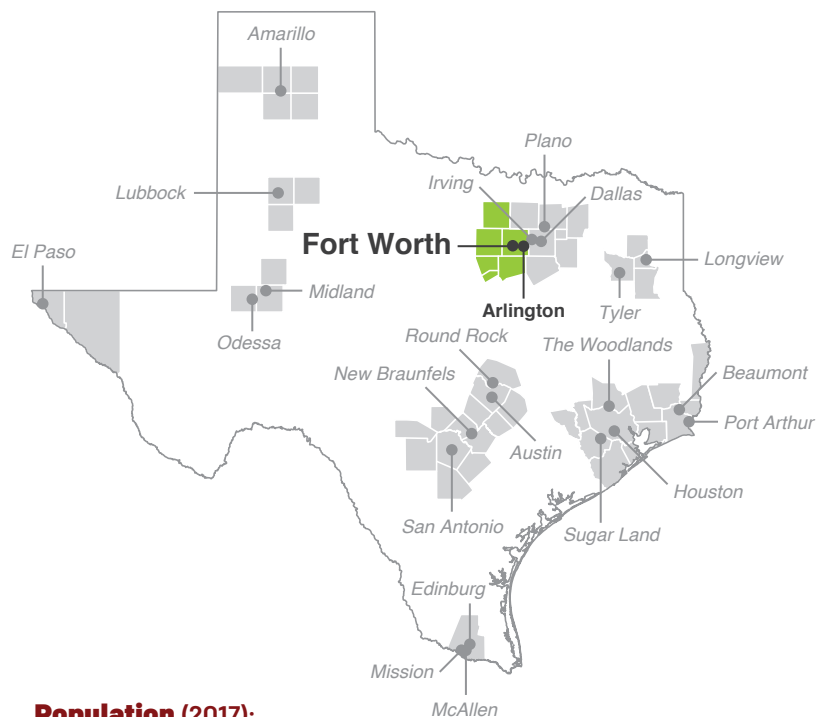
⁵ Detail on top employers in the El Paso metro area is from the city of El Paso, accessed May 25, 2018, www.elpasotexas.gov/~media/files/coep/economic%20development/top%20employers-2016.ashx?la=en.

⁶ Border crossings data are from the Bureau of Transportation Services, www.bts.gov/transborder.

⁷ Maquiladoras are manufacturing operations in Mexico that assemble imported components into exportable products that are free of import and export duties.

⁸ "The Impact of Maquiladoras on U.S. Border Cities," by Jesus Cañas, Roberto Coronado, Robert W. Gilmer and Eduardo Saucedo, *Growth and Change*, vol. 44, no. 3, September 2013, pp. 415–42.

⁹ "Economic Growth to Accelerate in 2018 and then Ease in 2019 as Auto Sales Downshift," by William A. Strauss and Thomas Haasl, *Chicago Fed Letter*, No. 399, 2018.



At a Glance

- Fort Worth began as an outpost marking Texas' western frontier. Rail connections and a central location for cattle drives helped establish the city's identity as "Cowtown," a moniker that endures.
- In the years surrounding World War II, Fort Worth emerged as a hub for the aviation and defense industries, key elements of the local economy today.
- Fort Worth's blue-collar workforce provides a ready labor supply for the manufacturing sector, but a less-educated pool of workers may be a factor shifting some types of employment toward its regional neighbor, Dallas.
- Depressed natural gas prices have limited exploration of the area's Barnett Shale, but high oil prices have aided growth in the metro's energy sector.

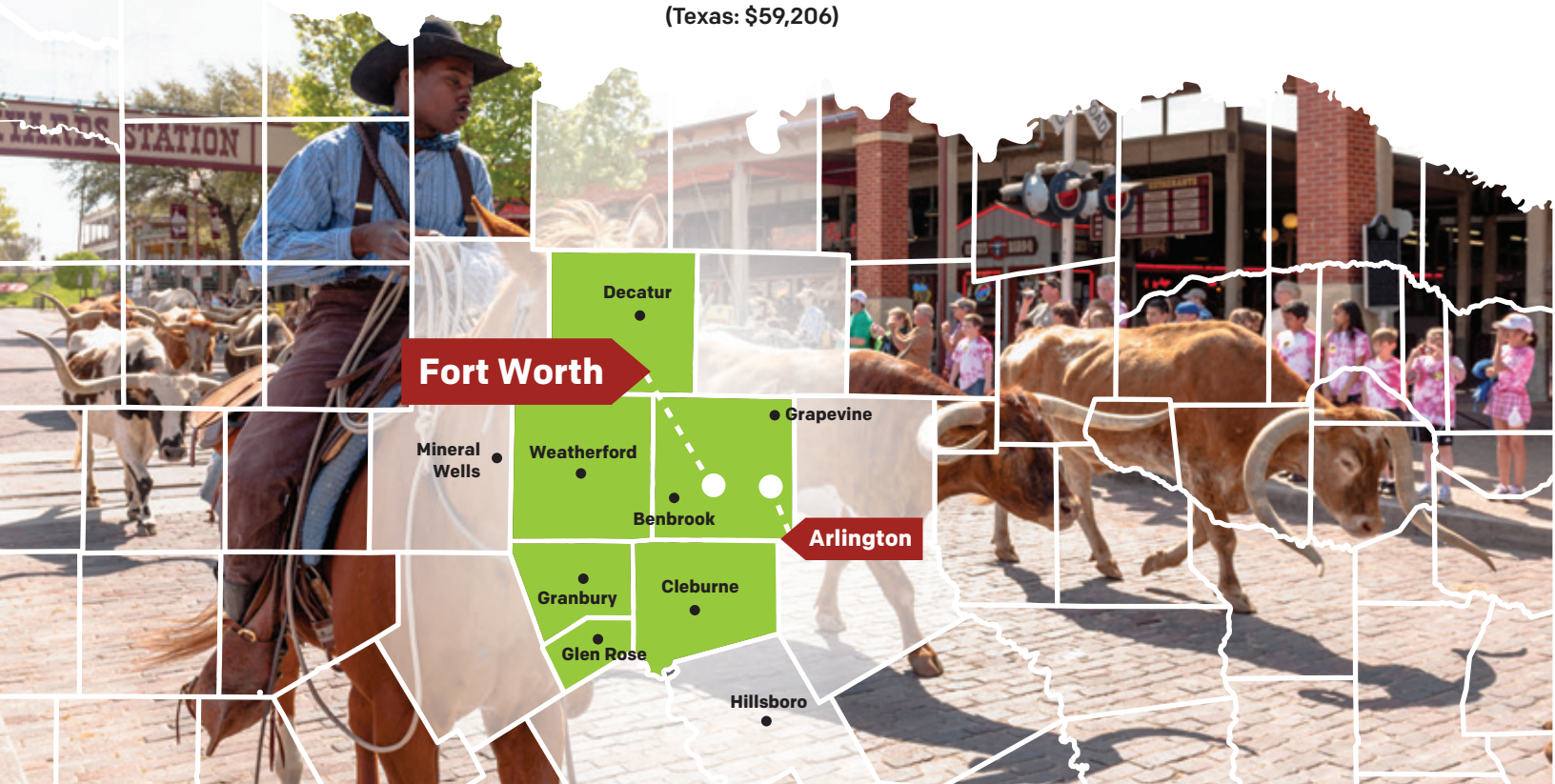
Population (2017):
2.5 million

Population growth (2010–17):
12.9 percent (Texas: 12.1 percent)

National MSA rank (2017): No. 4*
(Dallas and Fort Worth combined)

Median household income (2017): \$65,439
(Texas: \$59,206)

Kauffman Startup Index rank (2017):
No. 11* (Dallas and Fort Worth combined)



*The Fort Worth–Arlington metropolitan division is part of the Dallas–Fort Worth metropolitan statistical area (MSA) and encompasses Hood, Johnson, Parker, Somervell, Tarrant and Wise counties. The population of the Dallas–Fort Worth MSA is 7.4 million. The Kauffman Startup Activity Index, a measure of business creation in the 40 largest U.S. metropolitan areas, is further explained in the appendix.

Fort Worth–Arlington:

Transportation-Related Sectors Predominate in Local Economy

HISTORY: Cowtown Takes Off with Aviation

Fort Worth, established as an Army fort near the Clear Fork of the Trinity River in 1849, is named after Mexican–American War hero U.S. Army Gen. William Jenkins Worth. He had proposed a series of 10 forts from Eagle Pass to North Texas to mark the western Texas frontier. Shortly after Fort Worth's inception, settlers began moving in and, by 1860, had established the city as a county seat. However, its initial growth spurt didn't occur until after the Civil War.¹

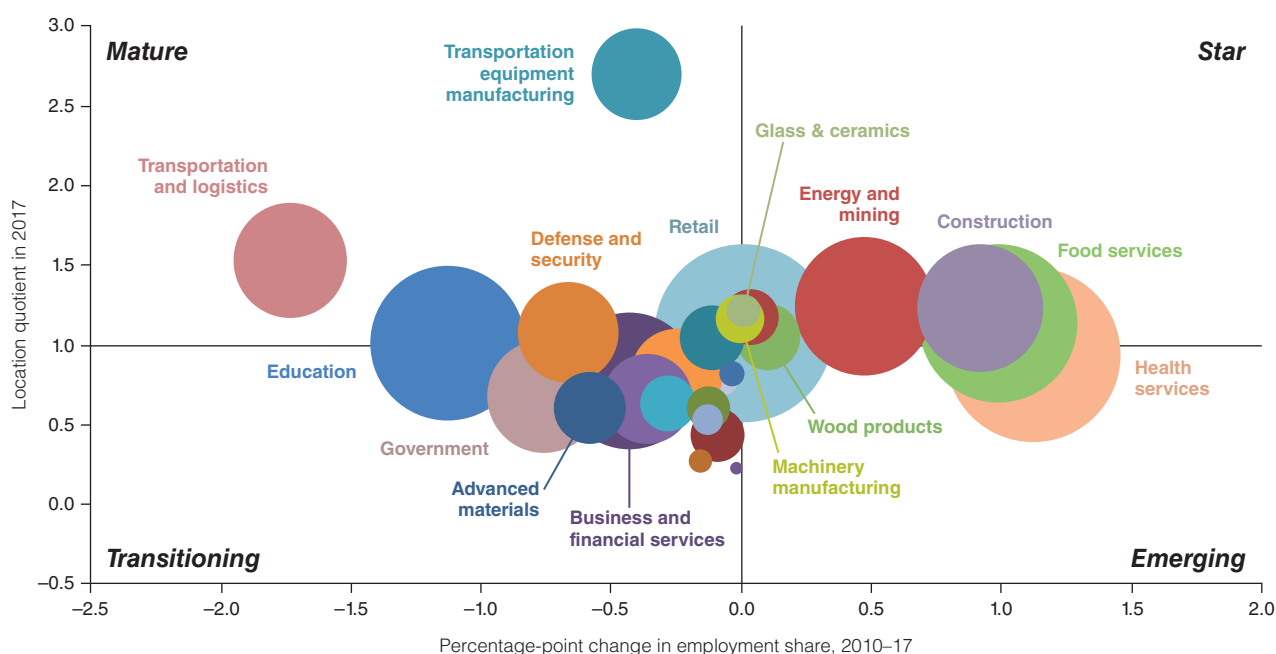
Once a wayside for cowboys on cattle drives to Kansas, Fort Worth attracted the interest of cattle buyers and meatpackers and acquired the nickname "Cowtown." The Texas Pacific Railway completed a route linking Fort Worth with San Diego in 1876—the first in a series of railroad ties—and the city caught the attention of Armour and Co. and Swift and Co. Local citizens assembled a

\$100,000 incentive to entice the companies. Both began slaughterhouse operations in 1903, helping draw a burgeoning livestock trade to north Fort Worth.

Following the discovery of oil in Texas in 1901, refinery and pipeline firms came to Fort Worth. Oil and gas companies increased their foothold during the oil boom of the 1980s and the more recent discovery of large natural gas deposits in the nearby Barnett Shale.

With World War II, the aviation industry established a major presence in the form of Consolidated Aircraft Corp. (later acquired by General Dynamics Corp. and now part of Lockheed Martin Aeronautics Co.). Carswell Air Force Base (now the Naval Air Station Joint Reserve Base), part of the Strategic Air Command, was located next door. The siting of Dallas/Fort Worth International Airport (DFW) in 1973 on the Tarrant–Dallas county line and subsequent relocation of American Airlines nearby have continued to link the city to the aviation industry.

Chart 5.1: Transportation, Manufacturing and Energy Drive Fort Worth's Economy



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

INDUSTRY CLUSTERS: Transportation Manufacturing, Defense Vital

Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, are a convenient way of assessing key drivers in an economy. An LQ exceeding 1 indicates that a specific industry cluster carries more relative weight locally than nationally. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2010 and 2017 (*Chart 5.1*).²

Clusters in the top half of *Chart 5.1*, such as transportation equipment manufacturing, have a larger share of employment relative to the nation and, thus, an LQ greater than 1. These clusters are generally vital to the area's economy and can be expanding rapidly ("star") or growing slowly ("mature"). Those in the bottom half, such as advanced materials and government, are less dominant locally than nationally and, hence, have an LQ less than 1. "Emerging" clusters, such as health services, are fast growing; those growing slowly or contracting are "transitioning."

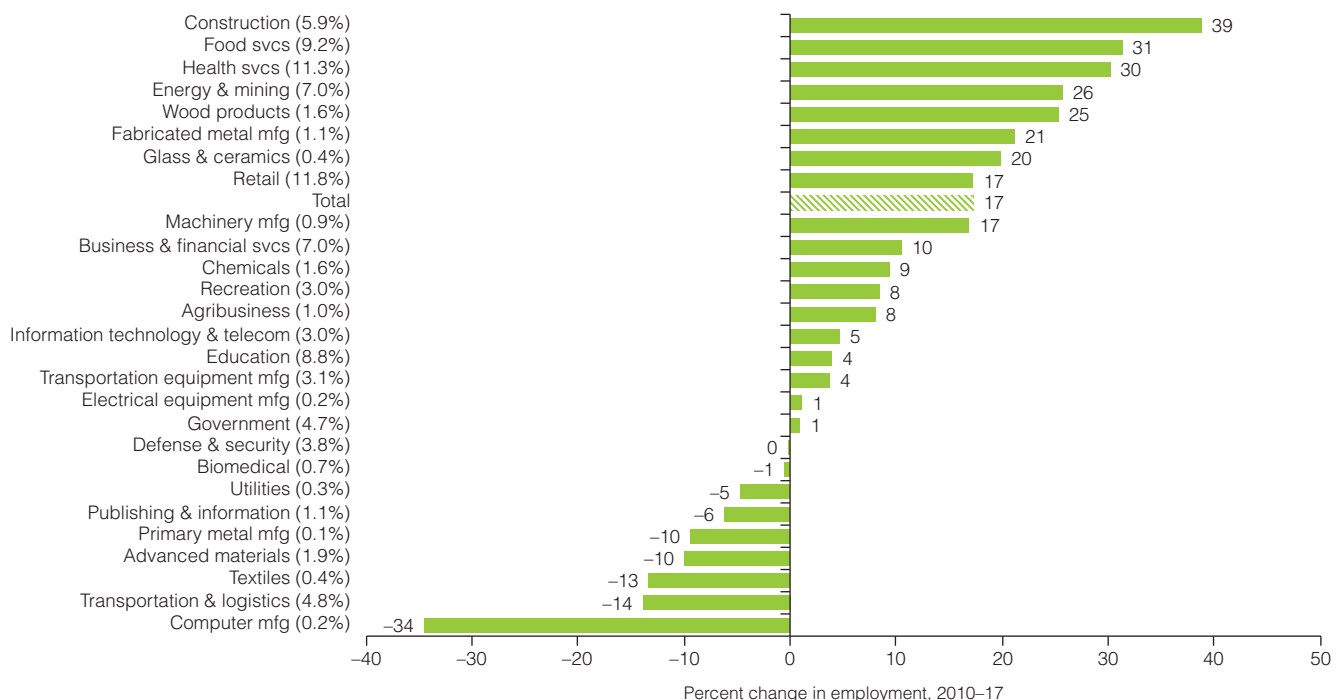
The large LQs of transportation equipment manufacturing, transportation and logistics, and defense and

security reflect their outsized role in the region. Along with DFW Airport, Fort Worth Alliance Airport and the Joint Reserve Base are major hubs. They have helped spur additional activity, much of it tied to e-commerce. United Parcel Service (UPS) has been constructing a \$200 million package operations facility in Arlington, expected to employ 1,400 full-time-equivalent positions. FedEx already operates a growing regional sorting hub at Alliance.

General Motors has operated an automobile assembly plant in Arlington since 1954 and continues to invest in its growth. The plant specializes in larger sport utility vehicles. A \$1.4 billion upgrade and expansion began at the facility in 2015, and in 2018, the company was completing a nearby manufacturing and warehousing complex to augment existing production.³

Fort Worth's largest industry clusters drive essential activity and development—these include retail, health services, food services and education. Retail, which experienced employment growth of 17 percent during the 2010–17 study period, is the largest cluster (*Chart 5.2*). Jobs in food services, the third-largest cluster, expanded 31 percent during the period. The smaller recreation

Chart 5.2: Job Gains Broad Based Across Dominant Goods and Services-Related Clusters



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 5.1: Transportation Manufacturing and Defense Sectors Pace Earnings

Cluster	Fort Worth					U.S.
	2010	2012	2014	2016	2017	2017
Transportation equipment manufacturing	94,220	96,044	92,359	99,533	95,231	73,569
Transportation and logistics	58,733	58,450	49,894	45,509	46,467	53,761
Energy and mining	83,368	75,853	78,625	71,766	72,643	80,900
Construction	50,460	51,753	54,579	57,863	60,418	60,742
Glass and ceramics	51,932	55,022	59,728	59,747	62,752	55,398
Fabricated metal manufacturing	52,526	53,323	55,472	54,188	55,033	55,830
Machinery manufacturing	66,040	69,553	67,927	66,944	68,726	70,059
Food services	17,533	17,437	17,565	18,164	18,254	18,963
Defense and security	87,777	87,885	88,876	91,022	89,034	91,226
Retail	32,001	31,397	31,680	32,110	31,700	31,216
Wood products	47,531	48,261	49,498	52,251	53,924	52,914
Chemicals	98,629	93,074	87,437	75,376	72,983	72,887
Education	43,232	42,308	43,278	44,695	44,066	49,322
Clusters with location quotient > 1	52,605	53,336	52,751	50,106	50,044	—
Clusters with location quotient < 1	64,161	59,931	60,142	64,908	64,544	—
Average earnings (total)	51,298	50,841	51,875	52,276	52,714	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

cluster, which grew 8 percent, includes Arlington's Six Flags Over Texas amusement park. The park's parent company, Six Flags Entertainment Corp., is based in nearby Grand Prairie.

The energy and mining cluster holds a large overall employment share and experienced the fourth-fastest employment growth of all clusters, up 26 percent from 2010 to 2017. Fort Worth was a commercial center for the oil industry early in the last century and enjoyed easy access to the Permian Basin to the west. Today, it is the center of the Barnett Shale formation, a prolific source of natural gas. Persistent price weakness—natural gas was selling for about one-third of its July 2008 high in November 2018—has prompted some retrenchment.

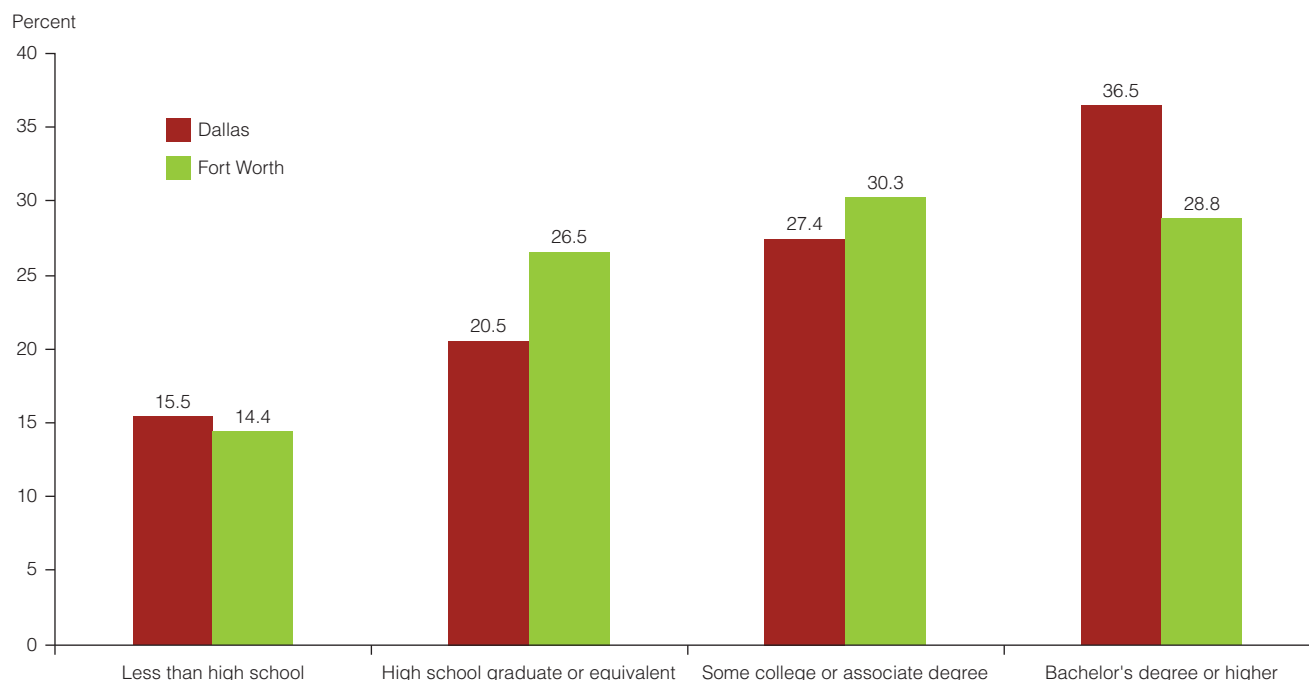
The Fort Worth metropolitan division also supports a sizable defense and security cluster that includes Lockheed Martin Corp. and Bell Helicopter. Arlington is the site of two premier sports facilities—AT&T Stadium, where the Dallas Cowboys football team has played since moving from Irving in 2009, and Globe Life Park (formerly the Ballpark in Arlington), home field of the Texas Rangers baseball team. A \$1.1 billion, 41,000-seat

baseball stadium, Globe Life Field, is under construction and scheduled to open in 2020.

Fort Worth's construction industry cluster was the fastest-growing over the study period. In 2016, the value of all construction activity in the greater Dallas-Fort Worth metropolitan area ranked second among the nation's metros, according to Dodge Data and Analytics.⁴ Major projects recently undertaken in Fort Worth include Facebook's more than \$1 billion data center and a \$450 million multipurpose arena near the Will Rogers Memorial Center that will become home of the annual Fort Worth Stock Show & Rodeo.⁵ Residential construction activity in Fort Worth has picked up as well, and growth in single-family permits exceeded the Dallas metropolitan division in 2017 for the first time since 2013.⁶

On average, clusters with a greater employment concentration locally than nationally paid \$50,000 annually, compared with those with a relatively smaller presence, at \$64,500 (*Table 5.1*). However, within more concentrated clusters, average pay varies widely. Transportation equipment manufacturing—with nearly three

Chart 5.3: Share of College Graduates Lower in Fort Worth Relative to Dallas



NOTE: Share of population age 25 and over.

SOURCE: Census Bureau, 2016 American Community Survey 1-year estimates.

times the national employment share (LQ of 2.7)—pays well, at \$95,200, as does defense and security (LQ of 1.1), at \$89,000. By comparison, the larger food services and retail clusters (both straddling the star and emerging categories) were among the lowest paying, at about \$18,300 and \$31,700 a year, respectively.

DEMOGRAPHICS: In-Migration Key to Growth

Fort Worth and its larger neighbor, Dallas, make up the Dallas–Fort Worth metroplex—the fourth-largest MSA in the country, with 7.4 million people in 2017.⁷ New residents from elsewhere in the U.S. accounted for 40 percent of the metroplex’s population growth in 2017, and the region took the top spot nationally for total net migration from 2010 to 2017. The largest share of people moving from outside the state to Dallas–Fort Worth in 2016 came from California, followed by Oklahoma.

A total of 59.3 percent of the Fort Worth area’s foreign-born population came from Latin America, less than the 68.6 percent share for Texas overall in 2016.

In 2017, Fort Worth’s median household income—the midpoint at which half of incomes are above and

below—was \$65,439, exceeding the U.S. median of \$63,336 but trailing Dallas.

Consistent with the area’s manufacturing emphasis, 28.8 percent of workers age 25 and older hold a bachelor’s or higher degree, less than Dallas at 36.5 percent and the U.S. at 31.2 percent but on par with Texas at 28.9 percent (*Chart 5.3*). The share of adults with only a high school diploma in Fort Worth exceeds the share in Dallas.

EMPLOYMENT: Energy Affects Postrecession Recovery

While Fort Worth and Dallas together make up a diversified economy that closely resembles the U.S. as a whole, the influence of the mining and energy cluster—whose LQ of 1.2 makes it more prominent locally than nationally—likely helped Fort Worth get a quicker start than its sibling metro following the Great Recession. While it took Dallas 51 months to regain all the jobs it lost during the recession, Fort Worth was able to rebound in 43 months.

The situation was reversed in 2015, when the steep decline of oil and gas prices restrained the Fort Worth area’s expansion.

Through much of 2012 and 2013, the Fort Worth area's unemployment rate was lower than Dallas'. A wider spread—this time favoring Dallas—emerged during 2015 as the energy slump deepened. Employment growth in Fort Worth slowed to 0.9 percent in 2015, and in 2016, job gains occurred at a 1.5 percent rate. This compares with 3.7 percent for Dallas over the same period. Higher oil prices and a pickup in manufacturing activity boosted Fort Worth employment growth to 2.3 percent in 2017, similar to Dallas' 2.6 percent increase.

Fort Worth's unemployment rate was 0.7 percentage points below the U.S. average during most of 2017 and was little changed through much of 2018.

