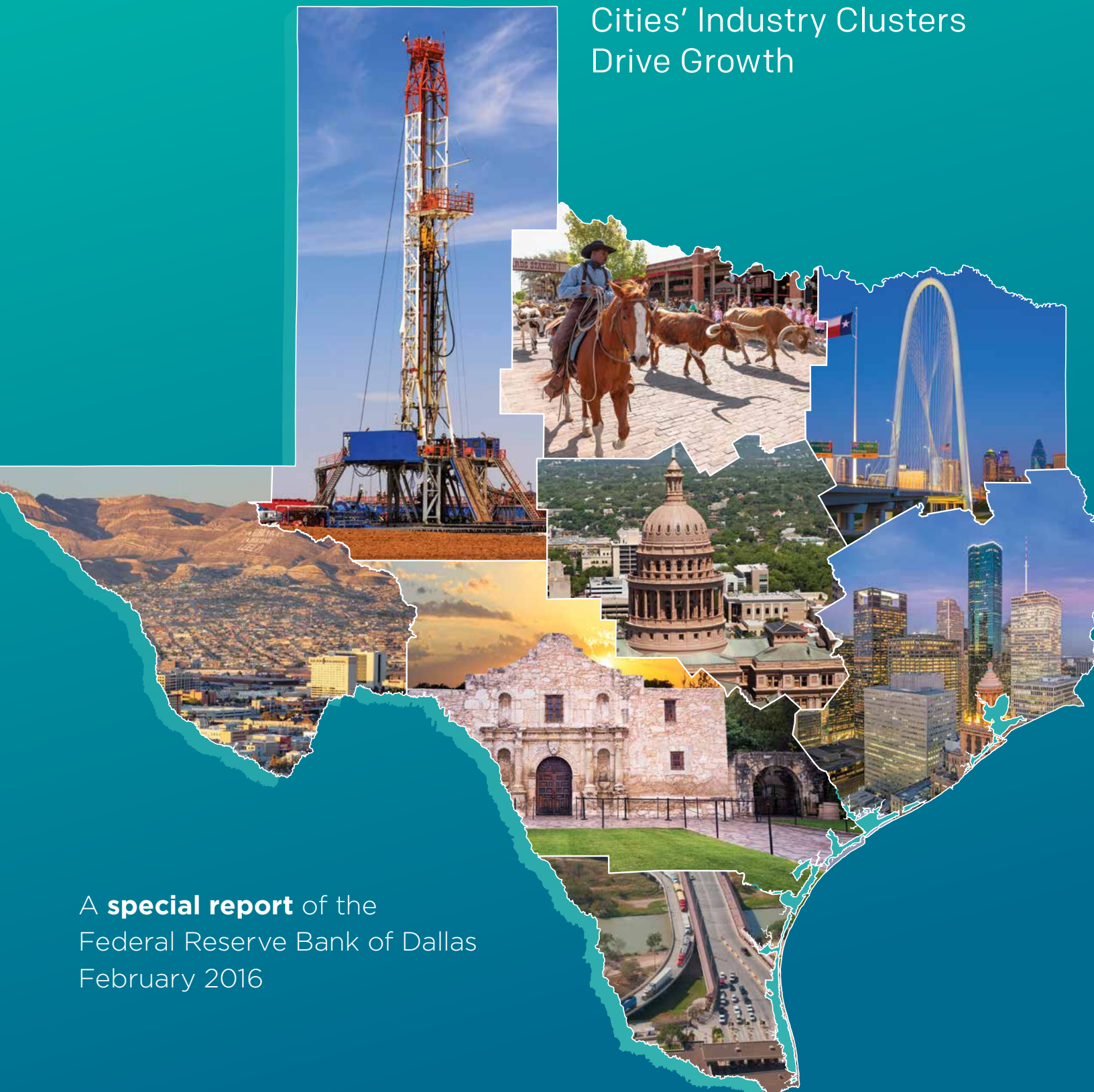
At the Heart of TEXAS

Cities' Industry Clusters Drive Growth



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At the Heart of Texas:
Cities' Industry Clusters Drive Growth

It is the age of the city. Paradoxically, as globalization has put everything and everywhere seemingly within reach, attention has been drawn from national boundaries to the smaller units of civilization—cities. This is not new when taking a longer perspective; after all, cities have typically been the rock stars of history, 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 facile exchange of ideas and low transportation costs.[1] 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.[2]

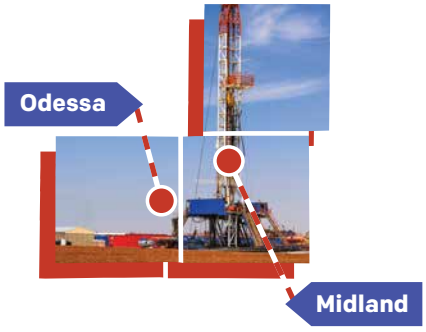
With five metropolitan areas of 1 million or more residents, Texas has more big cities per capita than the other large U.S. states with the exception of Florida and Ohio. Dallas–Fort Worth and Houston rank among the top five largest metropolitan areas in the U.S. in terms of both population and economic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

The abundance of large cities is an additional 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 business-friendly climate. With so many advantages, it is no surprise that employment grows a percentage point faster in Texas than the nation on average and that state gross domestic product growth was more than twice that of the nation in the recent economic recovery.[3]

While the Texas economy slowed notably in 2015 due to the collapse of oil prices and related drilling, metros will continue to play a key role in the state's economic expansion. Those with a more diversified industrial base, such as Dallas and Austin, will have to offset some of the downturn playing out in Houston, Midland–Odessa and the other energy-producing regions in the state.

This Federal Reserve Bank of Dallas special report details the historical, economic and demographic profiles of eight of Texas' most important cities: Austin, Dallas, El Paso, Fort Worth, Houston, McAllen, Midland–Odessa and San Antonio. Together, the eight accounted for 73 percent of the state's population, 76 percent of its employment and 82 percent of its economic output in 2014.

While such an aggregate view tells part of the story, the industrial clusters of each area define a metro's distinctive place in the state's economy and explain its returns to agglomeration, in terms of both job growth and income gains. Accordingly, the state as a whole provides useful context with which to look at the individual metros.



Dominant Clusters Power Texas

Characteristics such as location, natural resources and labor force contribute to an area's long-run economic performance. Another important factor is industry agglomeration, or clusters, which are geographically concentrated groups of firms linked by the technologies they employ, the markets they serve, the goods and services they produce and the labor skills they require. 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.[4]

An area typically has an economic base that consists of several dominant industry clusters. These clusters exceed the national average in their share of employment, output or earnings. Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, are one way of assessing these key drivers in an economy.

We use annual employment data from the Quarterly Census of Employment and Wages to compute location quotients. These data are readily available at the three-digit-or-higher North American Industry Classification System (NAICS) level by metropolitan area, facilitating

analysis. Industry cluster definitions are taken from StatsAmerica, 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.

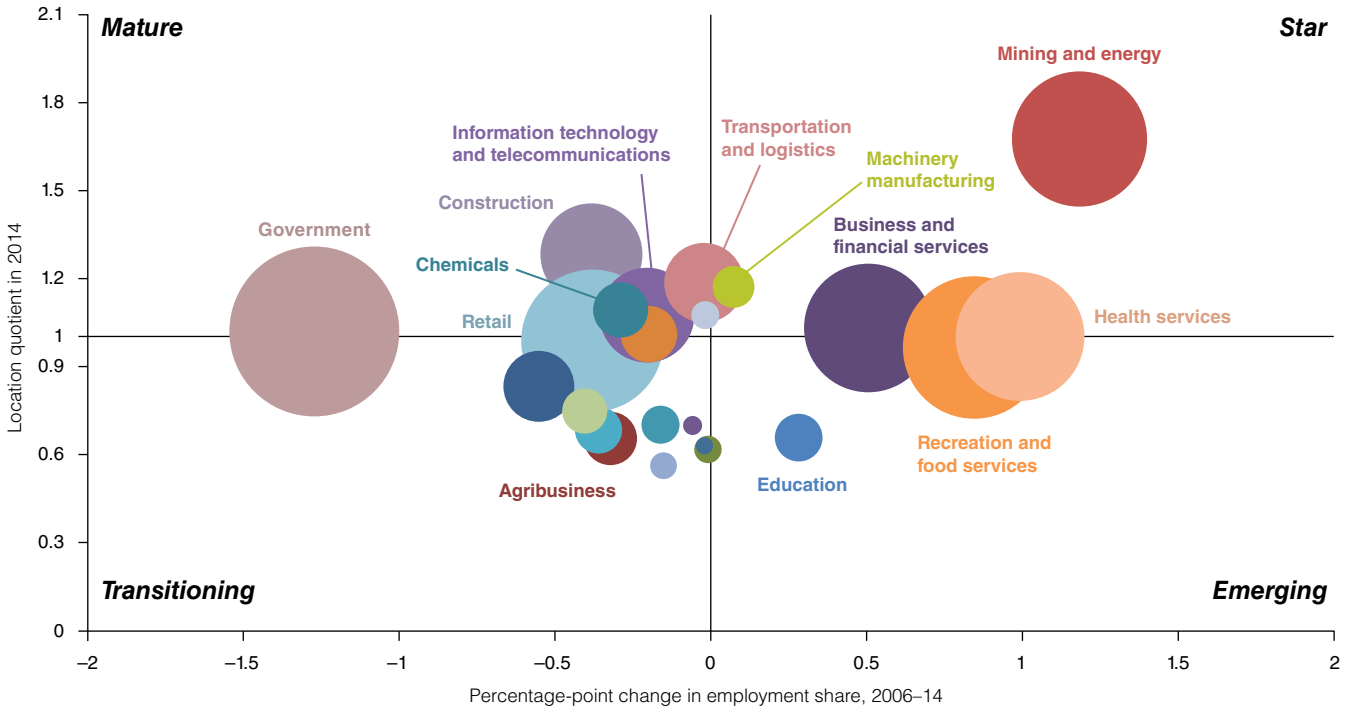
An LQ exceeding 1 indicates that a specific industry cluster is more dominant locally than nationally. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2006 and 2014.[5]