OUTLOOK: Transportation and Defense Lead

Although sometimes viewed as a single economic unit with Dallas, the Fort Worth region has a unique and complementary industry profile, with a greater concen-

tration in energy, transportation and defense. In the near term, those industries' performances will help set the course for Fort Worth. Logistics is an expanding sector that should provide a net positive. A lower cost of housing relative to Dallas will continue to attract residents to Fort Worth, which in 2017 outpaced its eastern neighbor in both single-family and multifamily construction.

Federal budget decisions will likely help set the long-term outlook for the historically powerful defense and security cluster and the almost 4 percent of the workforce it represents. Stagnant prices for natural gas will damp prospects and limit natural gas exploration along the Barnett Shale. Record high oil production in the state will continue to boost growth in the energy and mining cluster, which makes up 7 percent of the region's employment and is classified as a star among Fort Worth's clusters.

—Michael Weiss and Alexander T. Abraham

Fort Worth—Arlington Growth Outlook

Drivers

- Manufacturing operations, defense industry installations and transportation and logistics facilities provide a strong foundation of well-paying jobs.
- Expanding oil production will continue to benefit Fort Worth's energy and manufacturing sectors, fueling job growth in the metro.
- Greater housing affordability relative to Dallas will attract residents and employers to Fort Worth.

Challenges

- Volatile fuel prices may affect expansion in Fort Worth's large transportation cluster.
- A relatively less-well-educated workforce may limit the kinds of businesses that select a Fort Worth location over one in Dallas.
- The defense and security cluster and large military base are vulnerable to federal budget cuts in the future.

Notes

¹ The history of Fort Worth is taken from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdf01.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ "GM Adds 850 More Jobs in Arlington, Expands to Six Flags Mall Site," by Tracy M. Cook, *Dallas Morning News*, June 16, 2017, www.dallasnews.com/business/jobs/2017/06/16/general-motors-bring-850-jobs-arlington.

⁴ "Dallas-Fort Worth Construction Is Slowing from Recent Highs," by Steve Brown, *Dallas Morning News*, Aug. 1, 2017, www.dallasnews.com/business/real-estate/2017/08/01/dallas-fort-worth-construction-slowing-recent-highs.

⁵ "Facebook's Fort Worth Data Center Opening This Week Is Getting Bigger," by Steve Brown, *Dallas Morning News*, May 3, 2017, www.dallasnews.com/business/real-estate/2017/05/03/facebooks-fort-worth-data-center-opening-week-getting-bigger; "New \$450 Million Dickies Arena Moves Forward in Fort Worth," by Larry Collins, KXAS-TV, April 18, 2017, www.nbcdfw.com/news/local/New-450-million-Fort-Worth-Arena--419681933.html.

⁶ In 2017, single-family permits in the Dallas-Plano-Irving metropolitan division were up 13 percent from the previous year compared with a 29 percent increase in Fort Worth-Arlington.

⁷ The 2017 population estimates are from the Census Bureau. The three largest metropolitan statistical areas are New York-Newark-Jersey City, Los Angeles-Long Beach-Anaheim and Chicago-Naperville-Elgin.



Population (2017):
6.9 million

Population growth
(2010–17): 15.9 percent
(Texas: 12.1 percent)

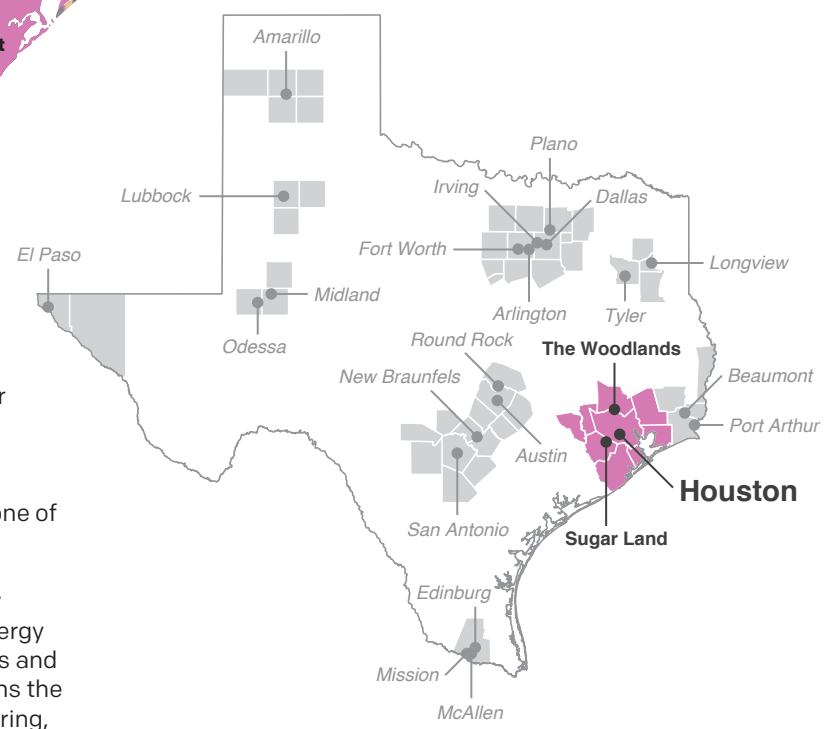
Median household income (2017): \$63,802
(Texas: \$59,206)

National MSA rank (2017):
No. 5*

Kauffman Startup Index rank (2017):
No. 9*

At a Glance

- Houston is Texas' second-largest metro, accounting for one-quarter of the state's jobs and 30 percent of its economic output.
- Houston began as a port city, rising to prominence as one of the top three busiest deepwater ports in the U.S.
- Due to its proximity to Spindletop, site of the legendary 1901 oil strike, the Houston area quickly became the energy capital of the U.S. and home to oil companies, refineries and petrochemical plants. While the energy industry remains the dominant cluster, the metro has diversified. Manufacturing, chemicals and health industries have grown in importance.
- A series of catastrophic flooding events has prompted reevaluation of the area's basic needs and plans. New building regulations and infrastructure investments may raise the region's cost of housing and doing business.



*The Houston–The Woodlands–Sugar Land metropolitan statistical area (MSA) encompasses Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery and Waller counties. The Kauffman Startup Activity Index, a measure of business creation in the 40 largest U.S. metropolitan areas, is further explained in the appendix.

Houston–The Woodlands–Sugar Land:

Texas' Gulf Coast Hub and Nation's Energy Capital

HISTORY: An Energy Complex Emerges from a Port City

Houston was founded in 1836 along Buffalo Bayou, a waterway leading to the Gulf of Mexico. At the time, the city was dependent on agriculture and commerce, and most business involved selling supplies to area farmers.¹

Because Buffalo Bayou was difficult to navigate, trade tended to pass through Galveston, 50 miles away on the coast. Rail lines connected Houston to the countryside, and by 1861, the city was the rail center of southeast Texas. The U.S. government began widening and deepening Buffalo Bayou in 1881, and when the Houston Ship Channel was finally completed in 1914, Houston became a deepwater port, ranking among the top three ports by volume in the U.S. just before World War II.²

Drillers struck oil in 1901 at Spindletop, 75 miles to the east near Beaumont, catalyzing the oil boom in Texas. Sinclair Oil Co. built the first major oil refinery in

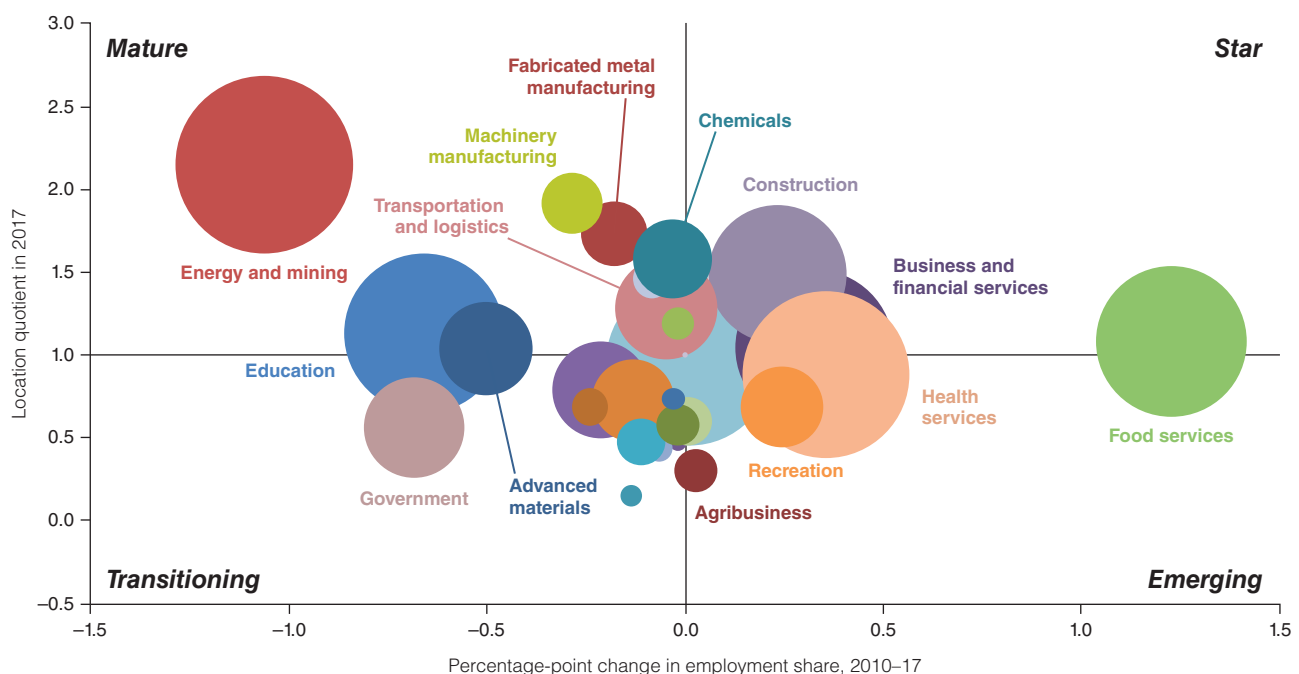
Houston in 1918, and many others followed, constructing facilities along the Houston Ship Channel.

Forty oil companies had Houston offices by 1929. During World War II, demand for petrochemical products skyrocketed, and Houston quickly developed one of the largest petrochemical plant concentrations in the U.S. Houston was an international energy capital by the 1970s, expanding with the oil boom but also contracting during the 1980s bust.

INDUSTRY CLUSTERS: Energy and Related Industries Dominate

Chart 6.1 shows the composition of industry clusters in Houston, organized by location quotient (LQ), a measure of a cluster's share of local employment relative to its share nationally. Each cluster is plotted based on employment share change between 2010 and 2017.³

Chart 6.1: Energy and Related Manufacturing Among Houston's Dominant Clusters



NOTE: Bubble size represents industry share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

Clusters in the “star” quadrant, such as construction, have a large share of employment relative to the nation (an LQ exceeding 1) and are relatively fast growing; “emerging” industries, such as recreation, are smaller relative to the nation (an LQ less than 1) but also fast growing. “Mature” sectors, such as the energy and mining industry, are more concentrated but slower growing; “transitioning” segments, such as government, are smaller relative to the nation and are slower growing.

Energy and related companies—which include oilfield services and refining—by far make up the largest industry group in Houston, employing 12 percent of the workforce, after contracting during the 2015–16 energy bust. As of 2018, Houston had 21 Fortune 500 headquarters, 17 of which are related to oil and gas extraction and processing. Apart from Phillips 66 and ConocoPhillips—whose headquarters are in Houston—the city’s largest employers include units of Exxon Mobil Corp., with 14,000 employees, and Shell Oil Co., with 12,000 employees.⁴

Oilfield manufacturing and services companies that support the energy extraction firms include National Oilwell Varco, Schlumberger and Halliburton. This concentration has spawned significant clusters of machinery and fabricated metal manufacturers.

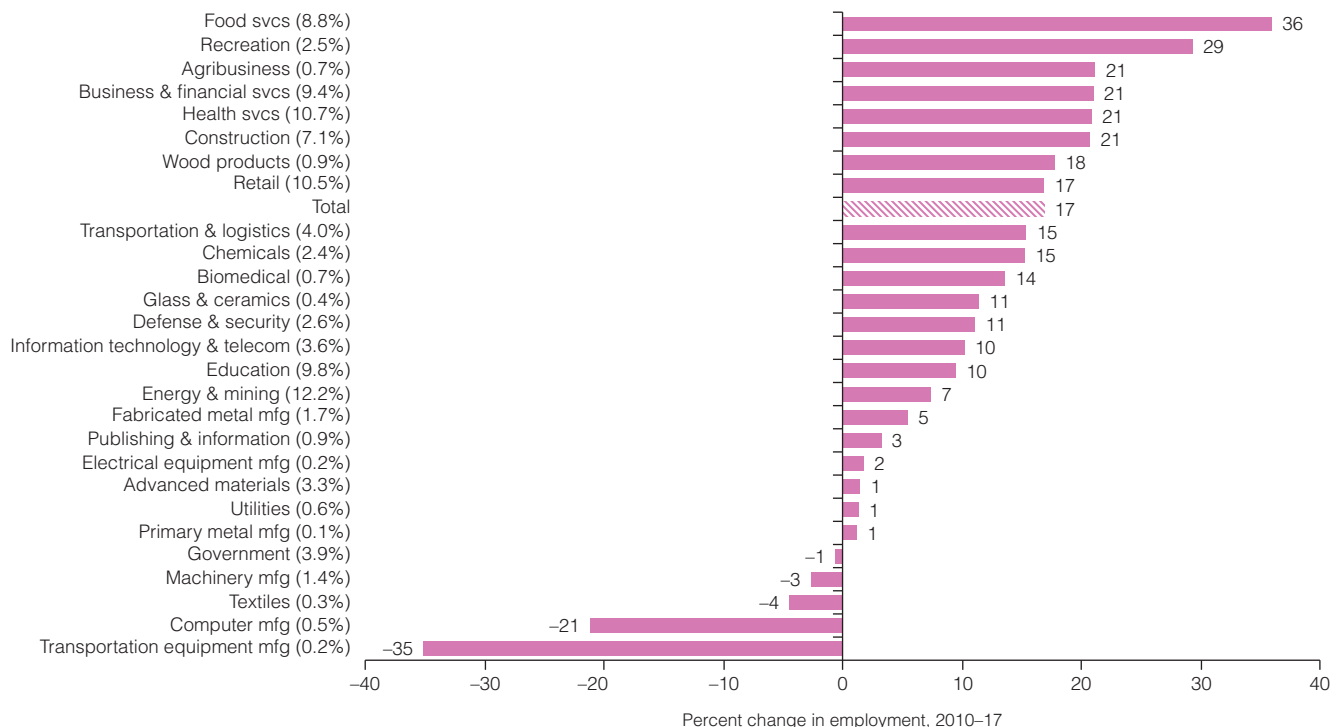
The chemical industry is another major energy-related cluster, employing 2.4 percent of Houston’s workforce. Leading employers include Dow Chemical Co. and many of the large energy companies, including Exxon Mobil, which also manufacture chemicals.

Houston is a major port city and regional commercial hub. The United Airlines hub, the carrier’s second largest, is located at George Bush Intercontinental Airport and employs 14,200 people in Houston. Southwest Airlines dominates Hobby Airport and has 3,600 local workers.

The health services cluster, accounting for 10.7 percent of Houston’s workforce, has also grown significantly in recent years. Two of the area’s largest employers, with more than 20,000 workers each, are Memorial Hermann Health System and the University of Texas MD Anderson Cancer Center. Though Houston’s concentration of health care workers remains below that of the U.S. (with an LQ of 0.9), employment grew 21 percent from 2010 to 2017 (*Chart 6.2*).

The major industry clusters in Houston pay significantly more than other industries (*Table 6.1*). Average annual earnings for energy and mining, for example, were \$120,700 in 2017; overall average earnings in Houston were \$65,000. Workers employed in the most-con-

Chart 6.2: Food Services and Recreation Lead Houston Job Growth



NOTES: Percent change in employment is shown in whole numbers. Each cluster’s share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors’ calculations.

Table 6.1: Energy and Related Clusters Drive Houston Workers' Earnings

Cluster	Houston					U.S.
	2010	2012	2014	2016	2017	2017
Energy and mining	119,894	125,444	124,557	123,673	120,706	80,900
Machinery manufacturing	97,114	101,846	102,492	103,066	103,421	70,059
Fabricated metal manufacturing	63,695	67,507	67,773	65,234	66,269	55,830
Chemicals	100,730	103,317	106,506	111,148	113,496	72,887
Construction	65,995	69,062	72,861	73,834	72,883	60,742
Utilities	119,242	124,631	126,614	124,790	134,235	107,188
Transportation and logistics*	76,050	84,102	77,871	79,562	80,508	53,761
Glass and ceramics	53,149	56,688	57,244	56,232	57,804	55,398
Education	46,750	45,968	47,670	49,880	49,985	49,322
Food services	18,860	18,683	18,990	19,530	19,514	18,963
Business and financial services	101,936	103,693	105,695	104,660	104,444	100,785
Advanced materials	85,835	88,217	89,508	94,195	97,136	85,695
Clusters with location quotient > 1	78,245	81,979	82,404	81,110	80,337	—
Clusters with location quotient < 1	55,631	55,889	56,250	57,454	57,303	—
Average earnings (total)	63,031	65,474	66,707	65,399	64,953	55,375

*Large increase is due to average earnings in NAICS 486 (pipeline transportation) doubling in second quarter 2012 compared with second quarter 2010.

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

concentrated clusters—those with LQs greater than 1—earn on average 40 percent more than workers in less-concentrated clusters (\$80,300 versus \$57,300). Average real earnings (inflation-adjusted) in Houston grew 3.0 percent from 2010 to 2017. Earnings in the most-concentrated clusters grew more slowly at 2.7 percent.

DEMOGRAPHICS: Houston Population More Diverse

Demographics in Houston—the state's second-most populous metro, with 6.9 million residents—are more diverse than in the other major metros. Houston's Hispanic population is as large as the white non-Hispanic population—around 37 percent. The black (non-Hispanic) share, 16.9 percent, and Asian (non-Hispanic) share, 7.6 percent, are higher than in most other Texas metro areas in this report (*Chart 6.3*).

As an immigrant gateway city with rapid job growth, Houston's increasingly diverse industrial base and top universities have made it a popular destination for those relocating from other countries. Apart from the Texas border metros, Houston has the state's largest foreign-born population share, 23.5 percent. Roughly

two-thirds of the foreign born are from Latin America and a fourth are from Asia.

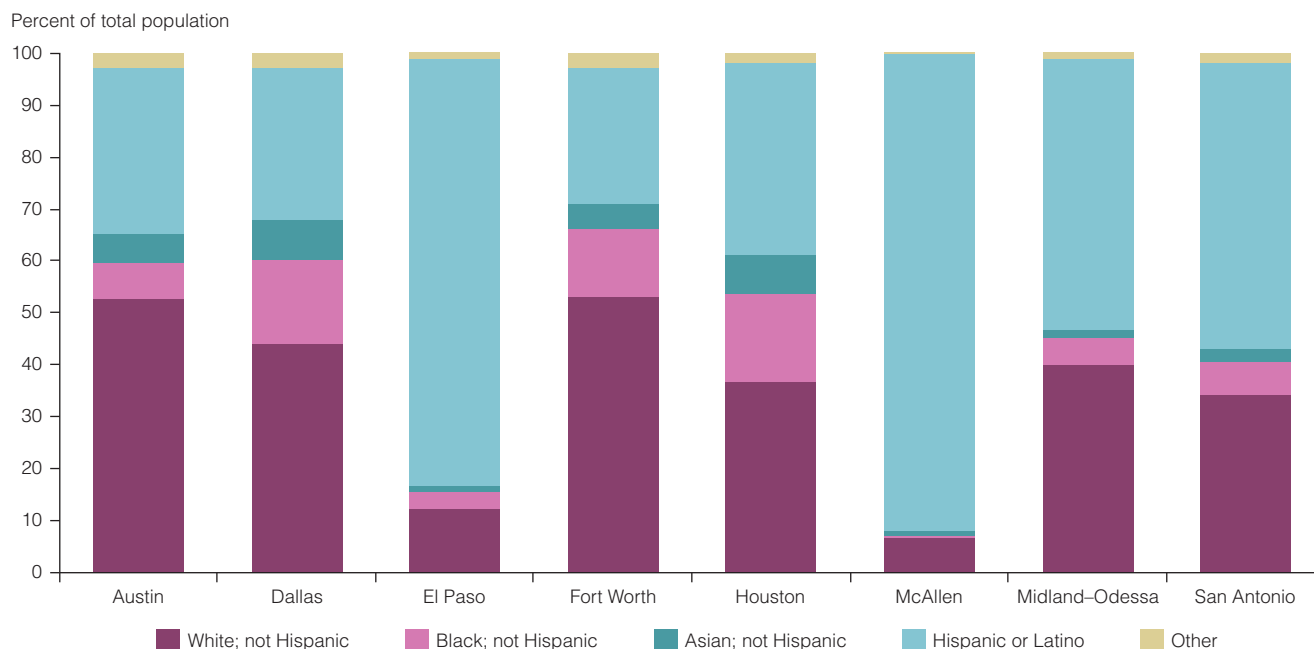
Houston trails Dallas and Austin in the share of the population with a bachelor's degree or higher. This reflects the abundance of energy industry and manufacturing jobs, many of which pay well but do not require a college degree. However, Houston's population is more educated than Texas' overall. Thirty-two percent of Houston's population holds a bachelor's degree or higher; the Texas average is 28.9 percent.

EMPLOYMENT: Impact of Energy Booms and Busts, Storms

The shale oil boom fueled Houston's rapid postrecession growth. With its high concentration of firms in energy and related industries, Houston's employment prospects were driven by shale exploration, directly and indirectly.

However, energy-fueled booms are sensitive to price busts. In response to crashing oil prices in late 2014, the Houston economy stalled in 2015 and 2016. Job losses were concentrated not only in goods-producing sectors such as energy and manufacturing, but also in some

Chart 6.3: Population More Diverse in Houston than in Other Major Texas Metros



SOURCE: Census Bureau, 2016 American Community Survey 1-Year Estimates.

service sectors such as professional and business services. Houston's economy bounced back in 2017, with payroll employment expanding 1.9 percent.

In August 2017, Hurricane Harvey wreaked havoc on the middle and upper Texas Gulf Coast, bringing the region to a standstill for a week. The region sustained at least \$70 billion in damage, and nearly 100,000 residential structures were flooded. The region also lost an estimated \$8.5 billion in economic output—about 1.7 percent of the metro area's gross domestic product (GDP).⁵

While the economic effects of major storms are generally transitory in thriving economies such as Houston, flooding has been a growing problem in the metro area in recent years. The potential impacts of future weather events have led to substantial public investment and expanded regulation. Harris County voters approved a \$2.5 billion flood control program in 2018.

Houston has historically bounced back from adversity. It was hard hit by the Great Recession, losing 4.6 percent of its jobs between August 2008 and November 2009. Among the large Texas metros, only Dallas–Fort Worth lost more. However, Houston rebounded strongly, with employment expanding 18.1 percent from December 2009 to December 2014, or 3.4 percent per year.

Among the large metros, only Austin came back faster, up 4.0 percent per year during the period.

Firms that directly participate in fossil fuel production, refining and petrochemicals expanded significantly, as did companies that provide support to energy producers, such as machinery manufacturers, construction and real estate firms, and business and financial services enterprises.

OUTLOOK: End of Energy Recession Signals Renewed Growth

Energy made up 18.4 percent of Houston's economy (nominal GDP) going into the 2015–16 oil bust, after which the industry hit a low of 9.6 percent of metro GDP in 2016. The oil bust led to severe job losses in the goods-producing sectors, steep declines in energy-related investment and falling demand for business services and commercial real estate, especially office space. That said, the effects of falling oil prices from December 2014 through February 2016 were not nearly as drastic for Houston as those during the 1980s oil bust, reflecting the region's greater resilience through economic diversification.

Other headwinds for the Houston economy during the last oil bust were low oil prices, the strong dollar and weak global demand, which suppressed export growth. Because Houston is a port city, trade is vital to the economy and supports hundreds of thousands of area jobs, by some estimates.⁶ The World Bank estimates that global trade growth strengthened to a six-year high in 2017 after two years of pronounced weakness, and it forecasts annual trade expansion to ease through 2020 due to deceleration in global investment and heightened uncertainty surrounding U.S. trade policy.⁷

Parts of the energy industry are poised to expand. A cycle of petrochemical-plant and liquefied natural gas-terminal openings peaked in 2017. After the comparatively labor-intensive construction phase—expect-

ed to taper off by 2020—the plants will require fewer employees as they become operational. The lifting of oil export restrictions has also contributed to a large upswing in related trade activity.

Meanwhile, Houston's health care industry is expected to grow to support a burgeoning aging population. More than 1-in-10 Houston residents is over age 65, and this cohort is expected to grow significantly in the coming decades as baby boomers age. The world-recognized medical research, highlighted by the MD Anderson Cancer Center, attracts patients from far outside the area. The University of Texas Medical Branch in Galveston is another hub of medical exploration.

—Kristin Davis and Jesse Thompson

Houston—The Woodlands—Sugar Land Growth Outlook

Drivers

- Refinery operators and petrochemical producers are benefiting from expanding domestic oil and natural gas production and growing global demand.
- Firm oil prices helped solidify the energy sector recovery from the oil bust of 2015–16.
- Global economic expansion and removal of the crude oil export ban may boost export-related employment and investment.
- A strong health care industry will continue to expand with the retirement of the baby boomers and innovations in medical technology and pharmaceuticals.

Challenges

- The winding down of construction on several large petrochemical plants and liquefied natural gas terminals in coming years may lessen demand for some construction workers and related services.
- The allocation of public dollars to flood-mitigation projects may limit investment in other public projects and services. New building regulations may raise housing costs and office rents.
- Uncertainty around federal policy on immigration, international trade and tariffs could adversely affect Houston's economy, which depends on the economic contributions of both.

Notes

¹ The history of Houston is taken from the Texas State Historical Association's (TSHA) *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdh03.

² "Houston Ship Channel," by Marilyn M. Sibley, *Handbook of Texas*, TSHA, tshaonline.org/handbook/online/articles/rhh11.