Chart O.1 plots industry cluster LQs and growth for Texas. Clusters in the top half of the chart, such as mining and energy, 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 rapidly (star) or growing slowly (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 education, are fast growing, while those growing slowly are termed "transitioning." Clusters comprise only private sector employment, with the exception of the government cluster, which includes public school teachers and staff.

Texas has several dominant clusters. An abundance of oil and gas has traditionally made mining and energy and related industries a major cluster—employing nearly 10 percent of the state's workforce. 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 37 percent of all U.S. crude oil and 28 percent of U.S. natural gas and employs nearly 14 percent of the workers in the nation's mining and energy cluster. The employment share of this cluster expanded from 2006 to 2014, with the head count up 30 percent—the second-fastest increase among the clusters covered in this report (*Chart O.2*). This remarkable expansion came as Texas oil production tripled from 2008 to 2014.

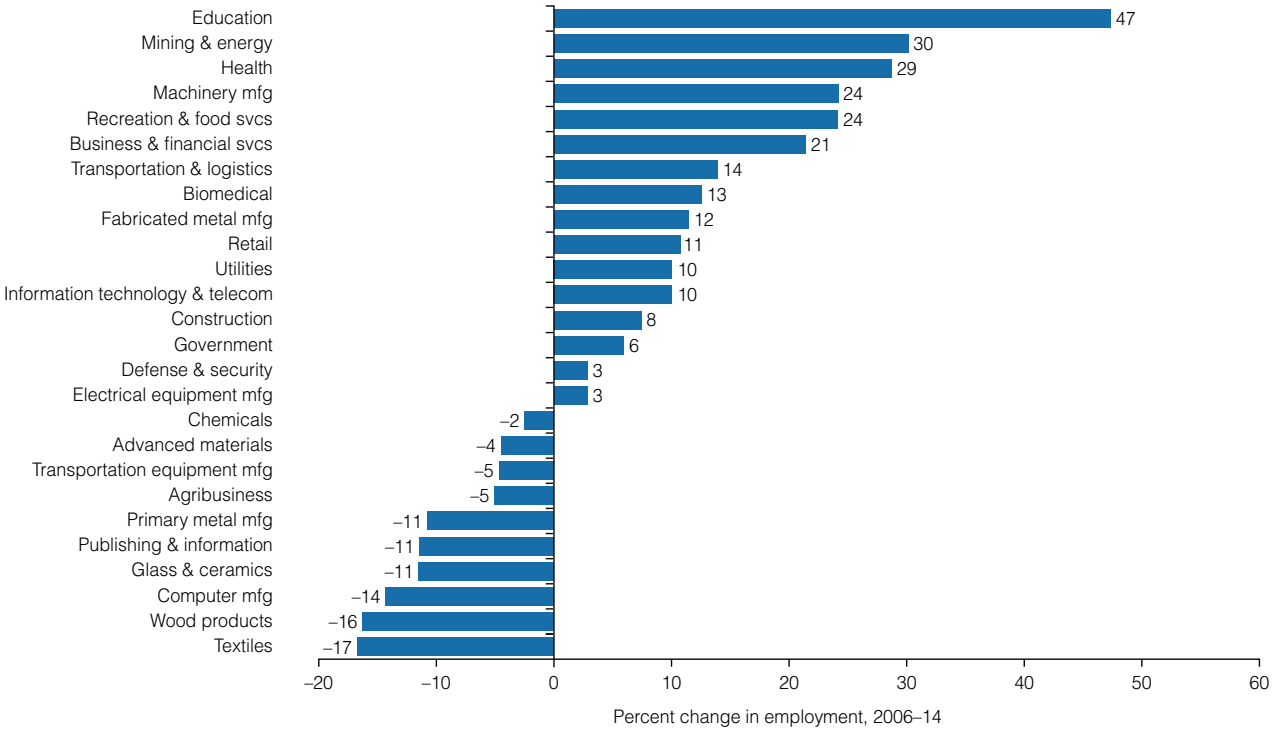
Tied to oil and gas exploration is machinery manufacturing, a cluster with 1.2 times the U.S. concentration.

Chart O.1: Energy and Information Technology 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; authors' calculations.

Chart O.2: Mining and Energy the Second-Fastest Growing Cluster in the State



SOURCES: Texas Workforce Commission; authors' calculations.

Employment in the cluster expanded 24 percent from 2006 to 2014. Employment in construction and fabricated metal manufacturing—both sectors with an LQ exceeding 1—grew over the same period. This growth was supported by a booming energy sector and overall strong economic performance that increased demand for office, industrial and residential space. The chemical industry also plays a meaningful role in Texas, not 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 2014). 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 high-tech boom, when the information technology and telecommunications industries took off in Austin and Dallas. Employment in the IT and telecom cluster grew about 10 percent in 2006–14 and now represents 5 percent of the state's workforce.

The energy and high-tech clusters dominate, but Texas' central U.S. location and its border with Mexico also boosted the concentration of the transportation and logistics industry (LQ of 1.2). The state is home to two large commercial airlines, a major railroad and two of the nation's busiest ports—Houston and Laredo. Government also has a slightly higher-than-average presence in the state, likely due to the number of major military bases in the state.

Several of Texas' dominant clusters, such as mining and energy and computer manufacturing, boast high pay (*Table O.1*). In fact, Texas' dominant clusters—those with an LQ exceeding 1—pay about 1.9 times more than the industries that are less concentrated in the state. Also, while real average earnings in clusters with an LQ below 1 dipped during 2006–14, real earnings in Texas' dominant clusters increased 6.7 percent.

In Texas and its metros, clusters with an LQ exceeding 1 generally pay more than ones that aren't as geographically concentrated. However, dominant clusters don't necessarily have faster inflation-adjusted earnings growth; performance depends on the underlying industries.

Texas Outperforms Nation; Slower Growth Ahead

Texas on average has grown faster than the nation, with job gains in the state averaging 1.9 percent per year from December 2005 to December 2014, compared with 0.4 percent for the nation. Similarly, Texas output expanded at 3.5 times the U.S. pace from 2006 to 2014.

Texas weathered the Great Recession better than the nation, and its economy rebounded strongly. The state surpassed its 2008 employment peak in 40 months (by December 2011)—a little over half the time it took the U.S. Texas ranked third among the states in job growth in 2012, eighth in 2013 and third again in 2014. The state's eight major metropolitan areas also experienced the expansion and contraction, albeit at different paces.

Employment declines during the Great Recession were steepest in Midland–Odessa, followed by Dallas and Fort Worth (*Chart O.3*). As the depth of decline varied, so did the pace of recovery. Despite major employment losses, Midland–Odessa achieved faster postrecession growth than all other metros in this report thanks to the shale oil boom. Meanwhile, the pace of recovery in Dallas was relatively slow because of its large construction and business and financial services sectors, which were hit hard during the recession. Though the rates of job loss in Austin, El Paso and San Antonio were comparable, Austin bounced back, paced by its large and fast-growing high-tech sector.

The state's rapid recovery from the recession reflected the shale oil and gas boom, but it was also due to the notable absence of a housing bust that weighed significantly on other large states such as California and Florida.

The downstream energy industry also came to play a very important role in the Texas recovery. Petroleum product exports such as gasoline and diesel ballooned, and the petrochemical producers became highly competitive internationally when the price of the natural gas used as an input declined as the price of the oil used by competitors abroad rose in the months after the economic downturn.

For a few years during the recovery, Texas was the only large state adding jobs. This growth, combined