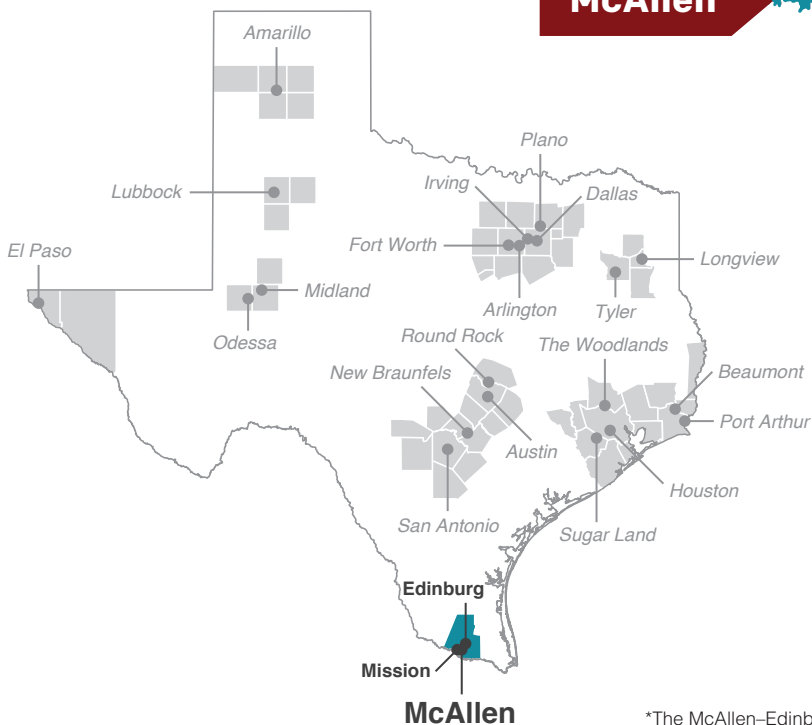
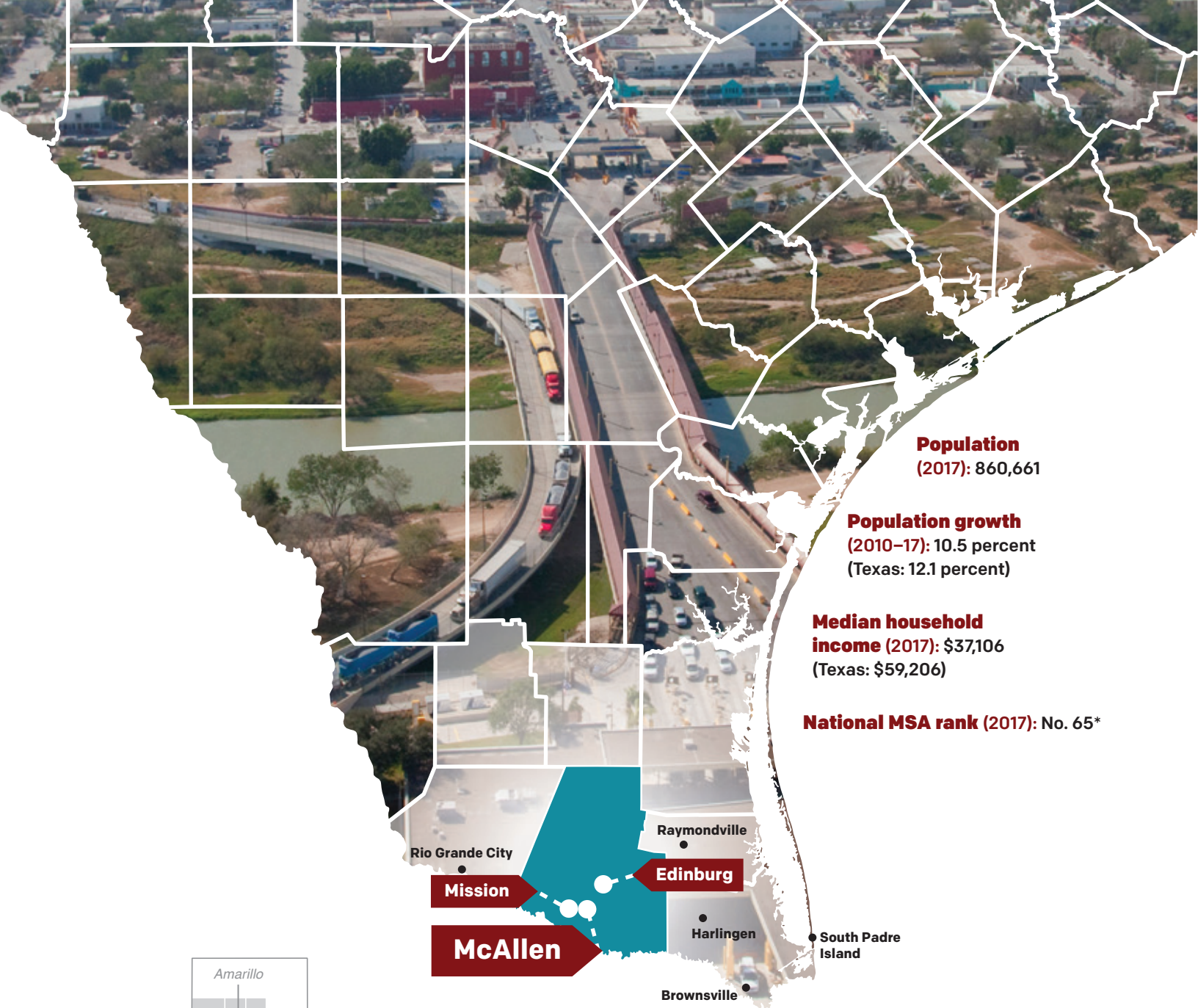
³ The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

⁴ Data on major Houston employers are taken from the *Houston Business Journal Book of Lists* and the Greater Houston Partnership's 2017 *Houston Facts*, www.houston.org/assets/pdf/economy/Houston_Facts_2017.pdf. Nonenergy Fortune 500 companies headquartered in Houston were Sysco, Waste Management, Group 1 Automotive and Quanta Services, www.houston.org/newgen/14_Company_Information/14A%20W001%20Fortune%20500%20Companies.pdf.

⁵ "U.S. Disaster Costs Come Into Clearer Focus," by Adam Kamins, Moody's Analytics, 2017, accessed Jan. 20, 2018, www.economy.com/dismal/analysis/todays-economy/298539/US-Disaster-Costs-Come-Into-Clearer-Focus/.

⁶ See the Greater Houston Partnership's 2018 Houston Employment Forecast, Dec. 8, 2017, www.houston.org/assets/pdf/economy/Employment-Forecast-2018-web.pdf. The total employment impact involves 450,000 jobs.

⁷ *Global Economic Prospects*, World Bank, January 2018, www.worldbank.org/en/publication/global-economic-prospects.



At a Glance

- Health services, education and retail trade are the largest clusters in McAllen, though transportation and logistics is also an important sector, attributable to the border crossings with Mexico.
- McAllen wasn't notably affected by slowing elsewhere in the state during the 2015–16 oil bust, though growth was below the long-term average.
- The dollar–peso exchange rate affects cross-border retail spending and, hence, growth in key retail and food services sectors.
- A population that is relatively poorer and less-educated than the Texas average may limit the area's ability to attract high-paying industries.

*The McAllen–Edinburg–Mission metropolitan statistical area (MSA) encompasses only Hidalgo County.

McAllen–Edinburg–Mission:

Retail, Medical Hub Draws on Cross-Border Trade

HISTORY: From a Private Ranch to a Bridge to Mexico

McAllen began as a private ranch in the late 19th century. The city was not officially incorporated until 1911, several years after the St. Louis, Brownsville and Mexico Railway established a depot on ranch-donated land.¹

At the request of President Woodrow Wilson, 20,000 soldiers from New York were deployed to McAllen in 1916 to help quell border disturbances. The area subsequently boomed, with the population growing from 1,200 to 6,000 by 1920.

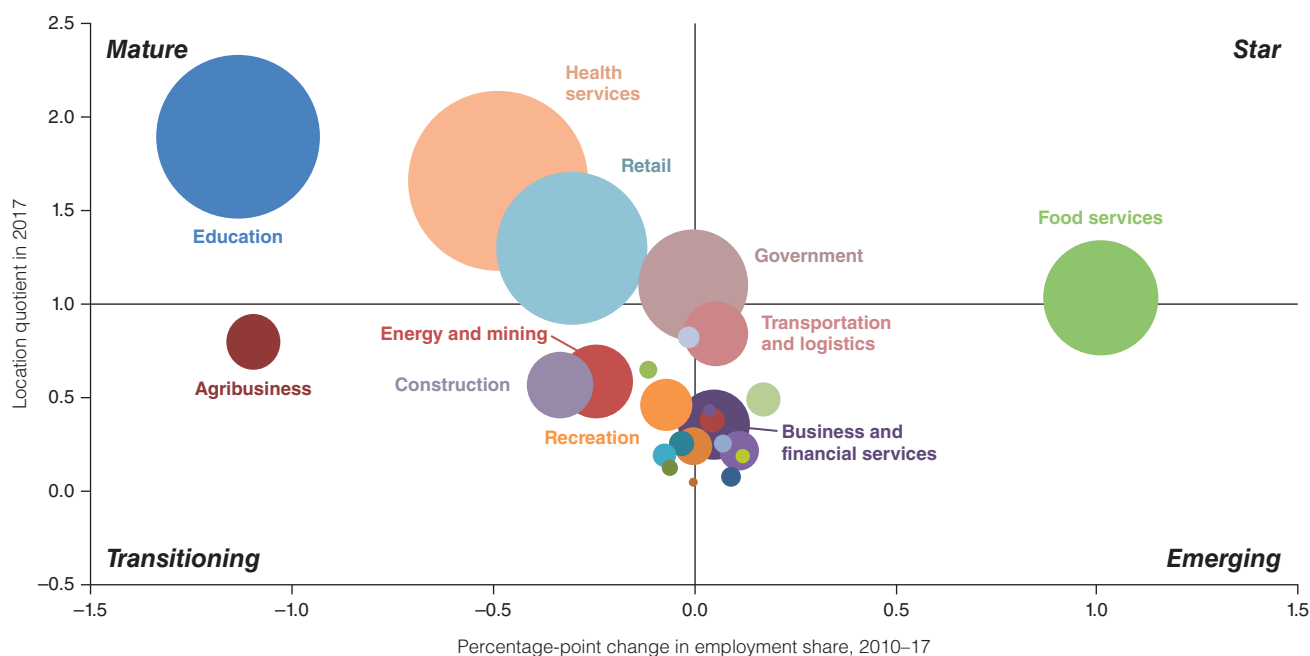
McAllen's economy was primarily agriculture based, with some oil exploration, in the early 20th century. In 1941, the city built a suspension bridge across the Rio Grande to Reynosa, Mexico. The McAllen–Hidalgo–Reynosa International Bridge increased tourism and trade, helping establish McAllen as an important port of entry.

The discovery of oil in the Reynosa area in 1947 prompted a large in-migration from the Mexican interior, boosting tourism and providing McAllen with an inexpensive labor supply. The McAllen Foreign Trade Zone—the first inland foreign trade zone in the United States—was established in 1973. International trade and tourism remain important to the region's economy.

INDUSTRY CLUSTERS: Retail, Health Drive Economy

McAllen's cluster composition is shown in Chart 7.1. Clusters are organized by location quotient (LQ), which represents the share of local employment in each cluster relative to the nation, and the change in employment share between 2010 and 2017.² “Star” quadrant clusters, such as food services, have a larger share of employment relative to the nation (an LQ exceeding 1) and are

Chart 7.1: Health Care, Education and Retail Dominate McAllen Clusters



NOTE: Bubble size represents the cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

comparatively fast growing. “Emerging” industries, such as transportation and logistics and business and financial services, are smaller relative to the nation (LQ less than 1) and fast growing. Industries in the “mature” quadrant are more concentrated but slower growing, and “transitioning” industries are smaller relative to the nation and slower growing or declining.

Health care is a key sector in the McAllen economy. While the cluster has grown in importance in most metro areas, it is more concentrated in McAllen (and has the highest LQ) relative to other metros in this report. About 20 percent of McAllen’s workers are in the health cluster. Hospitals and medical centers, including McAllen Medical Center and Edinburg Regional Medical Center, are among the metro’s top employers.³ The opening of the University of Texas Rio Grande Valley School of Medicine, which welcomed its first class in 2016, points to further sector growth.

Retail is typically big in the larger border communities, and this mature cluster employs 14.3 percent of McAllen’s workers. The metro area serves as the retail trade center of South Texas and northern Mexico. Retail tourism draws customers from as far as Monterrey, Mexico’s third-largest metro area, located 150 miles

southwest of McAllen. Mexican shoppers account for an estimated 30 to 40 percent of retail sales.⁴

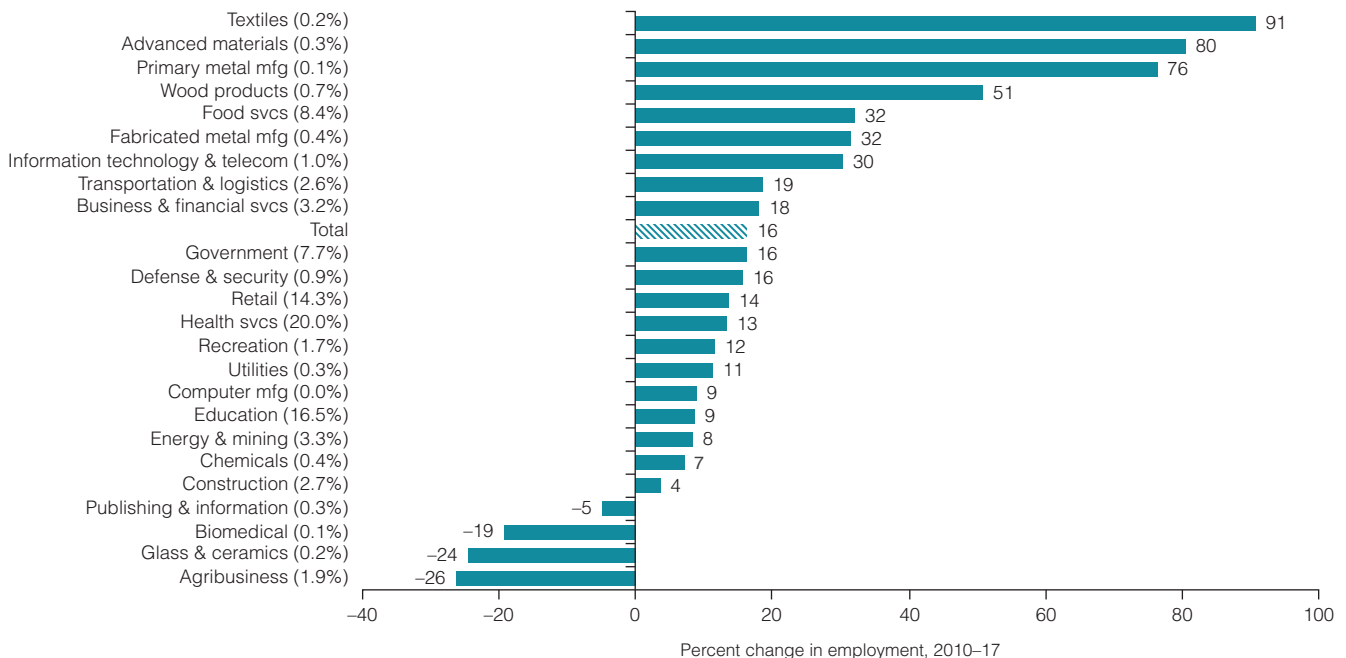
Overall, retail trade made up nearly 13 percent of McAllen’s total output in 2017.⁵ In terms of gross sales, retail trade accounted for 52 percent in McAllen in 2017, compared with about 26 percent statewide.⁶

Government employees figure prominently in border economies, and McAllen is no exception. Excluding public education and health services employees, government employees make up 7.7 percent of all workers in McAllen, and the sector’s workforce has grown 16 percent since 2010 (*Chart 7.2*). This is in stark contrast to a national decline of 2.5 percent in government employment over the same period.

The city of McAllen has more than 2,000 municipal workers, while border crossings and international trade represent a major federal employment commitment involving U.S. Customs and Border Protection and other federal agencies.

Education (both public and private) makes up one of the largest industry clusters in McAllen, accounting for 16.5 percent of all jobs, likely a result of the high share of youths in the metro area. After state and local budget cuts depressed growth from 2010 to 2012, the

Chart 7.2: Food Services, Manufacturing and Transportation Employment Growing Strongly



NOTES: Percent change in employment is shown in whole numbers. Each cluster’s share of total jobs is shown in parentheses (rounded to one decimal place). Data for a few manufacturing sectors excluded due to insufficient information.
SOURCES: Texas Workforce Commission; authors’ calculations.

Table 7.1: Earnings Across Dominant McAllen Clusters Trail U.S. Performance

Cluster	McAllen					U.S.
	2010	2012	2014	2016	2017	2017
Education	41,795	40,003	40,923	42,667	43,015	49,322
Health services	34,913	31,243	32,210	32,974	31,814	56,001
Retail	25,189	25,898	26,424	26,763	27,037	31,216
Government	47,784	48,307	48,460	50,122	49,455	60,568
Food services	15,287	15,050	14,928	15,245	15,102	18,963
Clusters with location quotient > 1	31,903	30,227	35,223	33,753	33,501	–
Clusters with location quotient < 1	39,776	41,287	32,845	38,875	39,803	–
Average earnings (total)	33,445	32,704	33,128	33,698	33,628	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

cluster's rate of expansion increased but at a slower pace than overall employment.

With three international border crossings in the metropolitan statistical area, McAllen is the third-busiest border crossing in Texas (behind Laredo and El Paso) in terms of commercial truck traffic and pedestrians.⁷ Consequently, transportation and logistics is an important emerging industry. While its concentration (LQ of 0.8) isn't as significant locally as nationally, the sector has grown 19 percent since 2010, adding workers and increasing its share of total McAllen employment.

The highly concentrated sectors—those with LQs greater than 1—are slightly lower-paying in McAllen than their less-concentrated counterparts (*Table 7.1*). This is due to the prevalence of retail and food services industries, which tend to pay low wages, and the relative scarcity of high-paying manufacturing and skilled services jobs. The utilities, computer manufacturing and biomedical clusters—the highest-paying industries in the region by a significant margin—constitute just 0.5 percent of jobs in the region, compared with 2.2 percent in the U.S.

Real (inflation-adjusted) wages overall remain significantly lower than U.S. industry averages. Wages in the star and mature clusters (LQs greater than 1) rose 5.0 percent from 2010 to 2017, and pay was flat in the area's less-concentrated sectors. Reduced government spending in recent years may have slowed public sector wage growth, while pay remains low in retail and has declined in the health services sector. It bears noting that wages in McAllen partly reflect the area's low cost of living.

A low-pay environment in the burgeoning health industry is unusual; doctors, nurses and other health workers are generally well-educated and command high wages. However, nearly 40 percent of workers in McAllen's health cluster and nearly 12 percent of the area's total workforce are employed in home health care services.⁸ This segment of the industry grew 16.6 percent from 2010 to 2017, slightly more than the overall health services cluster. Many home health workers are unlicensed, non-medical caregivers, and the average salary for these jobs is significantly lower than for the entire sector.

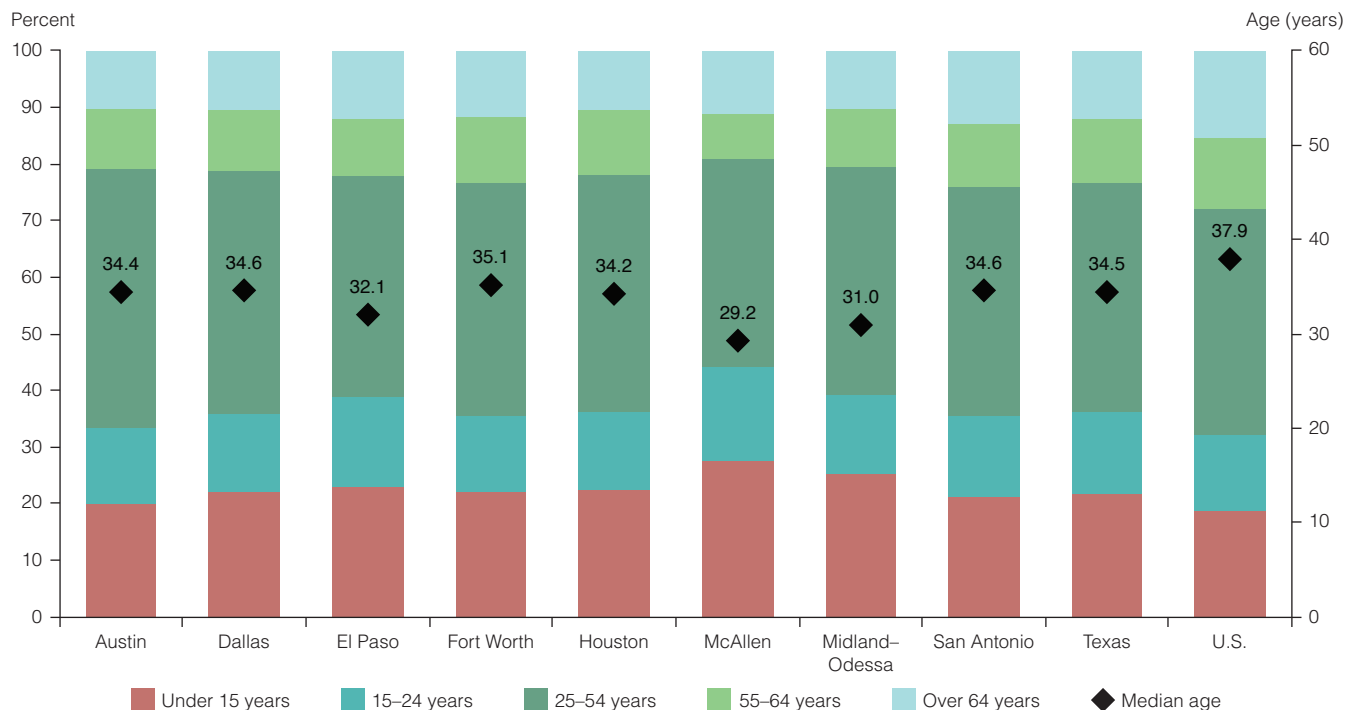
DEMOGRAPHICS: Poorer and Younger than the State

McAllen's population is much younger than that of the other metros (*Chart 7.3*). The median age of 29.2 is five years younger than the statewide figure. The city has the largest share of under-15-year-olds of all metros in this report at 28 percent. Families in McAllen also tend to have more children—the metro averages nearly 2 children per family, compared with 1.4 for Texas.

The population is predominantly Hispanic at 91.8 percent, and 88.7 percent of the population self-identifies as being of Mexican descent. McAllen has the largest foreign-born population of any metro in the report at nearly 27 percent, illustrating the city's deep ties with Mexico.

McAllen is also home to a large group of seasonal residents who, at an average age of 72.3, contrast starkly with the younger inhabitants of the metro and the Rio Grande Valley. These "Winter Texans" come primarily from midwestern U.S. states and Canada to

Chart 7.3: McAllen Has Youngest Population of Major Metros



SOURCE: Census Bureau, 2016 American Community Survey 1-year estimates.

find a more temperate climate and low cost of living. The approximately 106,000 migrants spent \$528 million locally in 2017–18.⁹

McAllen trails the state in terms of educational outcomes. Nearly 35 percent of the population age 25 and over has no high school diploma—twice the Texas average. Only 18 percent of the population holds a bachelor's degree or higher, compared with 29 percent in Texas.

Due to low education levels and the prevalence of low-paying industries, it's not surprising that McAllen has a high poverty rate—31 percent of the population lived below the poverty line in 2016, compared with 16 percent in Texas. The 2017 median household income of \$37,106 was less than two-thirds of the Texas figure, \$59,206.

EMPLOYMENT: Sluggish Growth After Recovery from Recession

McAllen weathered the Great Recession far better than most metros. While Texas lost 4.1 percent of its jobs from peak to trough, McAllen employment fell only 1.8 percent from its peak in October 2008 to the trough in March 2009.

Job growth in the postrecession period (December 2009 to December 2017) was 19.8 percent, or an average of 2.3 percent per year—matching the Texas annual average of 2.3 percent.

During the oil bust in 2015 and 2016, McAllen performed better than the rest of the state—growing at an annualized rate of 1.9 percent over the two years, compared with 1.2 percent for Texas overall. Private education and health services grew 4.5 percent (per year) over the period, significantly above the state's 3.3 percent. Government and leisure and hospitality jobs also grew strongly over the two-year timeframe.

Led by a sharply lower Mexican peso in the wake of the 2016 U.S. election, area-wide expansion remained modest during 2017, resulting in employment declines in the trade, transportation and utilities sector. Leisure and hospitality employment grew just 1.8 percent.

OUTLOOK: Mixed, Dependent on Ties to Mexico

Many highly educated McAllen residents seek employment elsewhere because of the higher pay offered

in bigger cities. This situation may change in the future; McAllen has greatly improved the quality and availability of education. The merger of the University of Texas—Pan American in Edinburg and the University of Texas at Brownsville created the University of Texas Rio Grande Valley, based in Edinburg and Brownsville, the largest public university by enrollment in the Texas border region. Nevertheless, the emerging industries that employ highly educated workers are not yet dominant enough to retain much of the young, educated workforce.¹⁰

Over the past several years, more retail outlets south of the border as well as a strong dollar have hurt border retail sales. Total retail sales fell slightly (1 percent) in 2017, following declines in 2015 and 2016 that were partly due to the energy bust and weaker cross-border retailing. A stable outlook for Mexico in 2018 should help such activity. However, uncertainty about bilateral

trade relations is a potential headwind to growth. Conversely, privatization of Mexico's oil industry should aid the area.

Investments in several sectors in McAllen could lend support to the economy. The La Plaza Mall, one of the largest retail hubs in the area, opened a 245,000-square-foot expansion in late 2017 that has drawn several high-end retailers.¹¹ The UT Rio Grande Valley School of Medicine's opening carries promise of future growth. A partnership established in 2017 between the city of McAllen and the McAllen Economic Development Corp. seeks to recruit and secure funding for medical research, suggesting the potential for expansion of high-skill, high-wage health services positions in the area.