Table O.1: Annual Earnings in Texas Exceed Nation in Most Dominant Clusters

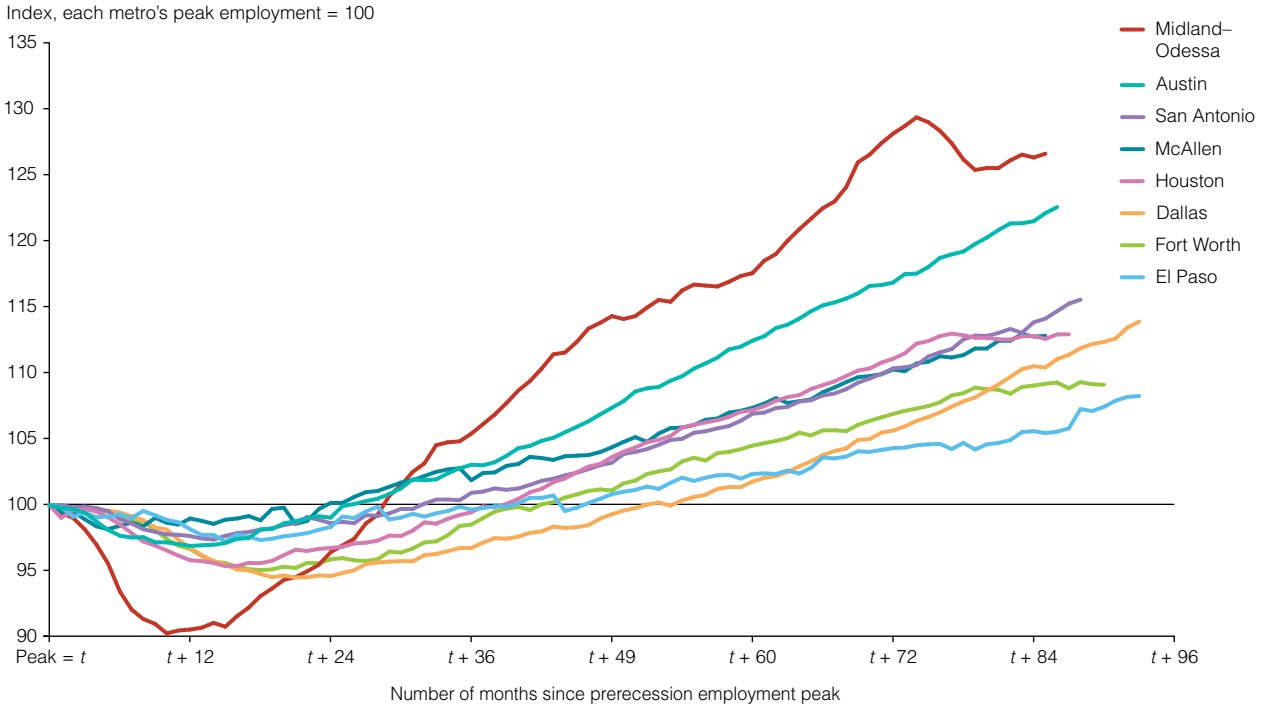
Cluster	Texas					U.S.
	2006	2008	2010	2012	2014	2014
Mining and energy	86,086	87,081	89,239	92,530	93,260	76,815
Construction	52,317	53,882	53,454	55,934	58,639	55,041
Transportation and logistics	55,401	54,937	57,548	60,067	59,956	51,043
Fabricated metal manufacturing	54,490	57,026	56,590	58,468	59,210	53,130
Machinery manufacturing	73,401	74,418	78,646	82,375	84,134	66,715
Glass and ceramics	51,256	53,116	49,738	52,086	55,759	51,073
Computer manufacturing	115,743	101,443	107,555	110,404	110,490	105,968
Chemicals	74,466	75,289	77,843	80,802	82,901	69,856
Information technology and telecommunications	91,046	87,933	90,288	92,034	92,434	96,631
Utilities	96,333	97,463	97,617	101,886	100,414	98,149
Business and financial services	81,973	82,511	83,207	84,674	87,090	92,957
Government	45,149	46,303	47,693	46,834	47,835	51,726
Defense and security	61,874	58,117	60,119	59,420	59,989	59,588
Health services	49,325	49,406	50,454	49,777	50,341	56,055
Clusters with location quotient >1	64,367	64,802	65,391	67,186	68,700	–
Clusters with location quotient <1	38,281	37,011	37,111	37,133	37,085	–
Average earnings (total)	49,827	50,526	50,975	52,152	53,220	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings data are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

with traditional Texas advantages such as a low cost of living and of doing business, prompted record numbers of people and firms to relocate from other states.[6]

With the plunge in oil prices, the economic landscape in the region changed, and employment growth in 2015 through November slowed to 1.3 percent from 3.6 percent in 2014. Given that energy-related industries are dominant in the state and oil prices have fallen further, employment growth will continue below trend in 2016.

Chart 0.3: Texas Metros' Recovery Reflects Underlying Strengths



SOURCES: Texas Workforce Commission; Federal Reserve Bank of Dallas.

Notes

[1] "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.

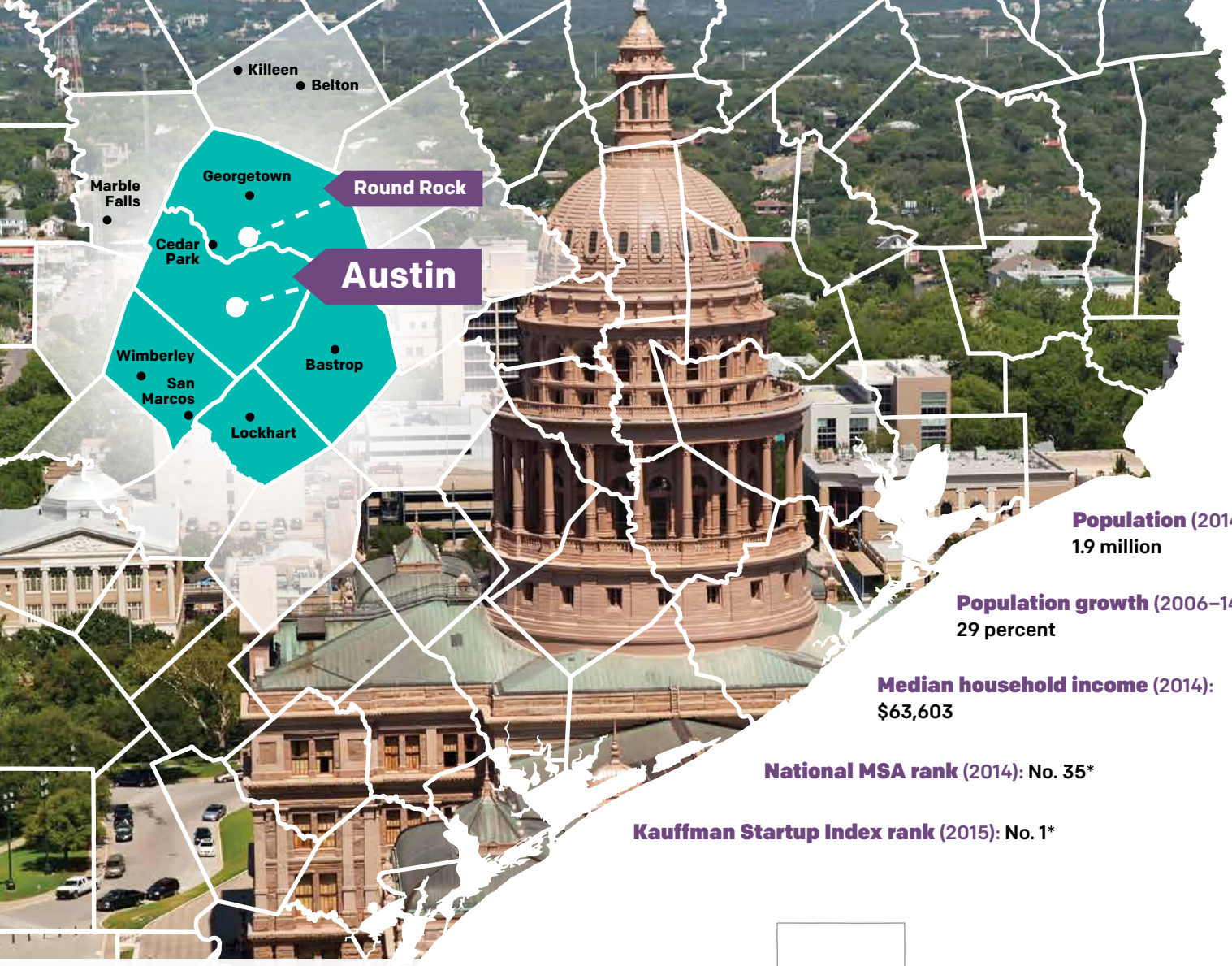
[2] *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier*, by Edward Glaeser, New York: Penguin Press, 2011.

[3] Texas job growth averaged 2.1 percent per year compared with 1.1 percent for the nation during 1990–2014. State gross domestic product growth averaged 4.9 percent per year compared with 1.7 percent for the U.S. during 2010–14.

[4] 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.

[5] Individual industry cluster shares add up to more than 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.

[6] See "Gone to Texas, Immigration and the Transformation of the Texas Economy," by Pia M. Orrenius, Madeline Zavodny and Melissa LoPalo, Federal Reserve Bank of Dallas Special Report, November 2013.