—Kristin Davis and Christopher Slijk

McAllen–Edinburg–Mission Growth Outlook

Drivers

- A young, growing population in the area will continue to provide a deep labor pool for strong job growth in the region.
- The creation of the UT Rio Grande Valley School of Medicine will provide an avenue for growth in higher-skilled health care positions.
- A stable outlook for Mexico and greater maquiladora activity should spur further growth in business services sectors tied to these industries.
- Continued progress on Mexico's recent energy reform will spur more growth and investment in the area.

Challenges

- Skill shortages remain an issue. It is hard to attract skilled workers to the region—and young, educated people tend to leave to find higher-paying jobs elsewhere.
- A strong dollar relative to the peso will negatively affect retail sales in the short to medium term.
- Trade policy uncertainty and tariffs on Mexico–U.S. trade may damp cross-border activity.
- A population that is relatively poorer and less-educated than the Texas average may limit the area's ability to attract high-paying industries.

Notes

¹ The history of McAllen is taken from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdm01.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ Information about McAllen's top employers is from the McAllen Economic Development Corp., www.mcallenedc.org.

⁴ See "Dollar-Sensitive Mexican Shoppers Boost Texas Border Retail Activity," by Roberto Coronado and Keith R. Phillips, *Southwest Economy*, Fourth Quarter, 2012, www.dallasfed.org/assets/documents/research/swe/2012/swe1204g.pdf.

⁵ Metropolitan statistical area (MSA) 2016 gross domestic product data by industry are from the Bureau of Economic Analysis.

⁶ See Texas Comptroller gross sales and tax data, mycpa.cpa.state.tx.us/allocation/HistSales.jsp.

⁷ Border crossing information is from the Bureau of Transportation Statistics. Data for McAllen are listed under Hidalgo, Texas, which is part of the McAllen–Edinburg–Mission MSA. See transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCQ.html.

⁸ See definition of home health care workers in NAICS 6216.

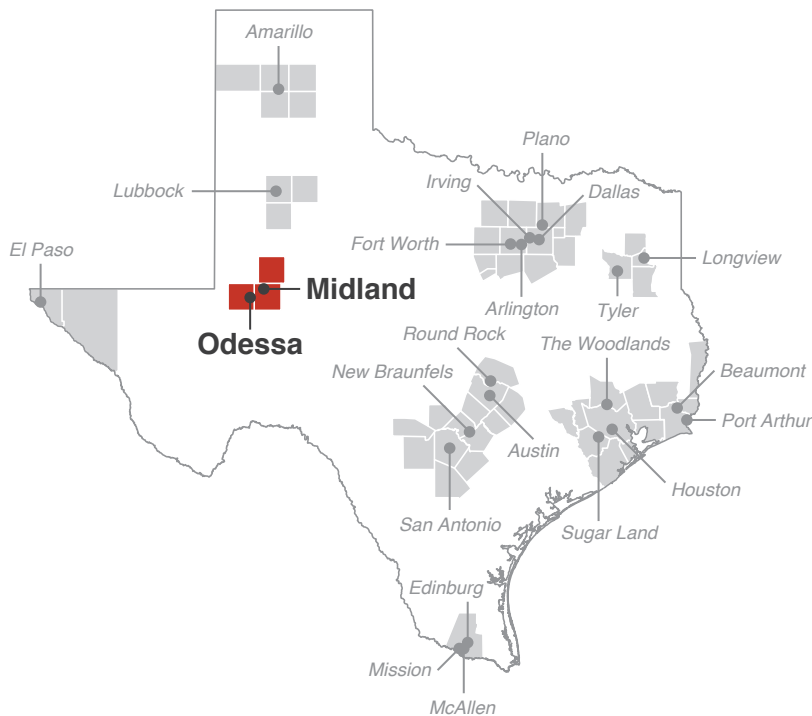
⁹ See "Winter Texan 2017–2018 Survey," Business and Tourism Research Center, University of Texas Rio Grande Valley, www.utrgv.edu/tourism/_files/documents/reports/winter%20texan%20survey%20report%202017-18.pdf.

¹⁰ See McAllen Economic Scan, 2013, mcallen.org/wp-content/uploads/2014/10/market_profile.pdf.

¹¹ See "La Plaza Mall's \$50 Million Expansion Opens Featuring H&M, Yard House, Much More," by Mitchell Ferman, *The Monitor*, Oct. 31, 2017, www.themonitor.com/news/business/article_2f8461ca-bea5-11e7-92e1-23a59f2d5189.html.

At a Glance

- Midland and Odessa began as railroad towns and together evolved into a cattle shipping center and regional financial hub. The Permian Basin oil boom in the mid-1920s shifted the economic focus to energy.
- The shale boom of the last decade boosted household income and spurred economic growth. The dominant energy industry has been supported by manufacturing and transportation. Per capita personal income in Midland is the highest in the state.
- The Permian Basin has bounced back after energy activity and household income decreased sharply with the onset of the oil bust in 2015. The subsequent reemergence of oil production, during what became a period of technological advances, has required fewer blue-collar workers.



*The Midland–Odessa combined statistical area is composed of the Midland and Odessa metropolitan statistical areas (MSAs). The MSAs encompass Ector, Martin and Midland counties.

Midland–Odessa:

Riding the Oil Booms, Seeking Fewer Busts

HISTORY: Heart of the Permian Basin

Midland and Odessa are sibling cities about 20 miles apart and jointly promoted as “Two Cities, No Limits.”¹ Like many other Texas communities, Midland and Odessa began as stations along a railroad—halfway points between Dallas and El Paso along the Texas and Pacific Railway. Early on, the area relied primarily on ranching. Midland became a prominent cattle shipping center for Texas as well as a regional financial hub by 1890.

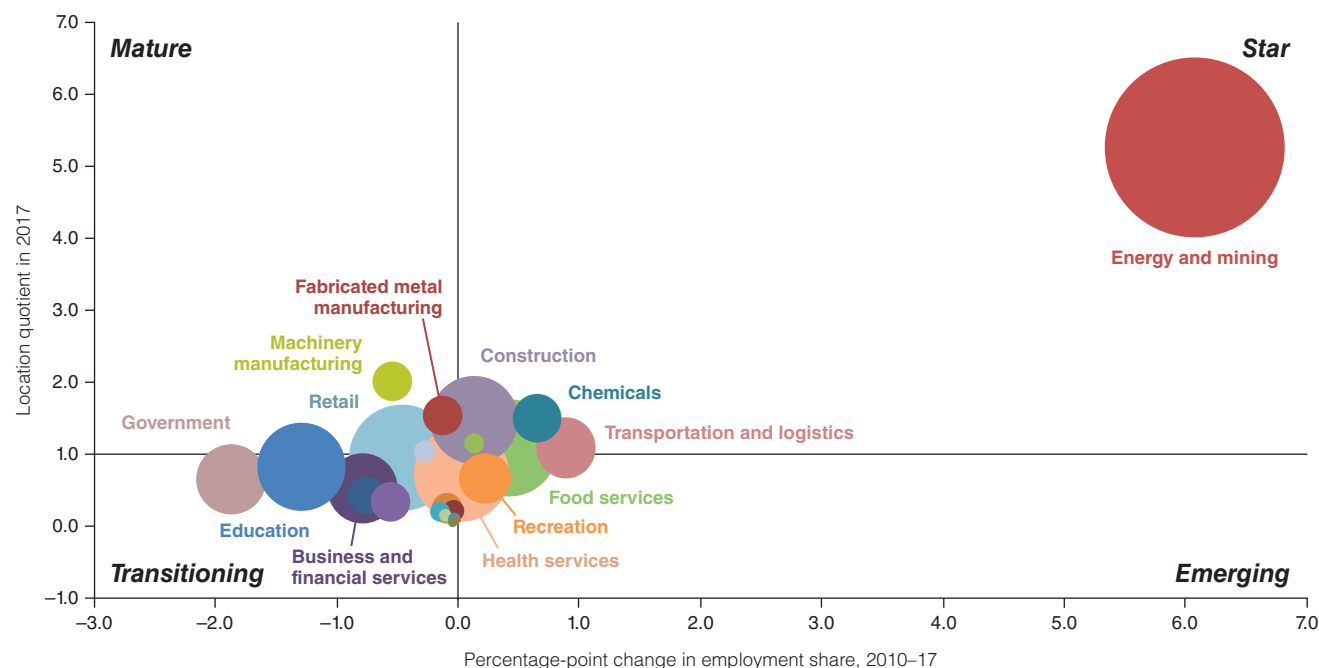
The beginnings of the oil boom in the Permian Basin—which encompasses two counties in New Mexico and 55 counties in West Texas—arrived in the 1920s. Scores of investors and oilfield workers moved to the area, and by 1929, a total of 36 oil companies had established offices in Midland. Demand for oil and petrochemicals rose during World War II, helping transform Odessa into the world’s largest inland petrochemical complex.

From that point forward, the area’s economy was closely tied to the energy industry, rising with the oil booms and contracting with the busts. After years of decline that began with the 1980s oil bust, the Permian Basin and its economic center, Midland–Odessa, were re-generated by the shale oil boom of the late 2000s. Investment grew in the prolific formation even during periods of soft oil and gas prices, as its infrastructure, industry know-how and technological advancement helped make retrieving energy deposits relatively inexpensive.

INDUSTRY CLUSTERS: Energy-Driven Economy

The composition of industry clusters in Midland–Odessa is shown in Chart 8.1. The chart is organized by location quotient (LQ)—a measure of a cluster’s share of

Chart 8.1: It's All About Energy in Midland–Odessa



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

local employment relative to its share nationally—and the change in employment share between 2010 and 2017.²

Clusters in the “star” quadrant, such as energy and mining, have a large share of employment relative to the nation (an LQ far exceeding 1, in this case) and are relatively fast growing. “Emerging” industries, such as recreation, are relatively smaller compared with the nation (an LQ less than 1) but are fast growing. “Mature” sectors, such as machinery manufacturing, are more concentrated relative to the U.S. (an LQ exceeding 1) but are slower growing; “transitioning” clusters, such as business and government, are smaller relative to the nation and are slower growing or declining.

Midland–Odessa lies in the heart of the Permian Basin—which accounts for 30 percent of U.S. oil production, up from 16.9 percent in 2010—and its economy is overwhelmingly energy driven. About 30 percent of the workforce is employed by companies in energy and mining, a cluster that has experienced rapid growth. Energy firms dominate the listing of the top private-sector employers in both cities.

Pioneer Natural Resources, with 3,600 employees in Midland, has been the city’s largest employer since 2016, surpassing the Midland Independent School District. Pioneer and the city’s two next-largest exploration

and production companies employ more than 5,800 people, accounting for about 7 percent of the city’s total employment in 2017.

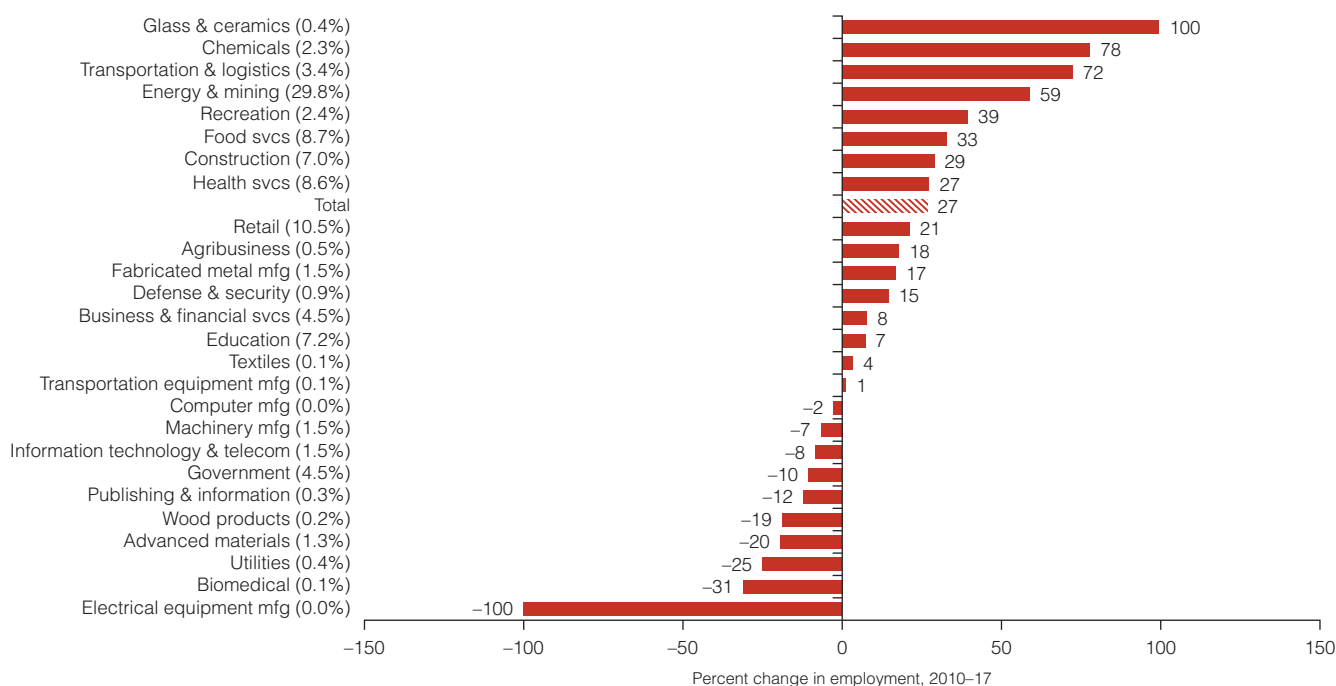
Odessa’s second- and third-largest private employers are Halliburton and Keane Group, which together employed about 4,300 workers, or over 5 percent of the total employed.³

The region’s other important industries support the outsized energy sector and have recently grown as well. Odessa’s largest private employer, Saulsbury Industries (a heavy industrial construction firm with nearly 4,000 employees nationwide and large midstream oil and gas operations), helped build the growing infrastructure in the Permian Basin. Oil and gas pipeline construction companies employed 2,800 people in Midland–Odessa in 2017, up from just 1,600 in 2014.⁴

The transportation and logistics cluster employs only 3.4 percent of the workforce but is the third-fastest-growing cluster in Midland–Odessa (*Chart 8.2*). Manufacturing—notably, fabricated metal manufacturing and machinery manufacturing—while mature and relatively stable, helps support the energy industry.

Job growth has been focused in truck transportation supporting expanding oil and gas production. Chemicals, long associated with the area’s energy sector, also

Chart 8.2: Midland–Odessa's Largest Clusters Continue to Grow



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 8.1: Oil Boom and Bust Impacts Earnings in Midland–Odessa

Cluster	Midland–Odessa					U.S.
	2010	2012	2014	2016	2017	2017
Energy and mining	87,747	90,293	96,750	91,316	98,001	80,900
Machinery manufacturing	70,645	73,032	82,595	77,851	78,239	70,059
Fabricated metal manufacturing	64,216	69,453	78,192	68,784	73,787	55,830
Chemicals	73,394	82,854	79,460	79,094	83,471	72,887
Construction	55,772	64,178	68,203	65,926	68,388	60,742
Glass and ceramics	56,168	54,738	60,246	66,710	69,608	55,398
Food services	17,289	18,471	19,554	19,279	19,642	18,963
Transportation and logistics	60,442	66,268	70,466	57,252	65,204	53,761
Utilities	109,430	120,053	93,523	102,454	104,871	107,188
Clusters with location quotient > 1	67,991	73,436	78,616	65,139	77,844	–
Clusters with location quotient < 1	46,200	48,484	52,406	54,252	49,458	–
Average earnings (total)	54,050	60,407	65,781	59,863	63,664	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

grew rapidly in the 2010–17 period. Additionally, the region remains an important midway point between El Paso and Dallas, serving as a transportation crossroad.

Wages in Midland–Odessa are relatively high for a small metropolitan area, but they boom and bust along with the energy industry. Inflation-adjusted annual average wages grew by about 22 percent between 2010 and 2014—more than quadruple the statewide rate of 4.4 percent (*Table 8.1*). Midland–Odessa's increase was driven by energy and mining's higher wages and growing share of employment. The energy slump depressed overall wages between 2014 and 2016 by 9 percent, led by an 18.8 percent decline among transportation and logistics workers' pay.

DEMOGRAPHICS: High Incomes, Low Poverty

Real median household income, though quite high in Midland–Odessa, fell 12.6 percent from 2014 to 2016 because of the oil bust (*Chart 8.3*). Midland–Odessa's income at \$64,210 in 2017 remained above the Texas median of \$59,206 as the energy sector rebounded.

The area's 10.4 percent poverty rate is the lowest among all the metros in this report and 5 percentage points less than the state average in 2016.

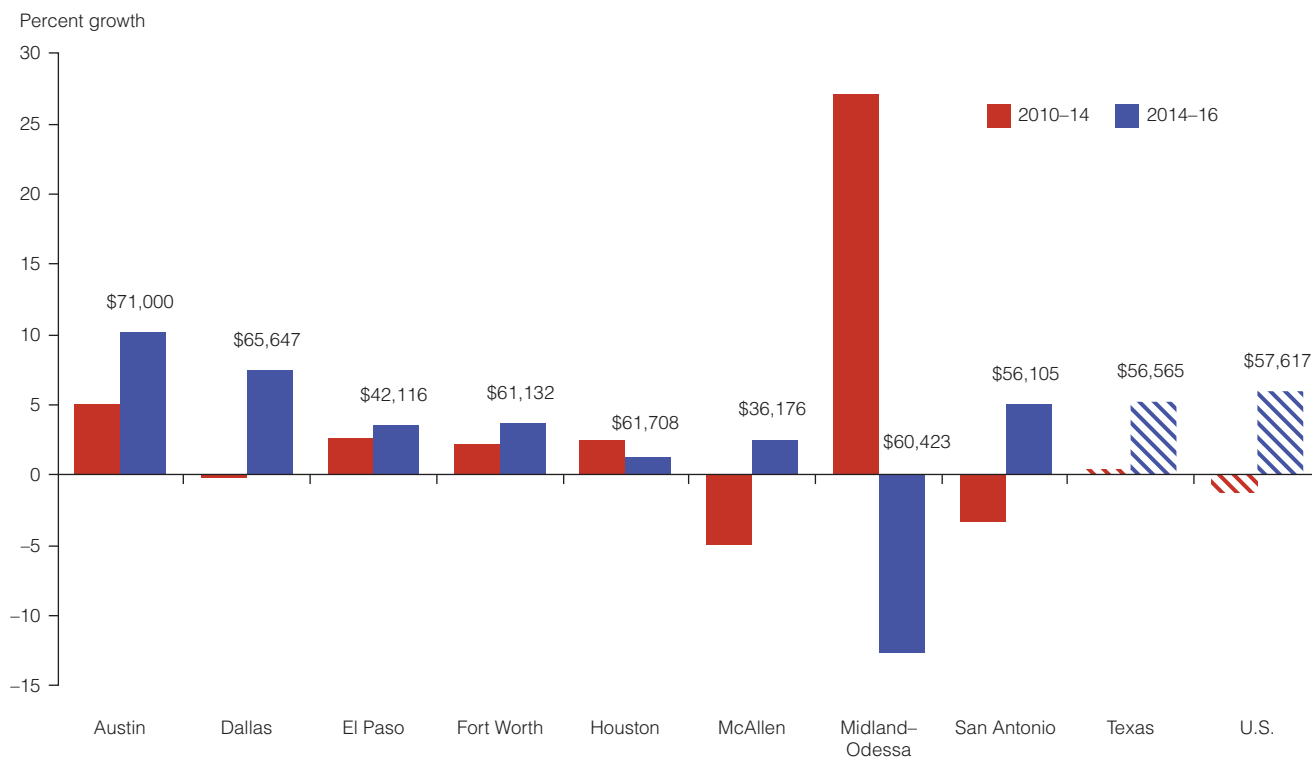
Midland–Odessa continues to trail the state in educational attainment. About 80 percent of residents age 25 or older have at least a high school diploma—3 percentage points below the state average in 2016. Midland–Odessa also has the third-lowest share of population with a bachelor's degree or higher (21 percent) among the Texas metros in this report, ahead of only McAllen and Beaumont–Port Arthur, and trailing the statewide average of 28.9 percent.

Traditionally, many well-paying oilfield jobs do not require a college education, hence the education gap vis-à-vis the rest of the state. More than half (52 percent) of Midland–Odessa's population is Hispanic—the migration flow reflecting the area's importance as the heart of the Permian Basin and the employment opportunities it affords.

EMPLOYMENT: A Tale of Boom and Bust

During the 2015–16 energy slump, the Permian Basin rig count tumbled from 548 in December 2014 to a low of 137 in May 2016. Net migration in 2016 was negative—the area lost 4,855 residents—even as migration increased in Texas' largest metros or remained stable in most others. The outmigration likely helped limit increases in the

Chart 8.3: Midland–Odessa Household Income Booms and Busts with the Energy Sector



NOTES: Bars show real median household income growth during the selected periods. Nominal median 2016 incomes are displayed above bars.
SOURCE: Census Bureau, 2010, 2014 and 2016 American Community Survey 1-year estimates.

unemployment rate, which peaked at 5.7 percent in April 2016 from a low of 2.8 percent in December 2014.

Technological improvements to oil exploration and extraction accelerated with firming oil prices since the slump ended. Because the Permian Basin’s shale deposits are stacked—some areas have as many as 12 shale layers—it has a considerable cost advantage over other regions that typically contain a single layer. Thus, the Permian has generated new investment and hiring with a drilling breakeven oil price of around \$50. The new technology has limited the overall number of workers needed for oilfield work, with new positions typically requiring a higher skill set.

The latest rebound, which has been less labor intensive than prior rebounds, differs from the upturn following the Great Recession. As shale exploration spread in the late 2000s, the Permian Basin’s rig count increased, and total employment returned to prerecession levels by March 2011, growing 41 percent between December 2009 and December 2014, or almost three times the state rate.⁵

A shortage of pipeline capacity from the area to terminals along the Gulf of Mexico has recently restrained the oil industry expansion. Industry officials have suggested that the bottleneck could ease in late 2019.

OUTLOOK: ‘New’ Old Industry Holds Promise

Midland–Odessa’s economy and labor market reflect the Permian Basin’s prominence as a leader in the U.S. and global oil markets. Oil companies operating in the region enjoy a cost advantage that comes from technological advances, a shale-rich geography and established workforce and infrastructure. New technology-enabled production will likely continue growing, though employment gains will likely occur at a slower pace than has historically been the case during upturns.

The Permian Basin’s thriving energy sector is helping drive employment among supporting industries, such as construction, manufacturing, transportation

and logistics. As production of oil and natural gas increases, infrastructure is expected to grow to meet demand. Several pipeline projects are planned to accommodate the Permian’s growth.

Midland–Odessa’s economy is still exposed to the commodity boom-and-bust cycle. However, recent attempts to diversify the local economy may help the region better weather inevitable busts.

The Permian Basin has the potential to produce alternative energy resources, such as wind power.⁶ Midland–

Odessa has also shown signs of moving beyond energy. The University of Texas of the Permian Basin established its College of Engineering in August 2017, and the area received a site license to operate a commercial spaceport in September 2014. Midland–Odessa already has a high concentration of manufacturing jobs, and the spaceport and engineering school may help draw more research and development to the region.

—*Kristin Davis and Dylan Szeto*

Midland—Odessa Growth Outlook

Drivers	Challenges
<ul style="list-style-type: none">• The Permian Basin’s shale-oil resources and new, more efficient technologies should help production grow over the near term.• Transportation and distribution industries will continue to grow as Midland–Odessa remains an important midway point between Dallas and El Paso and as the needs of the energy industry grow.• A commercial spaceport and new University of Texas System-supported College of Engineering may draw more research and development.	<ul style="list-style-type: none">• Advances in oilfield technology are changing the kinds and numbers of energy workers needed and the required skills.• Midland–Odessa’s highly energy-oriented economy still leaves it exposed to the commodity boom-and-bust cycles. Environmental concerns also pose a risk, as do recent pipeline capacity limitations.• New capital investment outside energy and related industries has been slow to come to the area, limiting options at least in the near term.

Notes

¹ The histories of Midland and Odessa are adapted from the Texas State Historical Association’s *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdm03 and tshaonline.org/handbook/online/articles/hdo01.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ Detail regarding Midland’s and Odessa’s top employers was compiled from several local websites: www.midlandtexas.gov/ArchiveCenter/ViewFile/Item/208, odessatex.com/major-employers and www.midlandtxedc.com.

⁴ Data are from the Texas Workforce Commission’s Quarterly Census of Employment and Wages.

⁵ Data are from the Texas Workforce Commission and have been seasonally adjusted by the Federal Reserve Bank of Dallas.

⁶ The city of Midland partnered with Texas Tech University to invest in the National Institute for Renewable Energy, which will research issues for the wind-power industry.

Population (2017):
2.5 million

Population growth (2010–17):
14.9 percent (Texas: 12.1 percent)

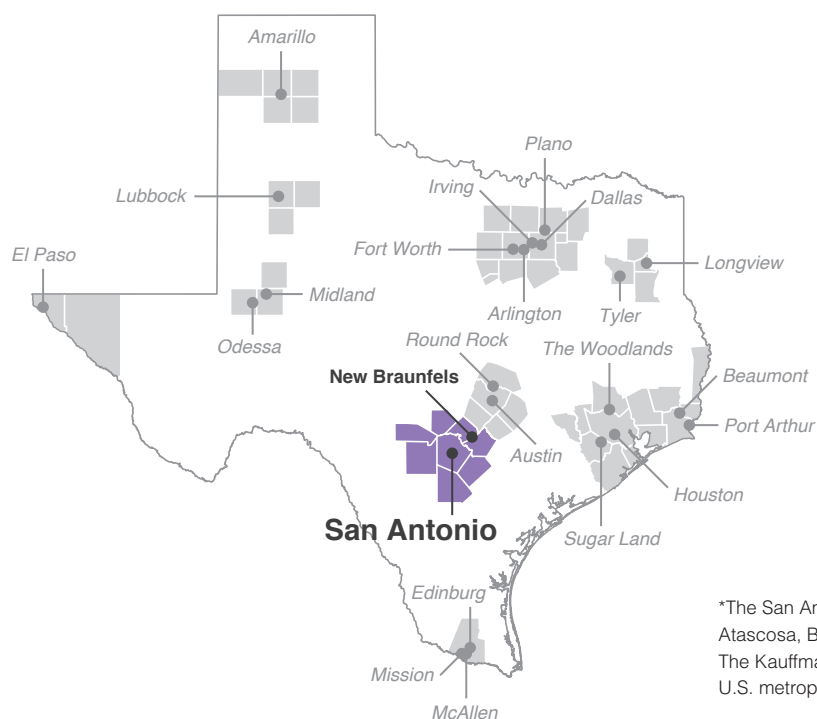
Median household income: (2017):
\$56,774 (Texas: \$59,206)

National MSA rank (2017): No. 24*

Kauffman Startup Index rank
(2017): No. 6*

At a Glance

- San Antonio has a rich heritage and history. It was the largest city in Texas from 1860 to 1930, when it fell behind Houston and Dallas. It has remained Texas' third-largest metro area.
- While housing costs are lower in San Antonio relative to other large Texas metros, its median household income is only slightly lower than the state figure.
- The area's diversified economy—particularly its business and financial services firms, tourism industry and medical research complex—will continue to provide economic stability.
- Tight labor markets and difficulties attracting skilled workers will make growth in high-wage industries more challenging.



*The San Antonio–New Braunfels metropolitan statistical area (MSA) encompasses Atascosa, Bandera, Bexar, Comal, Guadalupe, Kendall, Medina and Wilson counties. The Kauffman Startup Activity Index, a measure of business creation in the 40 largest U.S. metropolitan areas, is further explained in the appendix.

San Antonio–New Braunfels:

Home of the Alamo and Cradle of Texas Liberty

HISTORY: A Military Service and Health Research Center Emerges

Spanish expeditions explored the area of present-day San Antonio in 1691 and 1709. A town grew out of the San Antonio de Béxar Presidio and San Fernando de Béxar. The presidio was built to defend the San Antonio mission, and San Fernando was the first chartered civil settlement in Texas. In 1773, San Antonio de Béxar became the capital of Tejas, Spanish Texas. It was the site of several battles during the Texas Revolution from October 1835 to April 1836, most notably the 13-day siege of the Alamo. Bexar County was established by the Republic of Texas following the departure of Mexican troops, and San Antonio became its seat in 1837.¹

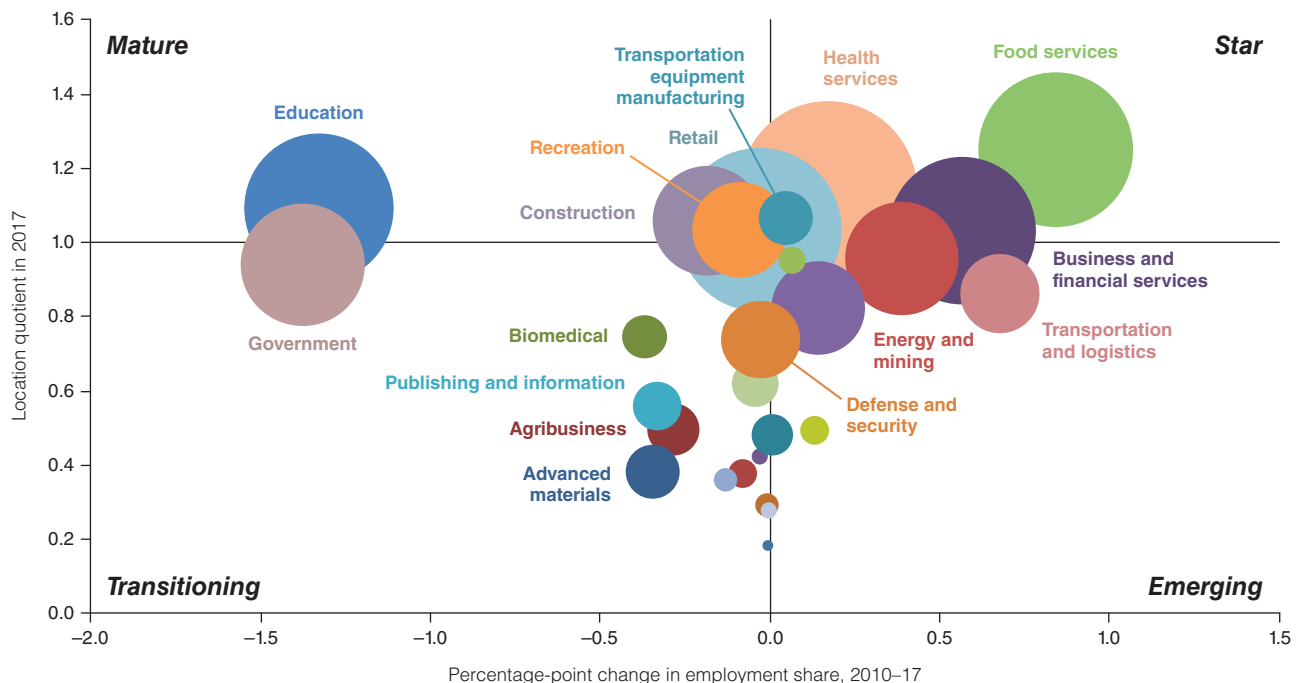
In 1860, San Antonio surpassed Galveston to become the largest city in Texas and, following the Civil War, it thrived as a center for the cattle industry. The 1877 arrival of San Antonio's first railroad—the Galveston,

Harrisburg and San Antonio Railway—fueled the city's economic growth and spurred additional railroad connections to other parts of the country by 1900. However, San Antonio's population fell behind that of Houston and Dallas by 1930, and San Antonio has since remained the third-largest urban area in Texas.

The First United States Volunteer Cavalry—later known as the Rough Riders—was organized in San Antonio during the Spanish–American War. In World Wars I and II, San Antonio served as an important military center for the Army and Air Force. Today, three large military installations—Fort Sam Houston and Lackland and Randolph Air Force bases—provide employment for many of the area's residents.

A 418-bed military hospital began operations in 1938 and expanded during World War II. In 1946, with Fort Sam Houston chosen as site of the U.S. Army Medical Field Service School, the hospital was renamed

Chart 9.1: San Antonio's Industrial Composition Is Diverse



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

Brooke Army Medical Center. It marked the beginning of the area's ties to medical research.

INDUSTRY CLUSTERS: Tourism and Health Dominate

Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, can be used to assess key drivers in an area's economy. An LQ exceeding 1 indicates that a specific industry cluster is more dominant locally than nationally. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2010 and 2017 (*Chart 9.1*).²

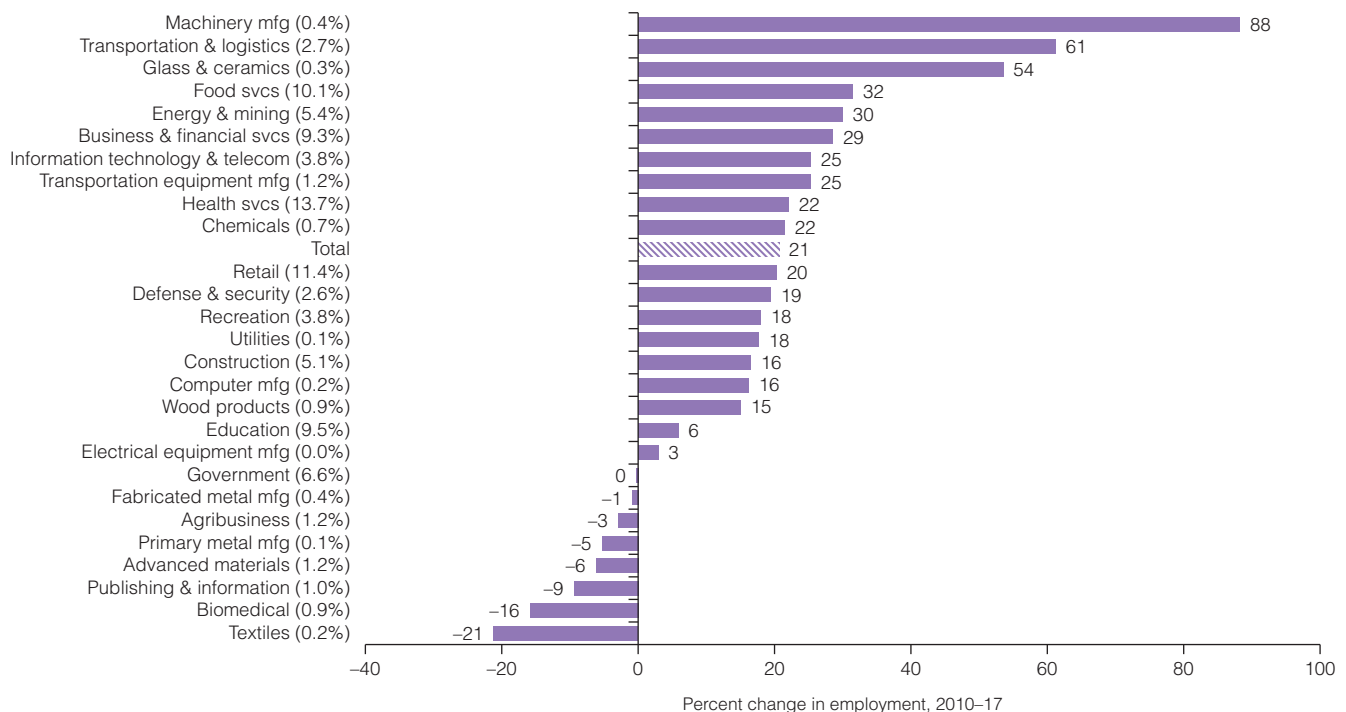
Clusters in the top half of the chart have a larger share of employment relative to the nation and, thus, an LQ exceeding 1. These clusters are generally vital to the area's economy and can be expanding relatively rapidly ("star") or slowly ("mature"). Those in the bottom half are less dominant locally than nationally and, hence, have LQs below 1. "Emerging" clusters are fast growing; those growing slowly or declining are "transitioning."

The higher LQs of food services, recreation, education, health services (the largest cluster) and retail reflect their outsized role in the San Antonio area. The metro's largest private employer is the supermarket chain HEB, with 20,000 employees. The second- and third-largest industry clusters, retail and food services, are tied to the region's strong tourism industry. San Antonio is a top U.S. convention city. Local attractions draw millions of visitors annually, and tourism and the travel industry together generate billions of dollars in economic impact each year.³

Employment expanded 32 percent in food services and 18 percent in recreation during the 2010–17 period—the two clusters make up nearly 14 percent of all metro jobs (*Chart 9.2*). San Antonio is home to two of the region's premier theme parks—SeaWorld, the largest of three such theme parks in the U.S., and Fiesta Texas, a 200-acre amusement park. Other notable attractions include the River Walk and the Alamo.

The government cluster reflects the presence of three military installations, which together employ more than 80,000 people.⁴ The military bases support

Chart 9.2: Transportation, Food Services and Energy Lead Growth Among Large Clusters



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 9.1: Pay in San Antonio's Dominant Clusters Lags U.S.

Cluster	San Antonio					U.S.
	2010	2012	2014	2016	2017	2017
Food services	17,780	17,627	17,770	18,496	18,606	18,963
Health services	49,084	48,431	48,407	51,534	51,479	56,001
Education	45,739	43,601	44,070	44,933	45,491	49,322
Transportation equipment manufacturing	58,582	58,576	62,677	69,627	75,418	73,569
Construction	49,188	50,803	52,645	56,073	56,524	60,742
Recreation	33,154	32,242	33,189	33,625	34,189	41,467
Retail	30,289	30,880	31,129	31,982	31,803	31,216
Business and financial services	73,828	76,897	76,366	78,046	78,614	100,785
Clusters with location quotient > 1	43,766	43,232	43,549	45,334	45,662	—
Clusters with location quotient < 1	59,739	61,313	62,135	63,466	63,354	—
Average earnings (total)	45,740	45,856	46,417	47,905	48,185	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

employment in the defense and security and health clusters. San Antonio has ranked in the top 10 among U.S. metro areas in terms of the largest concentrations of federal government and military workers.⁵

The health services and biomedical sectors also have a strong foothold in the area, with a combination of private and government operations. Employment in health-related institutions (private and government) accounts for almost 14 percent of San Antonio's workforce, a larger proportion than in other major Texas metros (including Houston). Large private health care service providers are Methodist Healthcare System and Baptist Health System. Medical research facilities in San Antonio include the Brooke Army Medical Center's San Antonio Military Medical Center (the nation's largest military hospital), Wilford Hall Ambulatory Surgical Center at Lackland Air Force Base, the University of Texas Health Science Center at San Antonio and the Texas Biomedical Research Institute.

Education is also a significant regional contributor, with more than 30 higher-education facilities and many ties to health care and biosciences through the South Texas Medical Center. Along with public and private K-12 education jobs, education accounts for almost 10 percent of employment in San Antonio.

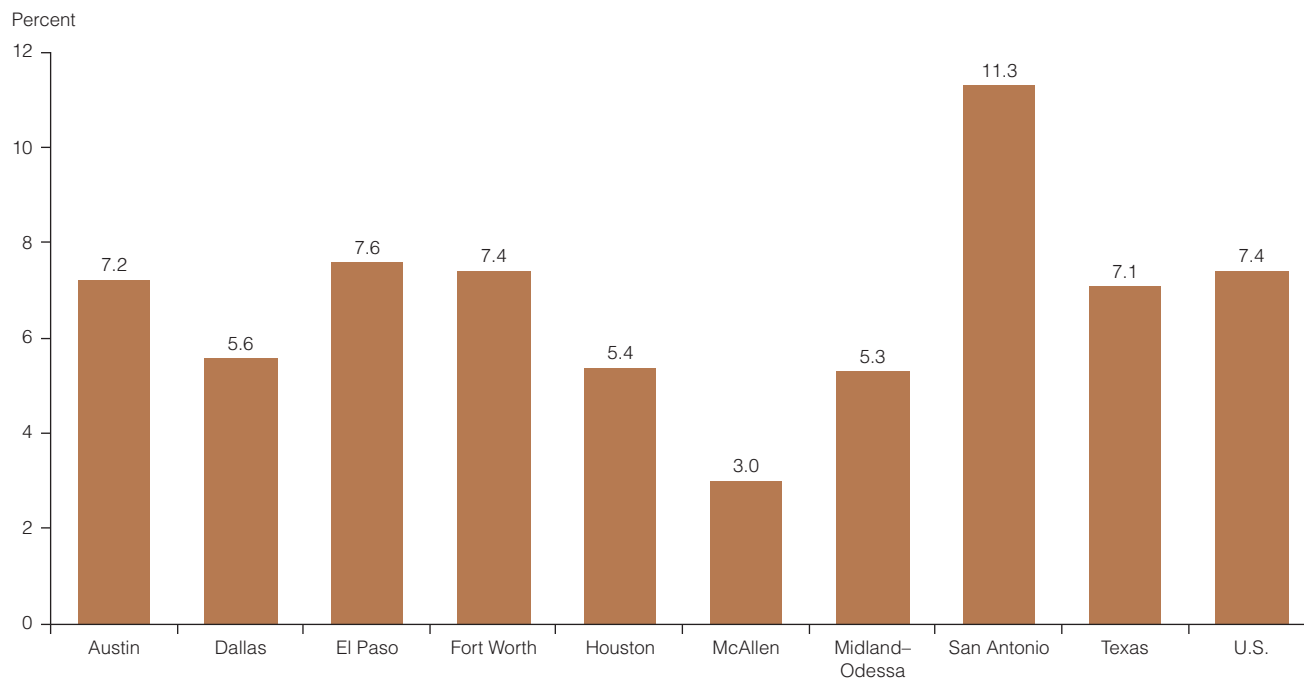
Machinery manufacturing—which includes mining machinery used in the oil and gas industry—was the fastest-growing cluster from 2010 to 2017 as employment increased 88 percent. Glass and ceramics expand-

ed 54 percent, while transportation equipment manufacturing grew 25 percent during the period, thanks in part to continued growth in area suppliers for a Toyota USA plant that began operations in 2006. The plant produces the Toyota Tundra, a full-size pickup, and added the Tacoma truck in 2010. Toyota employs 2,800 workers at its facility.

Business and financial services, the metro's fifth-largest cluster, accounts for 9.3 percent of the local workforce—roughly equivalent to its national presence. San Antonio is the headquarters of USAA (United Services Automobile Association), a Fortune 500 financial services group, and Cullen/Frost Bankers Inc. Employment in the business and financial services cluster expanded 29 percent from 2010 to 2017.

On average in 2017, clusters with a greater employment concentration in San Antonio than in the U.S. paid workers about \$45,700, less than those industries with a relatively smaller presence, which paid \$63,400 (*Table 9.1*). The average wage is lower because San Antonio's dominant clusters are in industries that typically command less pay. These include food services at \$18,600 annually and retail at \$31,800. Still, some locally concentrated clusters are among the highest paying—business and financial services, at \$78,600 annually, and transportation equipment manufacturing, at \$75,400. A relatively low cost of living in San Antonio boosts the purchasing power of local wages, a difference not accounted for in the table.

Chart 9.3: San Antonio's Share of Veterans Highest Among Texas Metros



NOTE: The share of veterans in Amarillo, Beaumont–Port Arthur, Lubbock and Tyler–Longview were 7.9, 7.3, 6.7 and 7.2 percent, respectively.
SOURCE: Census Bureau, 2016 American Community Survey 1-year estimates.

A low-pay environment in the health industry is unusual; doctors, nurses and other health care workers are mostly well-educated and command high wages. However, in San Antonio's health cluster, nearly 25,000 people work in home health-care services.⁶ Many are unlicensed, nonmedical caregivers, and the average salary for these jobs—\$21,100 in 2017—is significantly lower than the average pay in the health care sector (\$51,500).

DEMOGRAPHICS: Mostly Hispanic; Strong Military Background

The population is predominantly Hispanic, 55.1 percent—the highest share among the five major Texas metros and well above the Texas share of 39.1 percent.⁷ Despite the higher proportion of Hispanics, the metro area has the lowest foreign-born population among the major Texas metros in this report at 12.2 percent. This compares with the foreign-born share of 17.0 percent in Texas overall and 13.5 percent in the U.S.

Twenty-eight percent of the population age 25 and over holds a bachelor's degree or higher, similar to the Texas average of 28.9 percent but markedly lower than neighbor Austin at 42.8 percent.

San Antonio's median age is 34.6 years, in line with the Texas median of 34.5 years. Nevertheless, the area has a relatively large older population compared with other major Texas metros; the share of seniors is 12.7 percent. The area's age distribution reflects the significant military presence and a tendency for many armed forces personnel to retire in the area after completing their service. As a result, more than 1-in-10 San Antonio adults are current or former military personnel, the highest share of all the metros in this report (*Chart 9.3*). This compares with 7.1 percent in Texas and 7.4 percent in the U.S.

EMPLOYMENT: Steady as She Goes

San Antonio's diversified industrial base and considerable government presence likely helped the metro weather the Great Recession better than other major Texas metros.

Despite its proximity to the Eagle Ford Shale formation—a prolific source of energy deposits—San Antonio did not experience much of a boost in job growth from the shale boom. Employment at year-end 2014 was 12.2 percent above its 2008 high, just a tad higher than Texas' overall increase of 10.4 percent from the 2008 peak.

Thanks in part to San Antonio's relatively limited dependence on the cyclical energy and mining sector—the cluster accounts for 5.4 percent of its workforce—metro jobs grew at an annualized 2.9 percent rate in the oil bust years, 2015–16, compared with the state rate of 1.2 percent.⁸

Growth in 2017 was 2.0 percent, and it slowed to 1.0 percent during the first 10 months of 2018. Labor markets have continued to tighten, and the San Antonio unemployment rate fell to an 18-year low of 3.1 percent in October 2017. It has risen slightly since, to 3.3 percent in September 2018.

OUTLOOK: Industry Diversity Lifts Economy

San Antonio's industry profile is as unique as its history, with a concentration in health care, retail, food services, education, business and financial services, and recreation. In the near term, those industries' performance will set the course for the area's economy.

San Antonio's dependence on government and military jobs—government accounted for more than 15 percent of the area's 2017 nominal output—provides some

stability, although government employment levels have been relatively flat outside of growth in public health.⁹ Federal budget constraints may also limit growth.

Firming oil prices have spurred little additional activity in the nearby Eagle Ford, in contrast to the Permian Basin region of Texas. The total rig count in the Eagle Ford peaked at 98 in May 2017 and was at 90 in September 2018. The Permian Basin rig count rose from 356 in May 2017 to 485 in September 2018. While San Antonio has very few oil and gas jobs, related industries such as transportation and machinery manufacturing benefit from energy upturns.

The metro's proximity to several state-of-the-art military medical facilities, as well as large private research and health institutes, should continue to propel health sector growth and enable San Antonio to meet the needs of South Texas, including the Rio Grande Valley. Additionally, the Texas Research and Technology Foundation plans to develop a 110,000-square-foot innovation center in the downtown area, with the goal of incubating and developing bioscience, cybersecurity and emerging-technologies companies in San Antonio.¹⁰

—Laila Assanie and Christopher Slijk

San Antonio—New Braunfels Growth Outlook

Drivers

- The government, education and health clusters continue to provide stability as the region's population expands.
- Biomedical and health services should continue to support job growth in the area.
- The rebound in the state's energy sector should provide some boost to ancillary transportation firms and oil refiners in San Antonio.

Challenges

- San Antonio's high school dropout rate is above the state average, weakening the pipeline of high-skilled talent in the local labor force.
- A continued shortage of skilled workers may constrain growth in high-paying sectors and limit the area's ability to attract firms and investment.
- The three large military installations and the defense and security cluster are vulnerable should federal budget cuts occur.

Notes

¹ The history of San Antonio is adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hds02, and from the Brooke Army Medical Center website, www.bamc.amedd.army.mil/history.asp.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ See "The Economic Impact of San Antonio's Hospitality Industry," by Richard V. Butler and Mary E. Steffl, Trinity University, for the San Antonio Area Tourism Council and San Antonio Hotel and Lodging Association, www.sanantoniotourism.com/research-and-useful-links.

⁴ Data on the largest employers in San Antonio were obtained from the San Antonio Economic Development Foundation, www.sanantoniodef.com/why-san-antonio/data.

⁵ See "Relying on a Federal Paycheck During the Shutdown," *Washington Post*, March 7, 2013 (updated Oct. 1, 2013), www.washingtonpost.com/wp-srv/special/business/diversify-economy.

⁶ The definition of home health care workers is from the North American Industry Classification System, NAICS 6216.

⁷ Texas' major metros are Austin, Dallas, Fort Worth, Houston and San Antonio.

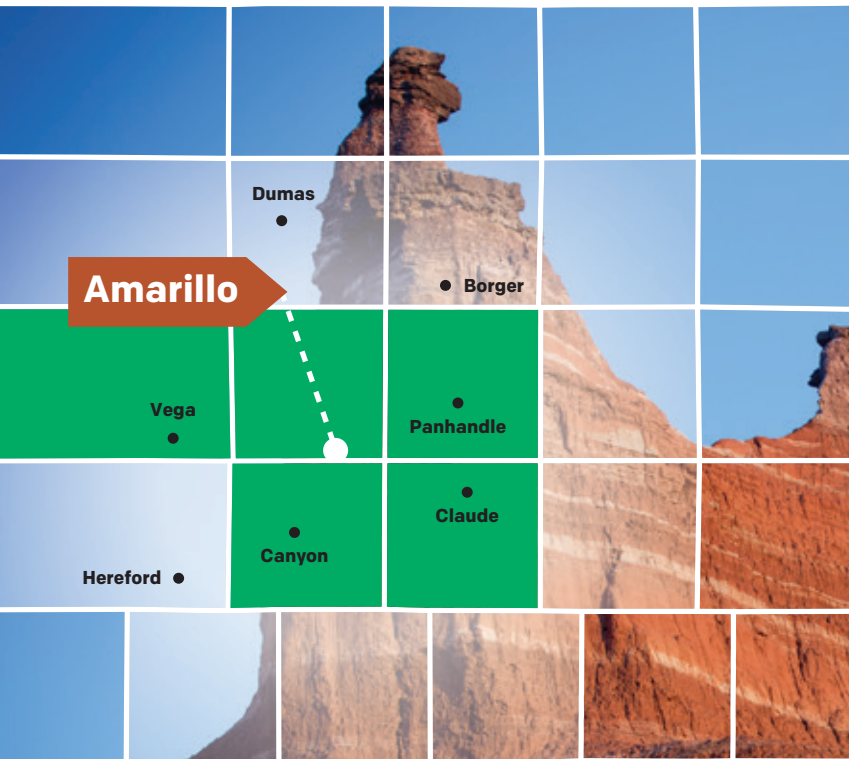
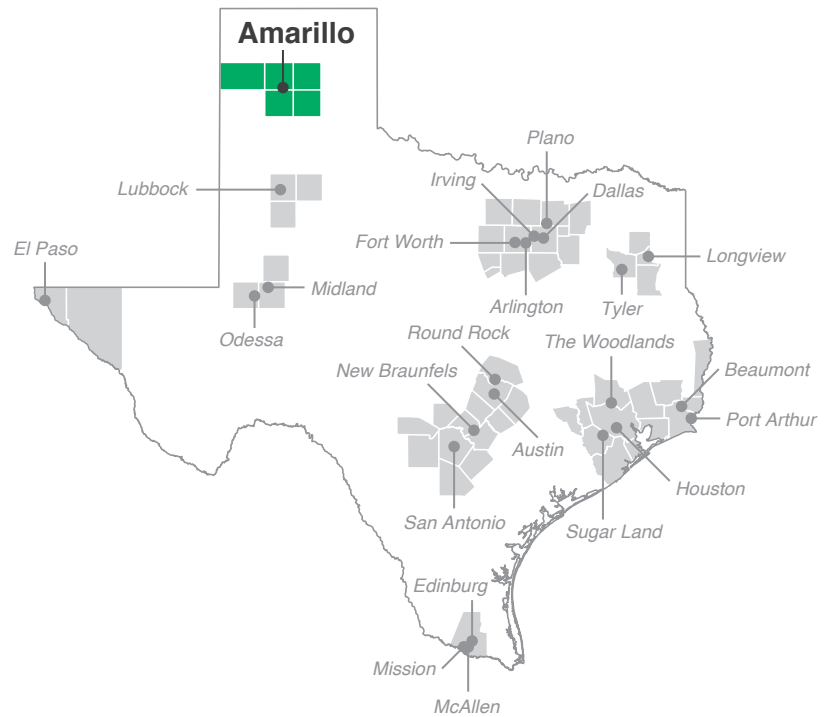
⁸ Employment data are from the Texas Workforce Commission and are seasonally adjusted by the Federal Reserve Bank of Dallas.