Population (2014): 1.9 million

Population growth (2006–14): 29 percent

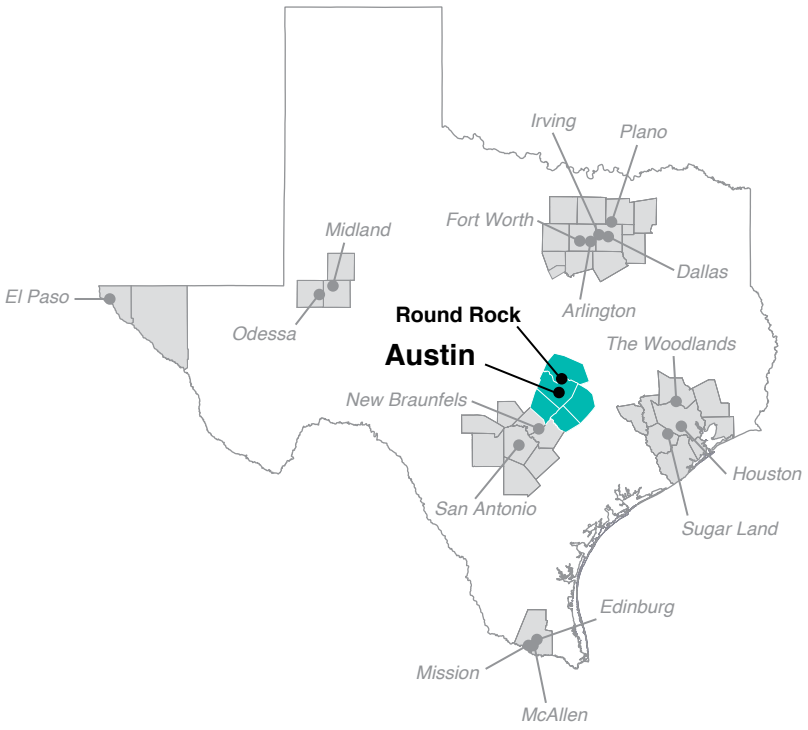
Median household income (2014): $63,603

National MSA rank (2014): No. 35*

Kauffman Startup Index rank (2015): No. 1*

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 appears little affected by the slowdown in the state economy attributable to low oil prices, and the area will likely experience continued solid 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.

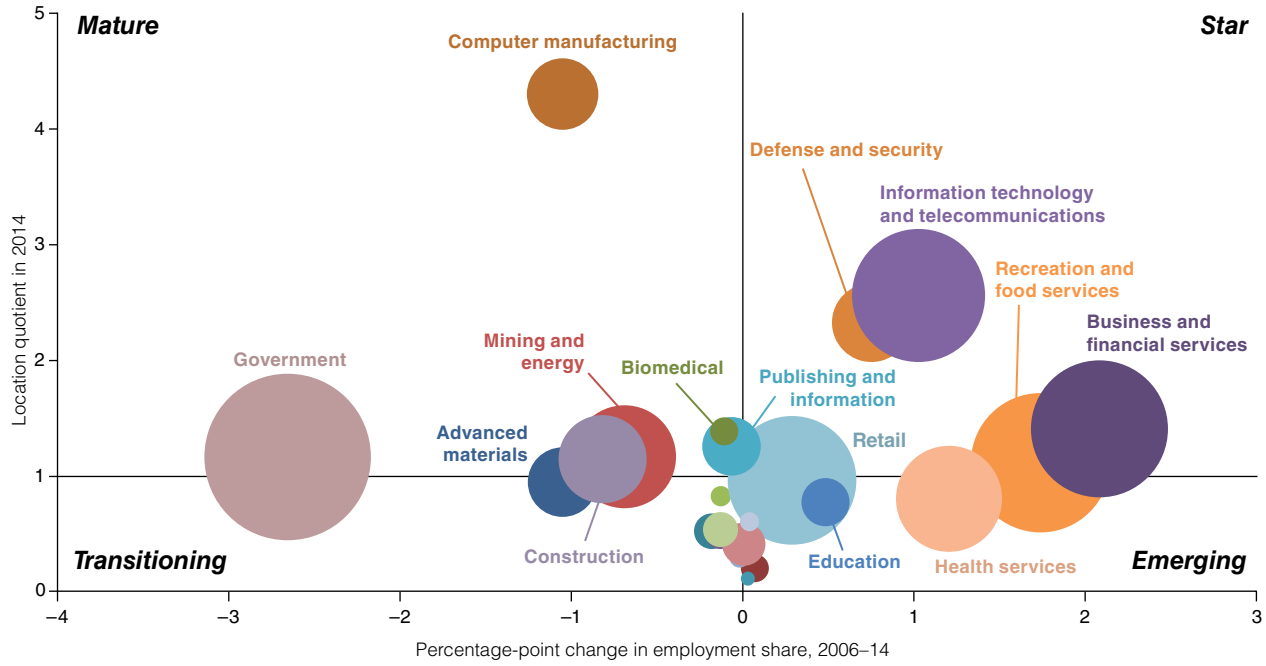
Expansion of Austin's key education and government sectors supported the region in the 1950s and 1960s. Buoyed by chamber of commerce efforts to expand the economic base and by a flourishing research program at UT, major technology firms such as IBM, Texas Instruments and Motorola began locating in the area in the late 1960s and early 1970s. Austin gradually emerged as a high-tech center. Among the 180 major employers in the Greater Austin area in 2014, about 70 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 employment share between 2006 and 2014.[3]