⁹ Output data are from the Bureau of Economic Analysis.

¹⁰ "Texas Research and Technology Foundation Plans Innovation Center," by Iris Gonzalez, *Rivard Report*, Sept. 14, 2017, <http://therivardreport.com/texas-research-and-technology-foundation-plans-innovation-center>.

At a Glance

- Amarillo initially flourished as a cattle-market hub, connecting ranches in the Panhandle to major urban markets by railroad. Large industrial plants, built after World War I to produce helium and weapons for the military, transformed the area, as did the discovery of oil and gas.
- Services have become the cornerstone of the economy while many manufacturing plants still thrive, contributing to comparatively low poverty and unemployment rates.
- The median household income trails the Texas average slightly but is higher than other metros of comparable size. The population is less diverse than that of the state. Domestic outmigration and tight labor markets may become a drag on future growth.



Population

(2017): 264,925

Population growth

(2010–17): 4.8 percent (Texas: 12.1 percent)

Median household

income (2017): \$53,922 (Texas: \$59,206)

National MSA rank (2017): No. 184*

*The Amarillo metropolitan statistical area (MSA) encompasses Armstrong, Carson, Oldham, Potter and Randall counties.



Amarillo:

Services Take Root in Panhandle's Ranching, Transportation Center

HISTORY: From Ranching and Trade Hub to Industrial Complex

Amarillo has its origins in 1887 with the arrival of rail freight service, helping create a cattle-market center in the Texas Panhandle, serving area ranches and those in the South Plains and eastern New Mexico. Additional rail service after the turn of the century strengthened Amarillo's standing in cattle shipping, and the city's standing as a transportation hub rose during the 1930s with the convergence of four U.S. highways, including the famous Route 66.¹

The community was originally named Oneida and later renamed Amarillo after the nearby lake and creek, which likely derived their name from the yellow soil along their banks or the yellow wildflowers plentiful during the spring and summer.

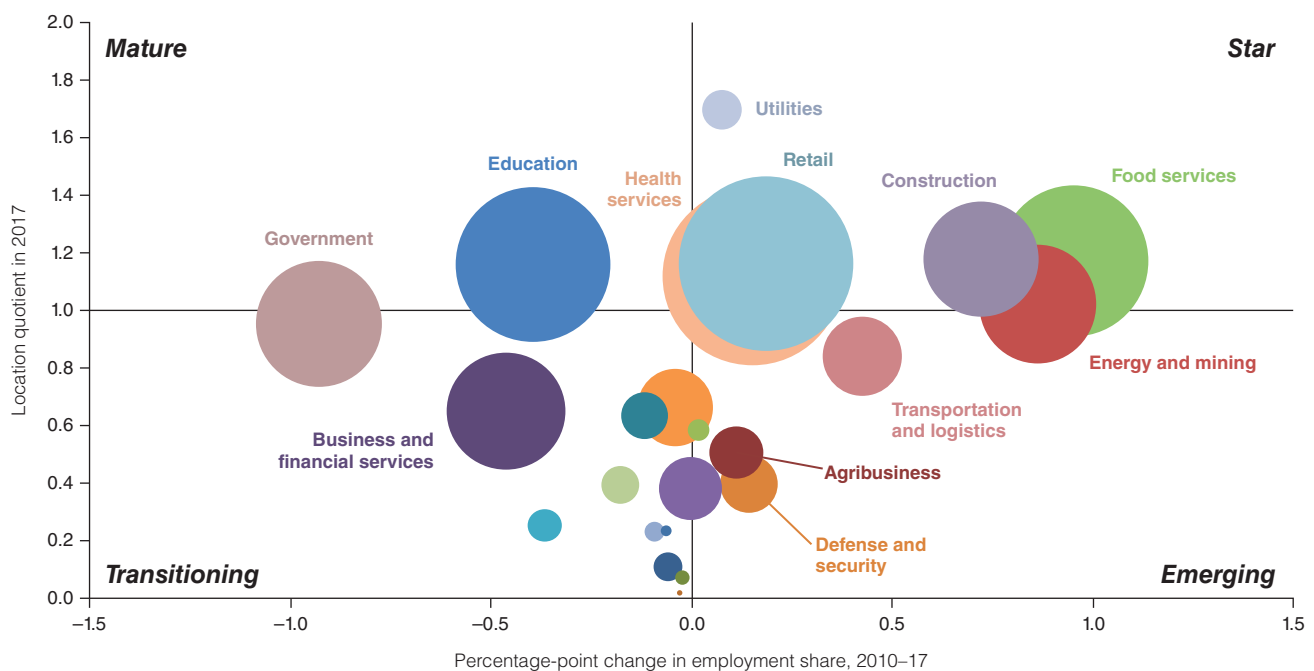
The area gained an industrial base with the discovery of natural gas in 1918 and oil three years later. Oil refineries and shipping facilities followed. Most

significantly, the Cliffside gas field discovery in 1928 included helium-rich deposits, leading to the federal government's establishment of the U.S. Bureau of Mines' Amarillo Helium Plant. In 1942, the Pantex Ordnance Plant was opened for the production of bombs and ammunition. It subsequently became the nation's premier nuclear weapons facility, today housing most of the national plutonium repository and encompassing 18,000 acres and 650 buildings.²

INDUSTRY CLUSTERS: Retail, Food Services Drive Local Economy

Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, are a convenient way of assessing key drivers in a regional economy. An LQ exceeding 1 indicates that a specific industry cluster carries more relative weight locally than nationally. Industry cluster

Chart 10.1: Diverse Cluster Mix Drives Activity



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

growth is measured by the percentage-point change in the cluster's share of local employment between 2010 and 2017 (*Chart 10.1*).³

Clusters in the top half of *Chart 10.1* are generally vital to the area's economy and can be expanding rapidly relative to other clusters ("star") or losing ground to other clusters ("mature"). Those in the bottom half are less dominant locally than nationally and have an LQ less than 1.

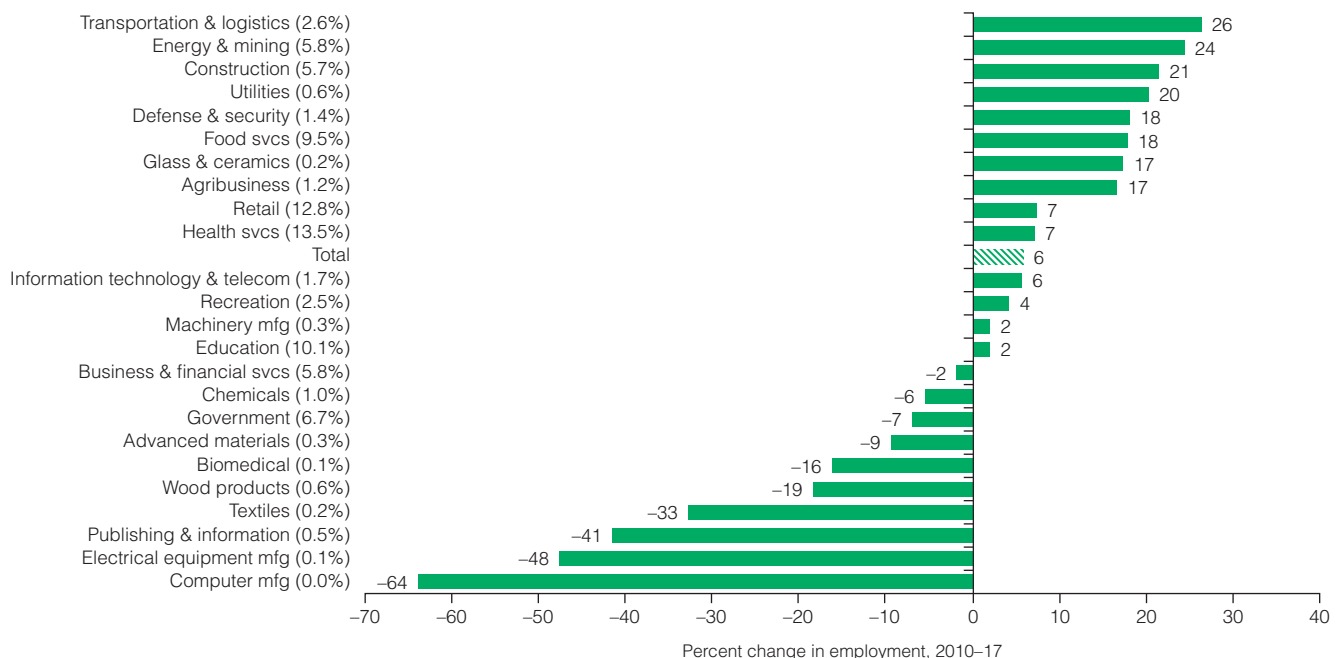
Most Amarillo workers are in service occupations, with 46 percent in the retail, health services, education and food services industry clusters. All of these clusters have LQs exceeding 1, indicating their outsized local contribution. Retail and food services are in the "star" category, with growing shares of the metro's employment. The largest employers include the Amarillo Independent School District, BSA Health System (formed from the 1996 combination of High Plains Baptist Hospital and St. Anthony's Hospital), the Northwest Texas Healthcare System, the city of Amarillo and several higher-education institutions, including Texas A&M University in Canyon.⁴

Although the utilities cluster employs less than 1 percent of the workforce, its high LQ and above-average growth indicate its significance. Amarillo-based Southwestern Public Service, a large regional electric

utility company with more than 800 employees (as of March 2018), is a subsidiary of Xcel Energy Inc. of Minneapolis. The energy and mining cluster, employing 5.8 percent of area workers, was among the fastest-growing sectors between 2010 and 2017, with total employment increasing 24 percent during the period (*Chart 10.2*). One factor in the growth of these two clusters is the Panhandle region's importance as a producer of wind energy.⁵ The metro increased its wind energy production capacity nearly 500 percent between 2010 and 2016, driving its share of the state's electricity-generating capacity from 3 percent to 10 percent.

While Amarillo has much lower shares of employment in manufacturing-related industries than the nation, production plants are among the largest private-sector employers. The defense and security cluster also grew rapidly from 2010 to 2017. The area is home to CNS Pantex, the nation's primary facility for the final assembly, dismantlement and maintenance of nuclear weapons, which is managed and operated privately but overseen by the Department of Energy/National Nuclear Security Administration. It employed 3,200 people as of March 2018, 2.7 percent of metro workers. Additionally, Bell Helicopter's production plant employs 1,000 workers. A Tyson Foods beef plant tied to Amarillo's large cattle industry employs 2,280 people.

Chart 10.2: Energy-, Construction- and Transportation-Related Clusters Post Above-Average Growth



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place). SOURCES: Texas Workforce Commission; authors' calculations.

Table 10.1: Earnings in Amarillo Trail U.S.

Cluster	Amarillo					U.S.
	2010	2012	2014	2016	2017	2017
Utilities	86,768	88,877	92,126	98,899	103,833	107,188
Construction	46,959	48,845	48,714	52,114	50,999	60,742
Food services	14,984	15,562	15,950	16,148	16,257	18,963
Retail	27,823	27,522	27,559	28,514	28,077	31,216
Education	40,771	38,535	39,712	40,634	40,478	49,322
Health services	50,480	49,070	47,992	50,479	50,434	56,001
Energy and mining	62,848	54,275	60,319	58,012	60,167	80,900
Clusters with location quotient > 1	36,871	36,207	38,632	39,668	39,806	–
Clusters with location quotient < 1	51,044	50,002	49,392	50,955	51,211	–
Average earnings (total)	43,813	43,270	43,510	44,619	44,891	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Average annual real (inflation-adjusted) earnings in Amarillo grew only 2.5 percent in 2010–17 (*Table 10.1*); this is below the state's 5.7 percent wage growth rate. The metro's wages are below the U.S. average in most industry clusters, and overall wages are 18.9 percent lower in Amarillo than in the U.S. Lower average wages in Amarillo partly reflect the low cost of living; adjusting wages for lower housing costs in particular would significantly reduce the wage gap vis-à-vis state and national wages.

DEMOGRAPHICS: Incomes Stagnate Even as Labor Market Remains Tight

Amarillo's real median household income grew 1.6 percent from 2014 to 2017 compared with 7.8 percent statewide. At \$53,922, Amarillo's median income was below the state median of \$59,206 in 2017—a relatively high income for a small city. Poverty rates are slightly lower than in the state; 15 percent of the local population and 18 percent of children live in poverty, compared with an overall statewide poverty rate of 16 percent and 22 percent among children.

Amarillo averaged the lowest unemployment rate among Texas metros in 2015 and 2016.

More than 60 percent of the population is non-Hispanic white; 28.4 percent of the population is Hispanic. The population rose in 2017 as net international migration and natural increase (births minus deaths) offset

losses via domestic outmigration. The overall population grew 4.8 percent from 2010 to 2017.

Amarillo's postsecondary education attainment among those ages 25 and older lags the state, with 23.7 percent possessing a bachelor's degree or higher, compared with 28.9 percent statewide.

Expansion of wind-energy production will likely continue to lead future growth. Defense and security manufacturing and cattle production will remain mainstays of Amarillo's economy, with an expected increase in export demand for beef aiding growth in the near term.⁶

—Stephanie Gullo

Notes

¹ The history of Amarillo has been adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hda02.

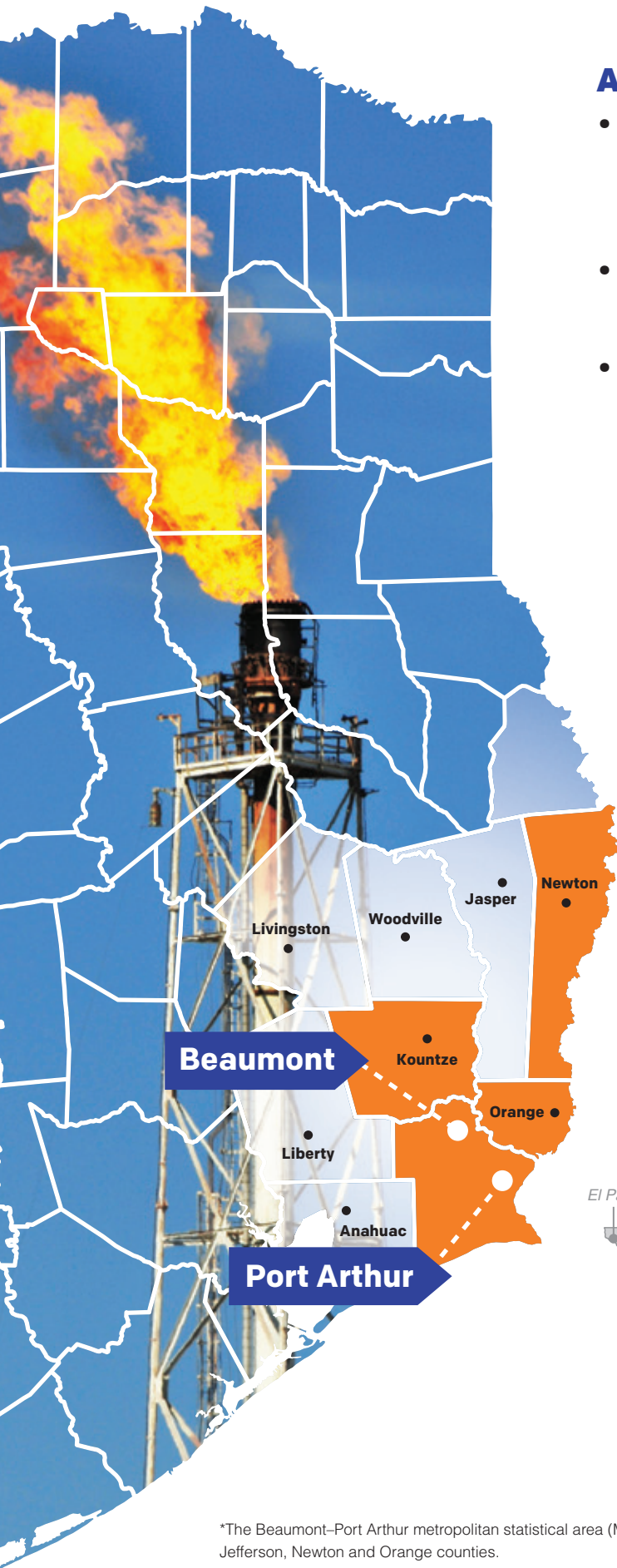
² Detail about Pantex's current operations has been obtained from <https://pantex.energy.gov/about>.

³ The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

⁴ Data about major employers in Amarillo have been obtained from the Amarillo Chamber of Commerce, www.amarillo-chamber.org/major-employers.html.

⁵ See "Wind Power a Growing Force in Oil Country," by Justin J. Lee and Kelvinder Virdi, Federal Reserve Bank of Dallas *Southwest Economy*, Second Quarter, 2017, www.dallasfed.org/research/swe.aspx.

⁶ See "CattleFax Outlook: Cattle Profitability Remains for 2018," by Wes Ishmael, *Beef Magazine*, Feb. 2, 2018, accessed May 7, 2018, www.beefmagazine.com/marketing/cattlefax-outlook-cattle-profitability-remains-2018.



At a Glance

- The Spindletop oil discovery near Beaumont in 1901 transformed the small lumber and port town into a thriving oil and gas hub, with one of the nation's largest concentrations of refineries, petrochemical plants and related businesses.
- The area, which includes the city of Orange, became known as the Golden Triangle, a reference to the wealth that came as a result of Spindletop's oil riches.
- Median household income grew faster in Beaumont–Port Arthur than in all major Texas metros from 2014 to 2016, likely due to the boom in downstream energy and the resulting highly paid jobs. However, median household income remains far below the comparable state and U.S. figures.

Population

(2017): 412,437

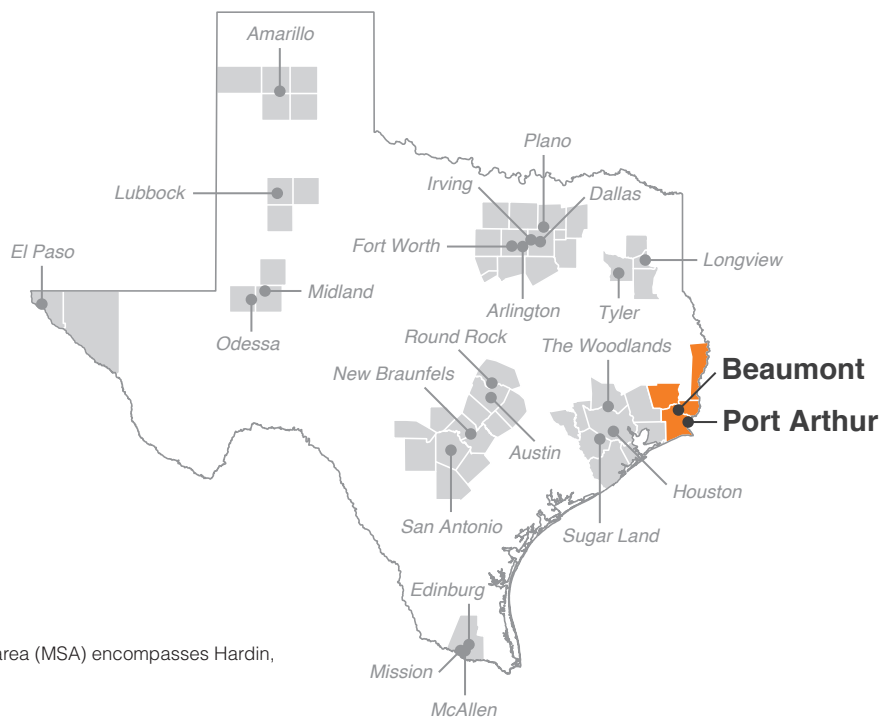
Population growth

(2010–17): 2.2 percent (Texas: 12.1 percent)

Median household

income (2017): \$49,875 (Texas: \$59,206)

National MSA rank (2017): No. 130*



*The Beaumont–Port Arthur metropolitan statistical area (MSA) encompasses Hardin, Jefferson, Newton and Orange counties.

Beaumont—Port Arthur:

The Golden Triangle Shines as Petrochemicals Boom

HISTORY: Discovery of Oil Transforms the Area

While Beaumont, like many Texas communities, traces its initial growth to the post-Civil War arrival of the railroad, it owes its longer-term viability to the Spindletop oil gusher in 1901. The oil field south of town spawned three oil companies—the Texas Co. (later Texaco), Gulf Oil Corp. and Humble (later Exxon Mobil)—and established the region as an oil distribution and refining hub. Beaumont, part of Texas' Golden Triangle along with Port Arthur and Orange, saw its population double during Spindletop's first decade. Discovery of another oil field at Spindletop in 1925 again brought a burst of growth to the area.¹

Nearby Port Arthur, which founder Arthur E. Stilwell initially envisioned as a tourist destination (naming the town after himself), became a seaport following creation of a canal linking Sabine Lake to Sabine Pass in 1899. The canal was deepened and extended up the

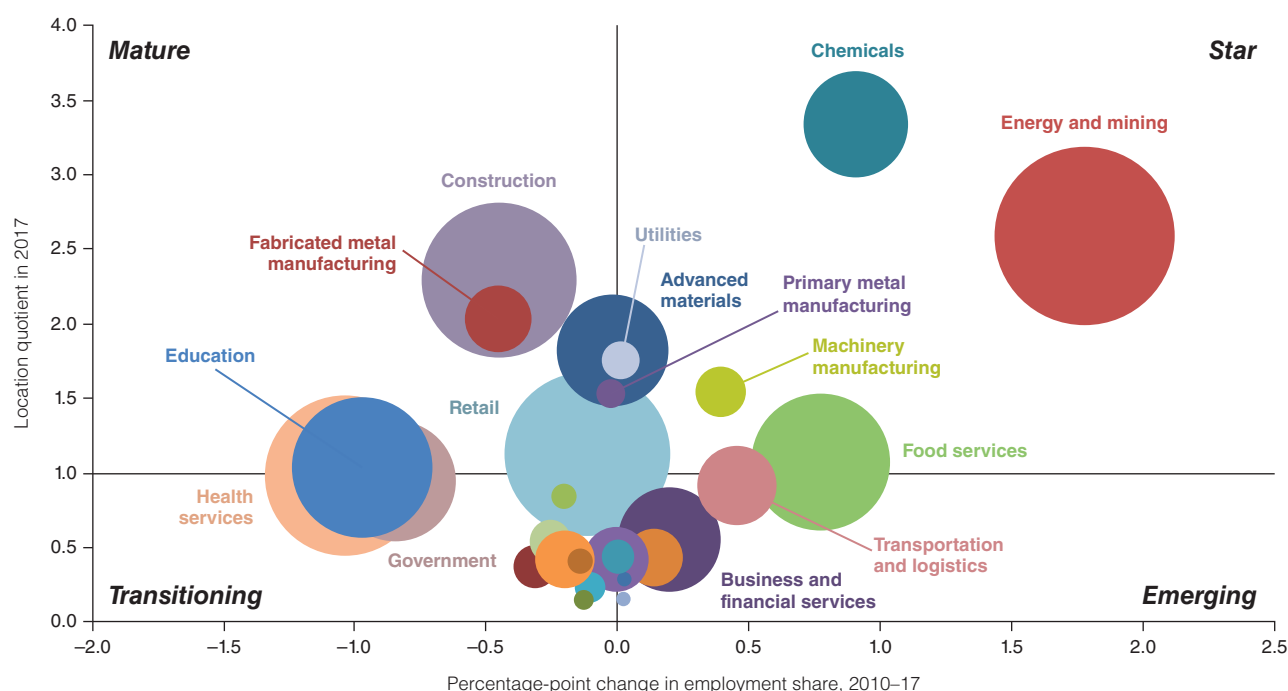
Neches River to Beaumont and Orange in 1908. Refineries tied to Spindletop followed and, by 1909, Port Arthur was already the nation's 12th-largest port based on the value of exports. By 1914, it became the second-largest oil-refining center in the country.

INDUSTRY CLUSTERS: A Global Petrochemical and Industrial Complex

Location quotients (LQs), which compare the relative concentration of industry clusters locally and nationally, are a convenient way of assessing key drivers in an economy. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2010 and 2017 (*Chart 11.1*).²

Clusters in the top half of *Chart 11.1*, such as chemicals, construction, and energy and mining, have a larger share of employment relative to the nation and, thus, an LQ greater than 1. These clusters are generally vital

Chart 11.1: Petrochemicals and Refineries Central to Beaumont–Port Arthur's Economy



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

to the area's economy and can be expanding relatively rapidly ("star") or growing relatively slowly ("mature"). Those in the bottom half are less-dominant locally than nationally and, hence, have an LQ less than 1. "Emerging" clusters are fast growing; those growing slowly or declining are "transitioning."

Energy and mining-related companies, including both upstream and downstream firms, make up the largest cluster in Beaumont-Port Arthur, employing 14.7 percent of the workforce. Major employers include Exxon Mobil in Beaumont (2,000 workers) and Motiva Enterprises and Valero in Port Arthur (1,500 and 850, respectively).³ The Motiva facility processes more than 600,000 barrels of oil per day, making it the largest refinery in North America.

Similarly, the chemical industry is a major cluster, its relative size increasing since 2010. Chemical manufacturing boasts 3.3 times the concentration in Beaumont-Port Arthur than in the U.S. due to the significant presence of employers such as BASF Corp. and Total Petrochemicals and Refining USA, which together operate the world's largest steam cracker in Port Arthur, and Exxon Mobil's chemical and polyethylene plants.

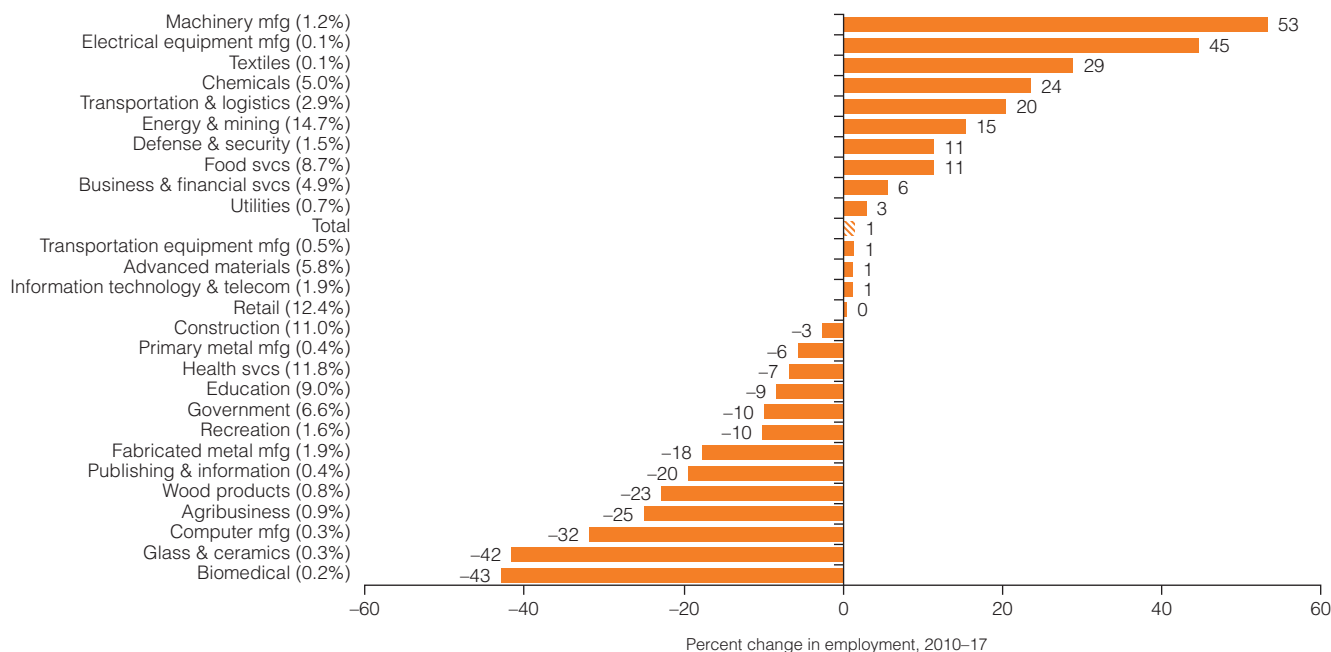
Texas-based chemical companies have benefited from the last decade's shale-led boom that has produced cheap and plentiful supplies of natural gas,

which is feedstock for propylene and other petrochemicals. Record low natural gas prices gave the companies a competitive edge vis-à-vis foreign producers that rely on oil as an input and propelled the construction or expansion of plants along the Gulf Coast. The projects include BASF's \$270 million expansion of its dicamba herbicide production facility in Beaumont.⁴

With the decline of oil prices in mid-2014, many refinery-related expansions were put on hold. As prices stabilized and then increased, some companies renewed plans. Total Petrochemicals has confirmed plans to build a \$1.7 billion ethane cracker in Port Arthur, scheduled to begin operations in 2020.

Beaumont-Port Arthur's other important industries have grown in support of its outsized manufacturing and energy base. Payrolls in electrical equipment and machinery manufacturing each grew at around 50 percent in 2010-17 (*Chart 11.2*). The transportation and logistics cluster, employing 3 percent of the workforce, is also among the fastest growing in Beaumont-Port Arthur, expanding 20 percent in 2010-17. The region remains an important seaport, with both the ports of Beaumont and Port Arthur placing among the top 25 U.S. water ports for total tonnage in 2017.⁵ The majority of the tonnage moving through both ports is crude petroleum and its refined products (gasoline, diesel

Chart 11.2: Energy and Manufacturing Payrolls See Strong Growth



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 11.1: Earnings in Energy-Related Clusters Outperform U.S. Averages

Cluster	Beaumont—Port Arthur					U.S.
	2010	2012	2014	2016	2017	2017
Chemicals	104,749	110,483	118,628	120,187	127,863	72,887
Energy and mining	88,747	89,992	90,947	100,690	98,938	80,900
Construction	61,393	64,965	65,214	72,117	72,728	60,742
Fabricated metal manufacturing	63,403	69,540	66,602	61,919	61,656	55,830
Advanced materials	90,693	97,395	105,335	107,557	114,780	85,695
Utilities	124,886	111,957	116,700	119,614	122,068	107,188
Machinery manufacturing	60,754	61,640	62,879	69,385	69,905	70,059
Primary metal manufacturing	69,779	74,267	72,041	72,756	70,851	67,868
Retail	29,366	28,766	29,764	30,814	31,376	31,216
Food services	17,500	17,280	16,153	17,101	16,832	18,963
Education	39,895	37,815	38,322	39,391	39,380	49,322
Clusters with location quotient > 1	55,939	61,225	66,369	63,073	67,299	—
Clusters with location quotient < 1	56,207	53,399	51,437	58,991	53,934	—
Average earnings (total)	49,481	51,145	52,279	54,139	54,572	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

and fuel oil). In November 2017, voters passed an \$85 million bond measure to upgrade facilities at the Port of Beaumont and improve its rail and highway access.

Driven by high-paying energy and manufacturing jobs, inflation-adjusted annual wages have grown rapidly since 2010 (*Table 11.1*). On average, a worker in Beaumont–Port Arthur made 10.3 percent more in 2017 than in 2010 in real (inflation-adjusted) terms.

Wages in industries with an LQ greater than 1 have driven the area's wages up, and in 2017, workers in these clusters (star and mature) made \$67,300 annually on average, compared with \$54,600 on average across all sectors.

DEMOGRAPHICS: Household Income Increasing, Underscoring Industrial Base

Primarily a petrochemical manufacturing-driven economy benefiting from the shale oil boom, Beaumont–Port Arthur saw median household income expand at a faster pace than in most Texas metros from 2014 to 2017, rising 13 percent.

Still, the metro's median household income of \$49,875 trails the state median, likely due to a less-educated workforce than in the state as a whole. About 17 percent of residents age 25 and older have at least a bachelor's degree, the lowest share among Texas metros covered in

this report and 12 percentage points lower than the Texas average of 28.9 percent. Many petrochemical and manufacturing-related jobs do not require a college degree.

Beaumont–Port Arthur's significance as a key player in the petrochemical industry will continue to dominate its fortunes. Energy companies have several billion-dollar projects planned, which will boost growth in the medium term, particularly in terms of construction employment and both retail and leisure and hospitality spending in the area.

—*Laila Assanie*

Notes

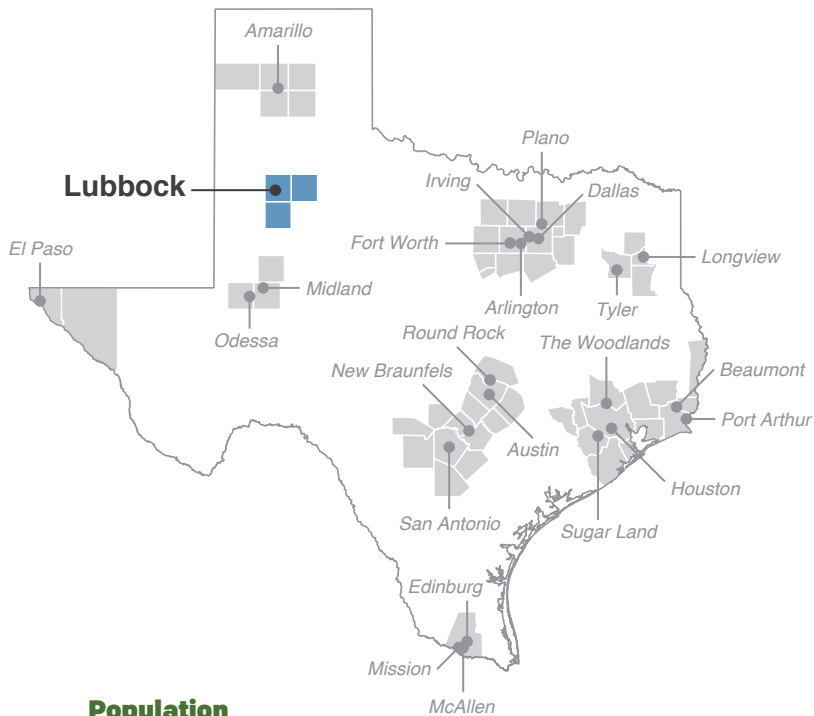
¹ The history of Beaumont and Port Arthur has been adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdb02 and tshaonline.org/handbook/online/articles/hdp05.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for detail.)

³ Employment data are from the individual companies websites: Exxon Mobil's Beaumont facilities, www.corporate.exxonmobil.com/en/company/worldwide-operations/locations/united-states/beatmont-operations/about-us; Motiva Enterprises' refinery, <https://motiva.com/About/What-We-Do/Our-Production>; and Valero's Port Arthur refinery, www.valero.com/en-us/Pages/PortArthur.aspx.

⁴ See "BASF Expands Production Capacity for Herbicide Dicamba in Beaumont, Texas," BASF news release, March 21, 2017, www.basf.com/en/company/news-and-media/news-releases/2017/03/p-17-154.html.

⁵ Port data are from the Bureau of Transportation Statistics, www.bts.dot.gov/port-performance-freight-statistics.



Population

(2017): 316,983

Population growth

(2010–17): 8.5 percent (Texas: 12.1 percent)

Median household

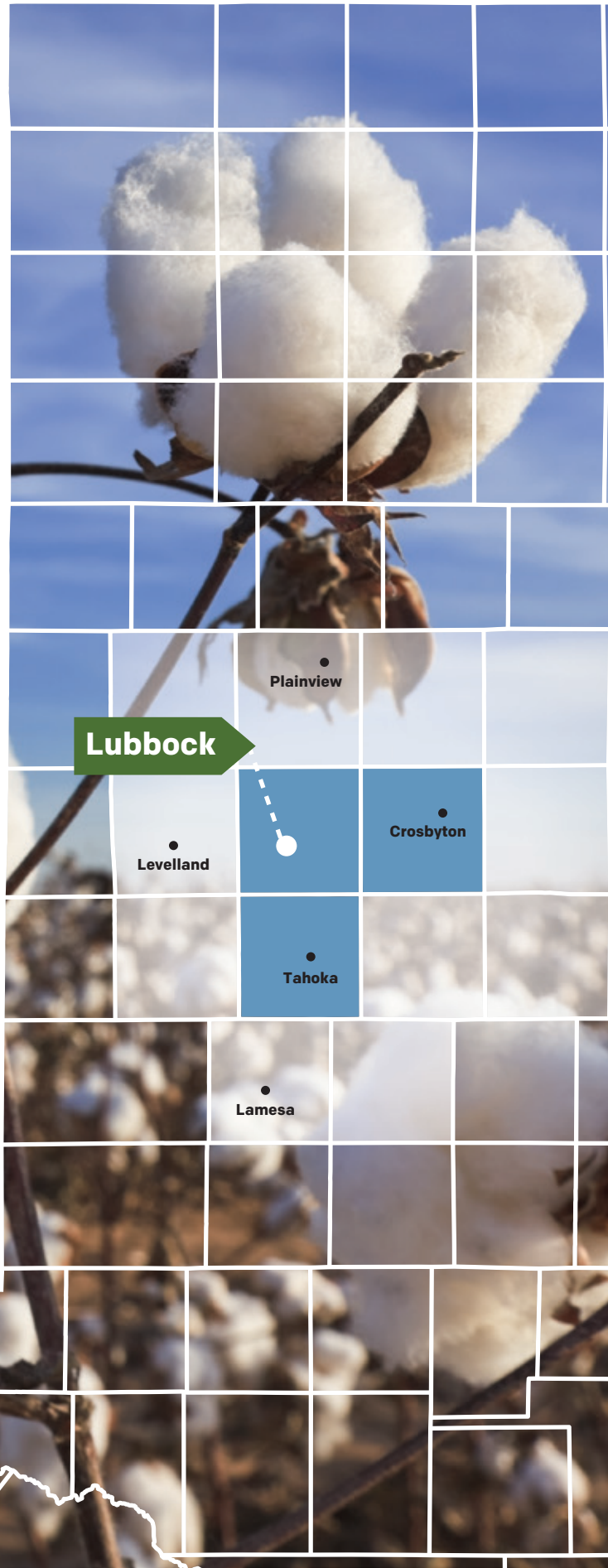
income (2017): \$47,276 (Texas: \$59,206)

National MSA rank (2017): No. 158*

At a Glance

- Texas Tech University and agriculture have shaped Lubbock's development since the early 20th century.
- Education, health, retail and food sectors are major contributors to economic activity.
- A large student population helps explain the area's relatively low median household income and disproportionate population shares of 15–24-year-olds and college degree holders relative to the overall state.

*The Lubbock metropolitan statistical area (MSA) encompasses Crosby, Lubbock and Lynn counties.



Lubbock:

Texas Tech, Agriculture Work Together in Plains Economy

HISTORY: Rooted in Agriculture and Education

Lubbock's settlers came in search of land to cultivate in the late 1800s. Other settlements dotted the West Texas plains, though Lubbock's growth stood out, driven by the railroad. The city was formally established in 1909, and later that year, the Santa Fe Railway arrived. Lubbock's 1910 population doubled over the following decade, to 4,051 residents in 1920.

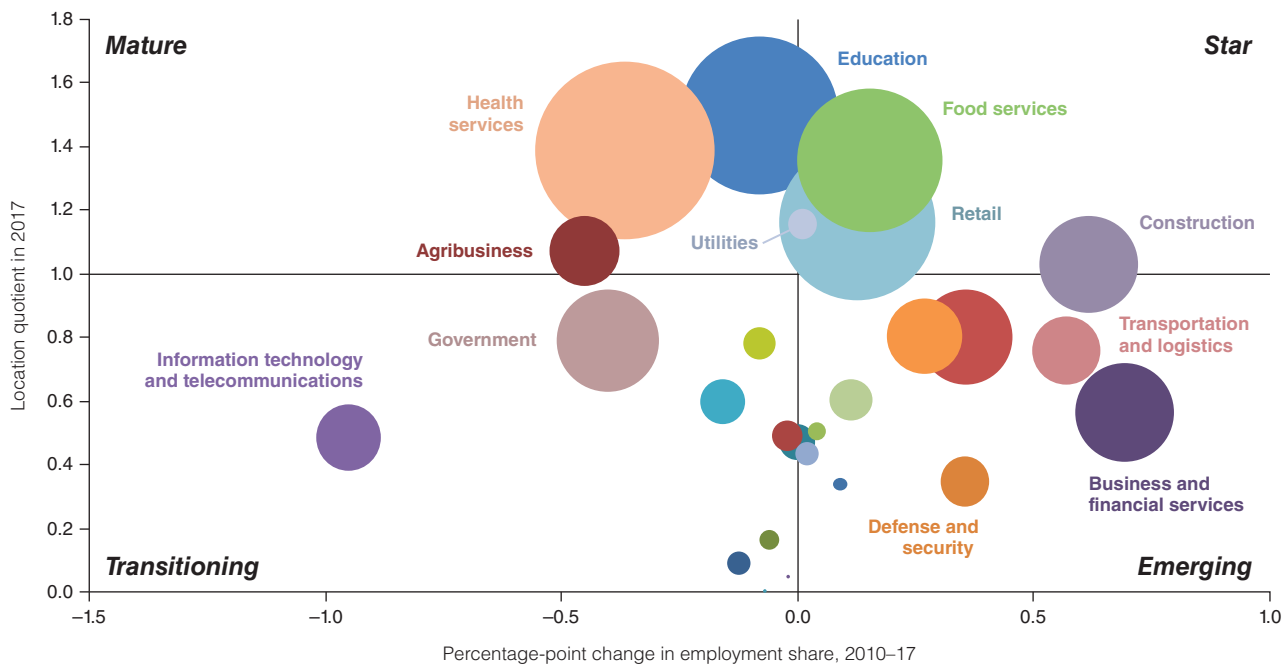
In 1923, the Legislature designated Lubbock as the home of Texas Technological College, known as Texas Tech University since 1969. Agriculture remained a vital component of economic activity, particularly cotton and sorghum farming. By the mid-20th century, Lubbock accounted for a major portion of the global cottonseed-processing industry.¹

INDUSTRY CLUSTERS: Location Quotients Assess Economic Drivers

Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, are a convenient way of assessing key drivers in an economy. An LQ exceeding 1 indicates that a specific industry cluster carries more relative weight locally than nationally.²

Clusters in the top half of Chart 12.1, such as food services and retail, have a larger share of employment relative to the nation and, thus, an LQ greater than 1. These clusters are generally vital to the area's economy and can be expanding relatively rapidly ("star") or slowly ("mature"). Those in the bottom half, such as defense and security and information technology and telecommunications, are less dominant locally than nationally

Chart 12.1: Education, Health, Food and Retail Services Dominate



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

and, hence, have an LQ less than 1. “Emerging” clusters are fast growing; those growing slowly are “transitioning.”

Health services, Lubbock’s largest industry cluster, encompasses nearly 17 percent of total employment and is 1.4 times more concentrated in Lubbock than in the U.S. on average. Major health services employers include University Medical Center, Covenant Health System and Lubbock Heart Hospital. University Medical Center is a public hospital, employing more than 4,600 people. The institution serves as the primary teaching hospital for the Texas Tech University Health Sciences Center, training 400 students annually for careers in nursing and medicine.

Education, Lubbock’s second-largest industry cluster, employs 13 percent of the workforce. The education cluster’s major employers include Lubbock’s independent school districts, Texas Tech, Lubbock Christian University and Wayland Baptist University.³

Texas Tech and its nearly 6,000-person payroll account for a significant portion of the education cluster employment. The university’s Health Sciences Center employed 3,400 people as of September 2016. Student enrollment at Texas Tech alone totaled 37,000 (11.7

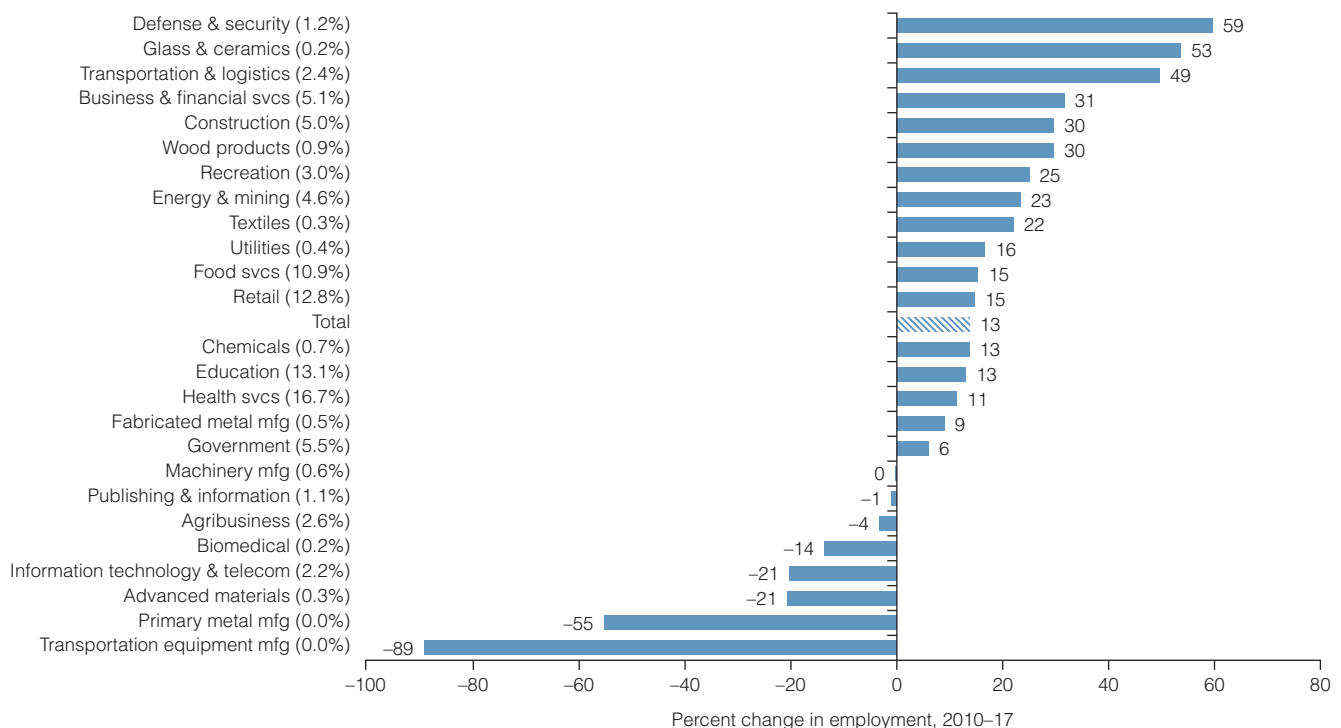
percent of the metro population) in fall 2017.⁴ At least \$2.1 billion of annual economic output in 2015 (latest estimate available) was attributed to Texas Tech—including research expenditures, university operations and visitors throughout the Lubbock metropolitan statistical area and nearby counties.⁵

Lubbock’s retail cluster accounts for 13 percent of the workforce, amounting to 1.2 times the cluster’s concentration in the U.S. The food services cluster is similarly large, encompassing nearly 11 percent of the workforce. In 2017, food services employment was 1.4 times more concentrated in Lubbock relative to the U.S.

Jobs in crop production and food manufacturing make up much of the agribusiness cluster, which is slightly more concentrated in Lubbock than in the U.S. overall. Texas’ broader High Plains region, which includes Lubbock, harvests 25 percent of the annual U.S. cotton crop.⁶ Agribusiness giant Monsanto, a Fortune 500 firm, scheduled the opening of a nationwide cottonseed processing center in Lubbock in 2018.

Lubbock’s fastest-growing industry clusters from 2010 to 2017 reveal a diverse mix (*Chart 12.2*). Recent employment growth may be partially due to increased

Chart 12.2: Employment Growth Broad Based Across Clusters



NOTES: Percent change in employment is shown in whole numbers. Each cluster’s share of total jobs is shown in parentheses (rounded to one decimal place). SOURCES: Texas Workforce Commission; authors’ calculations.

Table 12.1: Earnings in Education and Health Services, Two Largest Clusters, Boost Metro Average

Cluster	Lubbock					U.S.
	2010	2012	2014	2016	2017	2017
Education	50,322	49,112	49,869	51,365	50,976	49,322
Health services	47,913	45,366	48,227	50,237	50,845	56,001
Food services	15,864	16,267	16,587	16,681	16,700	18,963
Retail	27,698	28,239	29,374	29,432	29,570	31,216
Utilities	79,168	79,021	79,770	81,125	83,849	107,188
Agribusiness	44,626	43,382	44,243	43,997	46,548	44,576
Construction	40,502	44,337	44,448	47,552	48,250	60,742
Clusters with location quotient > 1	38,168	37,081	38,786	39,245	40,212	–
Clusters with location quotient < 1	46,591	46,566	47,898	48,237	48,620	–
Average earnings (total)	39,745	39,845	40,878	41,920	42,242	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

residential construction activity.⁷ Glass and ceramics job growth mainly reflects expansion in cement and concrete product manufacturing.

Annual earnings for workers in clusters with an LQ above 1 averaged \$40,200 in 2017, lower than the metro average of \$42,200 (*Table 12.1*). This subset includes the food services and retail clusters, which depress the area's average wages. Education and health services have the converse effect, raising the average earnings. Overall, in real (inflation-adjusted) terms, average annual earnings inched up 6.3 percent by 2017 from levels in 2010.

Annual earnings for workers in clusters with an LQ less than 1 averaged \$48,600 in 2017, slightly more than the metro average.

DEMOGRAPHICS: Future Professionals in Training

Lubbock's college student population partially explains wage, age and education trends. Real median household income was little changed in Lubbock from 2014 to 2017. Lubbock's median household income, \$47,276, also trails the state figure of \$59,206.

Lubbock's 15–24-year-olds make up 20.3 percent of the local population compared with the statewide figure of 14.3 percent in 2016. A sizable, highly educated population also resides in Lubbock, with 30.2 percent of the population age 25 and older holding a bachelor's degree or higher, compared with 28.9 percent for the

state. The college-student population likely explains Lubbock's relatively young median age: 30.8 years compared with 34.5 years for the state.

Higher education should continue leading Lubbock in the future, especially as Texas Tech's footprint continues to expand and support services grow. Agribusiness provides an important link between regional interests and growing global markets.

—*Alexander T. Abraham*

Notes

¹ The history of Lubbock has been adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdl04.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ The Lubbock Economic Development Alliance publishes a list of major employers and number of employees in Lubbock, lubbockeda.org/data-map-center/major-lists/local-major-employers/.

⁴ Texas Tech University provides a brief institution profile, www.ttu.edu/about/.

⁵ See the "Economic Impact Report," by Bradley Ewing, January 2013, www.ttu.edu/administration/president/pdf/TTU_EconomicImpactReport.pdf. Additionally impacted areas include Garza, Dickens, King, Motley, Floyd, Hale, Lamb, Bailey, Cochran, Hockley, Yoakum and Terry counties.

⁶ For Texas A&M Forest Service's definition of Texas' High Plains region, see <http://texastreeid.tamu.edu/content/texasEcoRegions/>. For the Lubbock Chamber of Commerce's facts about regional agriculture, see www.lubbockchamber.com/ag-facts.

⁷ The annual value of all permits for new private-housing units doubled in 2017 from 2010 levels. Calculations were made using nominal housing permits data from the Census Bureau.

Population

(2017): 445,208 (metros combined)

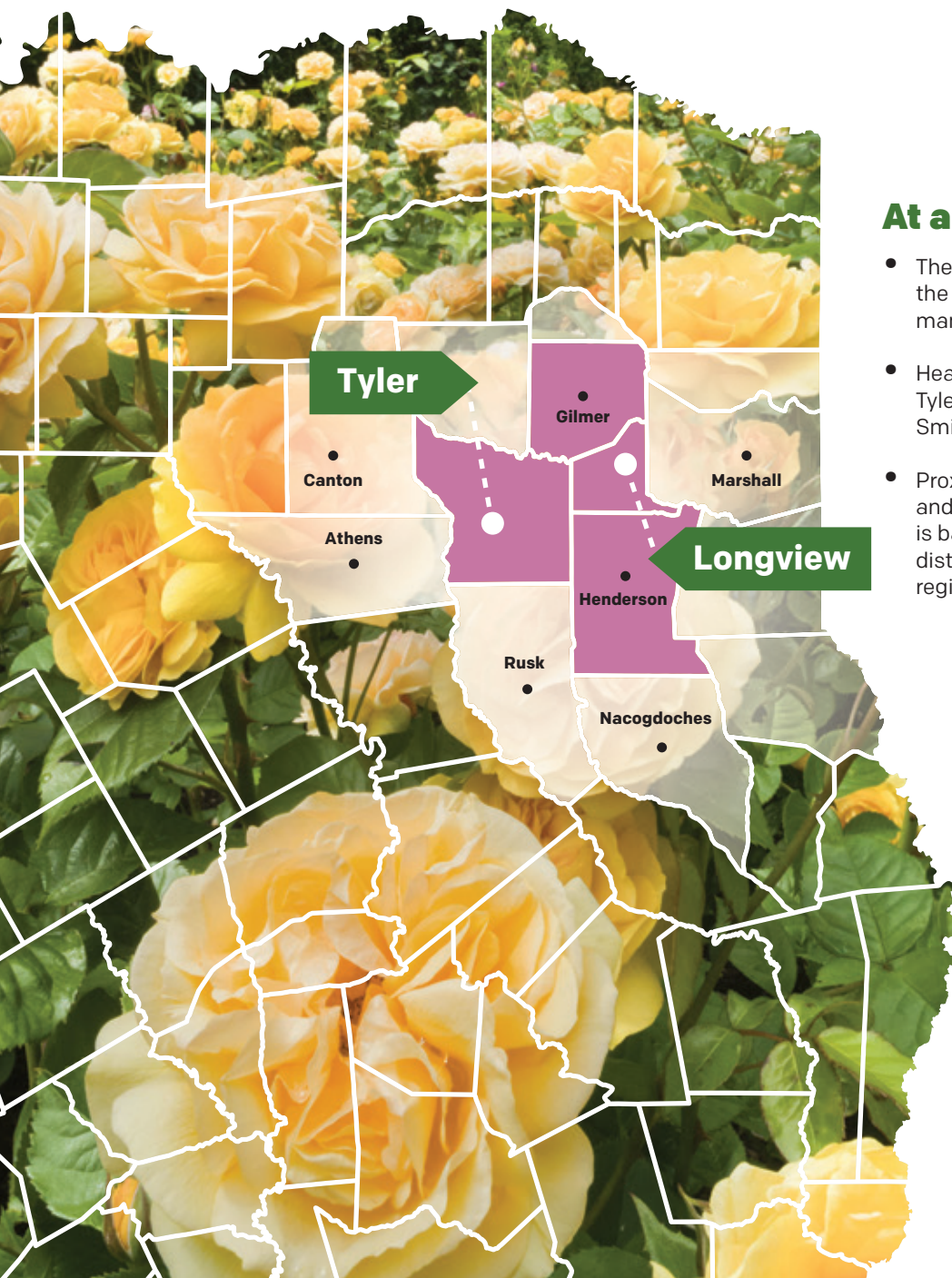
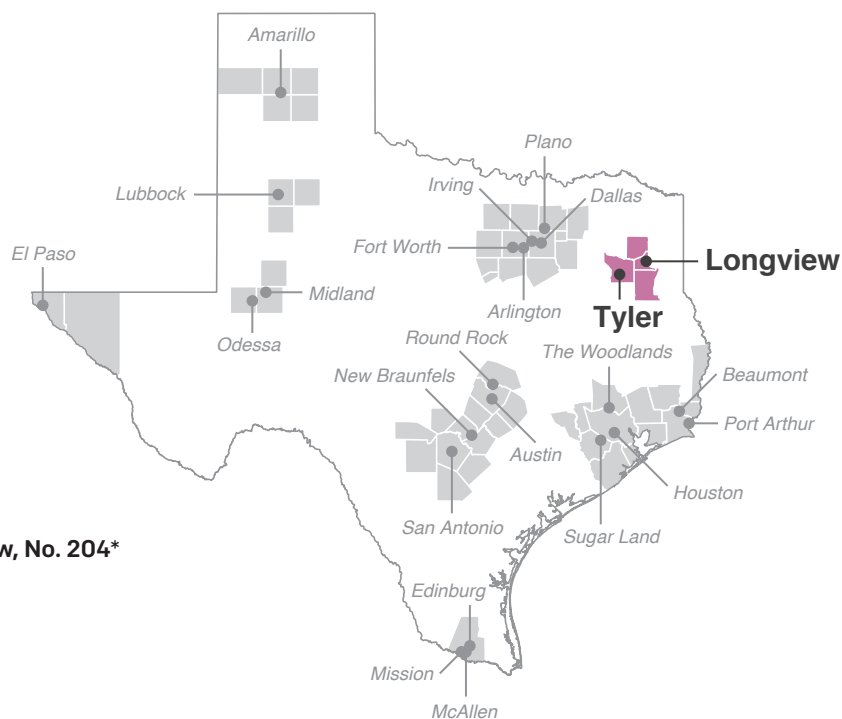
Population growth

(2010–17): 4.7 percent (Texas: 12.1 percent)

Median household

income (2017): Tyler, \$54,339; Longview, \$48,259
(Texas: \$59,206)

National MSA rank (2017): Tyler, No. 199*; Longview, No. 204*



At a Glance

- The discovery of oil in East Texas helped move the region from a reliance on agriculture to a manufacturing hub with an energy underpinning.
- Health care leads the list of largest employers in Tyler and Longview, the county seats of adjacent Smith and Gregg counties.
- Proximity to Interstate 20 has supported logistics and retailing in the area. Brookshire Grocery Co. is based in Tyler, which is also home to a Target distribution center. Dollar General is building a regional distribution facility in Longview.

*The Tyler and Longview metropolitan statistical areas (MSAs) encompass Smith, Gregg, Rusk and Upshur counties.

Tyler–Longview:

Health Care Growth Builds on Manufacturing, Energy Legacy

HISTORY: East Texas Oilfield Changes Agricultural Economies

The East Texas communities of Tyler and Longview, though 40 miles apart, are viewed as sharing an economic base and history. Tyler's early economy relied on agriculture and immigration from the Old South before the Civil War. Longview's growth took off with westward expansion of the Southern Pacific Railroad in the early 1870s.

The discovery of the East Texas oilfield in the 1930s provided an economic respite for both cities from the Great Depression and shaped their subsequent commercial development.

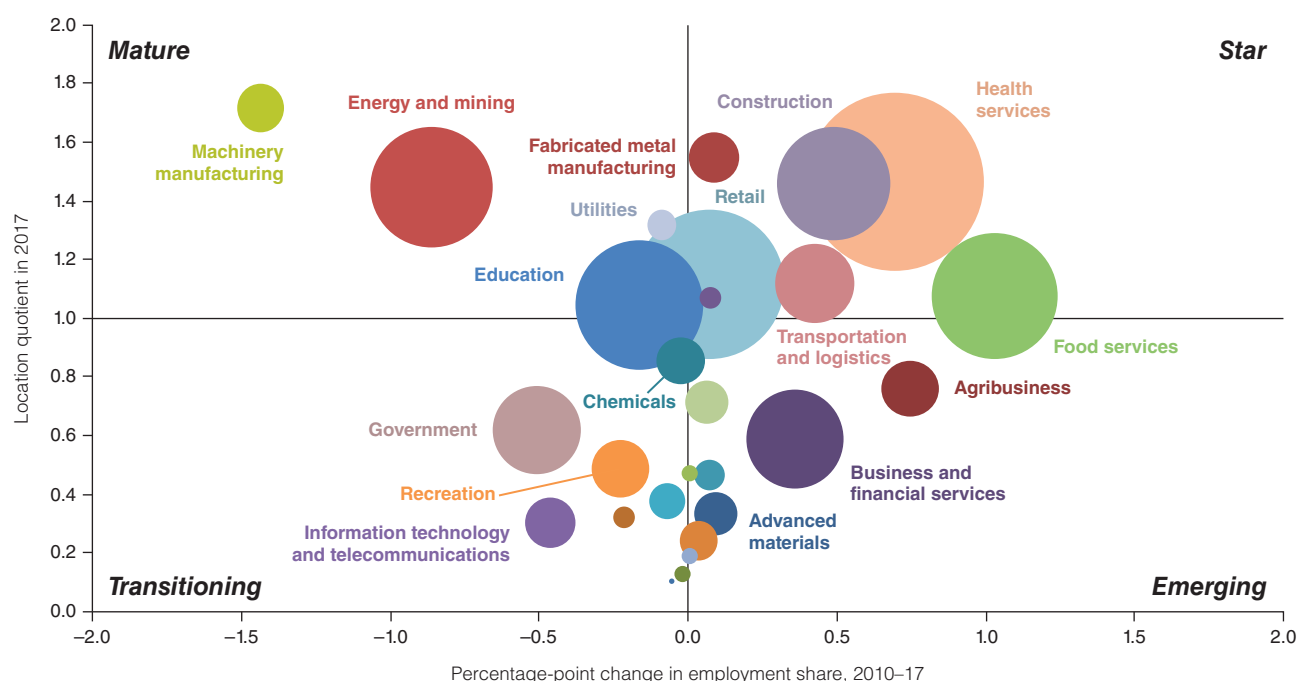
Tyler is widely known for its rose industry and annual Texas Rose Festival. Local growers turned roses into a major business after peach blight wiped out more than 1 million fruit trees in 1900. The arrival of oil led first to the growth of metal and fabricating industries,

and by the mid-1960s, Tyler's 125 manufacturing plants employed 8,000 workers.

Longview, a cotton and timber town before the oil boom, attracted newcomers from throughout the South for its industrial plants. The Texas Eastman Co., an offshoot of the Eastman Kodak Co. (best known for predigital photography supplies and equipment), located in Longview and was the state's largest inland chemical complex in the 1950s. The Jos. Schlitz Brewing Co. opened what became the state's largest brewery and associated factory in 1966, producing 4 million barrels of beer annually. The plant closed after its subsequent owner, the Stroh Brewery Co., exited the beer business in 1999.¹

Although Tyler and Longview are separate metropolitan statistical areas, the neighboring communities' commercial activities overlap and complement one another.

Chart 13.1: Health Care, Manufacturing and Energy Dominate



NOTE: Bubble size represents cluster share of metropolitan statistical area employment.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics.

INDUSTRY CLUSTERS: Health Care Emerges amid Manufacturing

Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, are a convenient way of assessing key drivers in an economy. An LQ exceeding 1 indicates that a specific industry cluster carries more relative weight locally than nationally. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2010 and 2017 (*Chart 13.1*).²

Clusters in the top half of *Chart 13.1* are generally vital to the area's economy and can be expanding rapidly ("star") or growing slowly ("mature") relative to other industries. Those in the bottom half are less dominant locally than nationally. "Emerging" clusters are fast growing; those growing slowly or declining are "transitioning."

The region's largest cluster is health services, with an LQ of 1.5 and over 34,000 employees. The two largest employers in Tyler, East Texas Medical Center and CHRISTUS Trinity Mother Frances Health System, together employ more than 6,700 people. CHRISTUS Good Shepherd Medical Center Longview is Longview's largest employer, with a payroll exceeding 2,500.³ The University of Texas Health Science Center in Tyler received degree-granting

authority in 2005 and is a regional teaching institution as well as a health care provider.

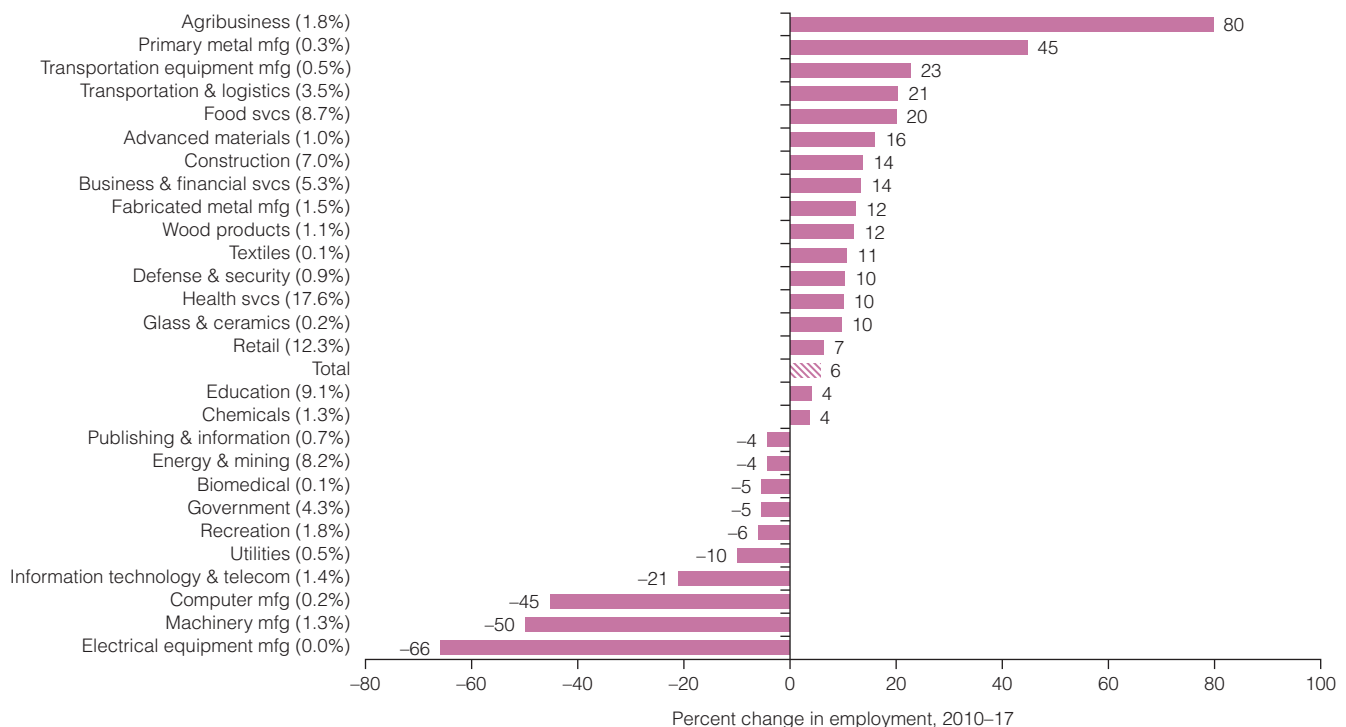
Tyler-based Brookshire Grocery Co., with 2,460 employees, is part of the retail sector, the second-largest in the region, with an LQ of 1.1. Walmart employs 1,060 in Longview. Interstate 20, linking Tyler and Longview, helps support the retail sector and related activities.

The transportation and logistics sector, with an LQ of 1.1, includes 400 Union Pacific personnel in Longview. A Target distribution center in Tyler, with 600 workers, is among the largest employers, while Dollar General is constructing a regional distribution center that will employ 400 workers in Longview. It will join a Neiman Marcus national service center, with almost 300 workers.

The mature machinery manufacturing sector, which is tied to the area's large energy and mining cluster, has the region's highest LQ, 1.7. Among the largest companies are Trane Co. with 1,750 employees and Komatsu Ltd. with 400 employees.

Transportation and logistics, manufacturing and construction helped drive economic growth from 2010 to 2017 (*Chart 13.2*). Agribusiness has seen the fastest growth during this period and includes Tyler's famous rose industry.

Chart 13.2: Manufacturing, Transportation Support Tyler–Longview Growth



NOTES: Percent change in employment is shown in whole numbers. Each cluster's share of total jobs is shown in parentheses (rounded to one decimal place).
SOURCES: Texas Workforce Commission; authors' calculations.

Table 13.1: Manufacturing, Energy Propel Wage Growth

Cluster	Tyler–Longview					U.S.
	2010	2012	2014	2016	2017	2017
Machinery manufacturing	72,482	76,313	80,825	77,205	75,603	70,059
Fabricated metal manufacturing	56,522	58,523	59,808	59,363	62,161	55,830
Health services	51,350	50,858	48,471	51,036	52,093	56,001
Construction	47,234	48,449	49,471	50,177	49,319	60,742
Energy and mining	69,041	76,254	76,629	70,970	70,490	80,900
Utilities	84,274	84,227	87,420	94,030	92,473	107,188
Transportation and logistics	52,299	56,168	56,731	56,100	53,444	53,761
Retail	30,904	30,172	30,432	29,290	29,798	31,216
Food services	15,066	14,698	15,042	15,514	15,809	18,963
Primary metal manufacturing	43,880	40,915	42,499	40,324	56,922	67,868
Education	37,147	35,506	35,154	36,250	35,995	49,322
Clusters with location quotient > 1	46,251	47,835	47,751	44,543	44,481	–
Clusters with location quotient < 1	46,632	46,344	47,502	51,565	52,503	–
Average earnings (total)	44,792	45,631	45,564	44,105	44,467	55,375

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2017 dollars.

SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

The energy and mining sector remains active, reflecting the legacy of the massive East Texas oilfield and the recently tapped Haynesville shale formation, which mostly holds natural gas. It has been a source of jobs that paid an average of \$70,500 in 2017, nearly 60 percent above the average pay of \$44,500 for all jobs in the area (*Table 13.1*). Reflecting relatively weak natural gas and oil prices as well as soft demand in the 2015–16 period, energy wages stagnated. Meanwhile, pay in the primary metal manufacturing sector averaged \$56,900 in 2017, jumping nearly 30 percent since 2010.

DEMOGRAPHICS: Lower Labor Force Participation, Less Education

The Tyler–Longview labor force participation rate of 58.9 percent in 2016 trailed both the state (64.5 percent) and the nation (63.1 percent).

A larger share (15.5 percent) of the local population is age 65 or older, relative to the state at 12.0 percent. Notably, the prime-age portion of the population (ages 25 to 54) in Tyler–Longview, 37.4 percent, is three percentage points lower than the statewide figure. This age distribution reflects a population that is growing older, partly because younger workers are moving to larger cities.

The local population is less educated than the Texas average. The share of the population over age 25 with

a bachelor's degree or more is 22.4 percent compared with 28.9 percent statewide. Meanwhile, 27.4 percent of the local population has a high school diploma or equivalent, more than two percentage points higher than for the state.

The data reflect the significant regional presence of traditional blue collar industries, including manufacturing, construction and energy and mining sectors. They typically have not required workers with advanced levels of education.

Tyler–Longview's expanding distribution sector should benefit from the state's increasing population and demand for goods and services. The health care sector can expect further growth as the UT Health Science Center in Tyler expands.

—*Michael Weiss*

Notes

¹ The history of Tyler and Longview has been adapted from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdt04, and tshaonline.org/handbook/online/articles/hdl03.

² The percentage shares of individual clusters do not add to 100 because some industries are counted in multiple clusters, and some industries are not counted at all based on cluster definitions. (See the appendix for more information.)

³ "Tyler Texas Community Profile, Smith County's Largest Employers," Tyler Economic Development Council Inc., 2017, and "Real East Texas Longview Major Employers," Longview Economic Development Corp., 2018.

Appendix

A.1. Methodology

This report uses industry cluster definitions developed by the StatsAmerica Innovation Project, funded by the U.S. Commerce Department’s Economic Development Administration and assembled by the Purdue Center for Regional Development and the Indiana Business Research Center.¹ The original 17 clusters and six manufacturing subclusters provide a comprehensive view of the interconnected upstream and downstream industries.²

While clusters based on this definition are defined by their North American Industrial Classification System identifier (or NAICS code), they do not necessarily correspond to a specific broad NAICS sector. Rather, the clusters are made up of interrelated subsectors or industries (from the three-digit level down to the six-digit level) that are part of different NAICS supersectors (two-digit level). In some instances, individual NAICS industries may be found in multiple clusters, and not all existing industries are included in a cluster.

The StatsAmerica analysis focuses only on “traded” clusters, or industries that are export oriented; thus, some large and important industries were omitted. We altered some of the cluster definitions to create a more complete view of the industry mix in Texas and its metro areas. We included the Retail, Construction and Utilities NAICS supersectors, the Food Services sector (NAICS 722) and the Government sector that includes federal, state and local government workers, with the exception of those employed in education or health services. We took ambulatory health care services and health and personal care stores out of the Biomedical StatsAmerica cluster and created a separate Health Services cluster that includes public and private employment at hospitals, ambulatory health care services, and nursing and residential care facilities.

We combined the StatsAmerica Energy and Mining clusters and aggregated all of the mining and support activities subsectors up to the three-digit NAICS level. We modified StatsAmerica’s Education and Knowledge Creation cluster to include only public and private educational services. Additionally, to look at the manufacturing sector in more detail, we broke up the manufacturing grouping into its six subcluster components as defined by StatsAmerica.

For purposes of our cities analysis, we used Census Bureau definitions of metropolitan statistical areas (MSAs) for Amarillo, Austin, Beaumont–Port Arthur, El Paso, Houston, Lubbock, McAllen and San Antonio. For Dallas and Fort Worth, we used the Census Bureau’s definitions of metropolitan divisions. For Midland–Odessa and Tyler–Longview, in each area, we combined the two MSAs into one.

The analysis uses data from the Quarterly Census of Employment and Wages, which contains employment, wage and firm information by industry down to the six-digit NAICS level. Data for Texas metros were retrieved from the Texas Workforce Commission (TWC), while data for Texas and the U.S. came from the Bureau of Labor Statistics (BLS).

TWC and BLS data may be suppressed at some levels of detail when the number of firms does not reach a certain threshold and the confidentiality of individual firms may be at risk. TWC data are only available quarterly, so annual employment data were calculated by taking average quarterly employment; annual total wages were calculated by summing quarterly wages. Thus, some discrepancies may exist in the wage data because some industries may be unsuppressed in one quarter and suppressed in another, leaving annual wage data incomplete. In instances when wage data for a particular NAICS code were available in some quarters and missing in others within the same calendar year, observed quarterly wage data were applied to/ substituted for missing quarters. Additionally, because of suppression issues, employment in some industries with fewer firms is potentially understated.

The detailed employment and wage data were aggregated into clusters based on the StatsAmerica cluster definitions using NAICS codes to match the raw data with the cluster definitions. For each cluster, the component industry annual employment and wage data were summed and excluded industries were subtracted. Average wage data for each cluster were calculated by taking total wages for the aggregated cluster and dividing by total employment in the cluster.

Location quotients (LQs) were calculated by taking cluster employment in each metro divided by total metro employment, over cluster employment in the U.S. divided by total U.S. employment.³ An LQ greater than 1, therefore, means that the cluster’s share of total

employment in the metro is greater than its share of total U.S. employment, indicating that the cluster is more concentrated in the metro than in the U.S. overall.

Demographic data are from the Census Bureau's American Community Survey. For 2017, population and median household income are used; other detail is from 2016. We compared those with data from the 2010 survey. In all three years, only one-year estimates were used for analysis.

The Kauffman Startup Activity Index measures business creation in the 40 largest metropolitan areas in the U.S. The index is based on three indicators: the rate of new entrepreneurs starting businesses, the percentage of new entrepreneurs not unemployed before starting a business and the number of newly established employer businesses per 1,000 employer firms.⁴

A.2. Changes to StatsAmerica Cluster Definitions

- Split Manufacturing grouping into individual sub-cluster components.
- Changed the Education and Knowledge Creation cluster as follows:
 - Removed NAICS 51111 (Newspaper Publishers), NAICS 51112 (Periodical Publishers), NAICS 51113 (Book Publishers), NAICS 516 (Internet Publishing and Broadcasting), which are already counted in Printing and Publishing, and NAICS 519 (Other Information Services).
 - Included both public and private employment in Educational Services (NAICS 61). In the 2016 edition, Education Services consisted only of private employment in NAICS 61.
- Added NAICS 519 to the Printing and Publishing cluster but removed NAICS 51911 and NAICS 51919 to avoid double counting.
- Combined the Energy and Mining clusters and aggregated all subsectors in NAICS 212 and 213.
- Removed NAICS 621 and NAICS 446 from the Bio-medical cluster and created a Health Services cluster that includes both government and private employment in NAICS 621, NAICS 622 and NAICS 623. In the 2016 edition, Health Service cluster was made up of only private employment in NAICS 621, NAICS

622 and NAICS 446.

- Added Retail (NAICS 44–45), Construction (NAICS 23) and Utilities (NAICS 22) supersectors.
- Added a Government sector, which includes total federal, state and local government workers, excluding those employed in public education and health care.
- This edition follows StatsAmerica's original definition of the Arts, Entertainment, Recreation and Visitor Industries cluster, which we refer to as the Recreation cluster. The first edition augmented the original definition by including all of NAICS 72.
- Added a Food Services cluster, composed of NAICS 722.

A.3. Location Quotient and Average Wage Equations

$$1. \text{ Cluster location quotient} = \frac{\frac{\sum e_i}{\sum e}}{\frac{\sum E_i}{\sum E}},$$

where e_i = metro's cluster employment, e = metro's total employment, E_i = U.S. cluster employment and E = U.S. total employment.

$$2. \text{ Cluster average wage} = \frac{\sum x_i}{\sum e_i},$$

where x_i = total wages paid in each cluster and e_i = employees in each cluster.

A.4. Additional Data

Detailed cluster location quotient, employment, wage and demographic data are available at www.dallasfed.org/research/heart.

Notes

¹ As used by Diane F. Primont and Bruce Domazlicky in "Industry Cluster Analysis for the Southeast Missouri Region," Center for Economic and Business Research, September 2008.

² Detailed cluster definitions can be found on the StatsAmerica website, www.statsamerica.org/innovation/about.html.

³ See A.3. for the full equations.

⁴ See www.kauffman.org/kauffman-index/reporting/startup-activity.