Chart 1.1 displays the composition of industry clusters in Austin–Round Rock. The top two quadrants—"mature" and "star"—display industry clusters

Chart 1.1: 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.

with a larger share of employment relative to the nation (LQs exceeding 1). These clusters are vital to the metro-area economy and can be expanding rapidly (star) or growing slowly (mature). Clusters shown in the bottom two quadrants—such as retail and health—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, which includes UT, and the technology industry. Computer manufacturing boasts four times the concentration in Austin than in the U.S. due to the significant presence of manufacturers of personal computers and related parts such as Dell, Apple, Advanced Micro Devices and Applied Materials.

Dell, with 13,000 local workers, and IBM, 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 Electronics, Intel and Hewlett-Packard—make the concentration of Austin's information technology and telecommunications cluster 2.6 times that of the nation.[5]

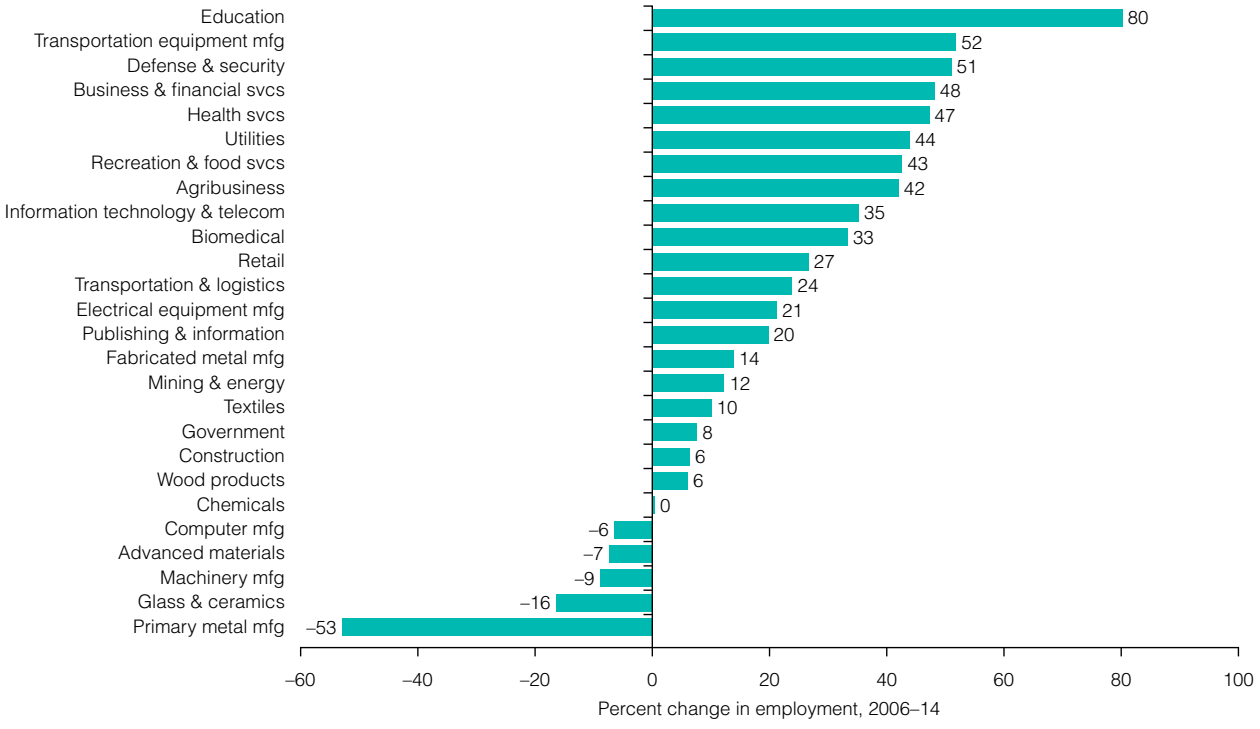
As the state capital and home to the flagship UT campus—a highly regarded research institution—Austin's government sector is large. Both state government and the university are top area employers.

Other concentrated clusters include publishing and information, defense and security, mining and energy, biomedical, and business and financial services. Growth in the private education sector has been the fastest among the clusters, expanding by nearly 80 percent from 2006 to 2014 and complementing UT's presence (*Chart 1.2*). The defense and security and business and financial services clusters take the third and fourth spots among rapidly growing clusters.

Recreation and food services, which round out Austin's base clusters—those with LQs greater than 1—are important to the local economy. An Austin slogan, "Live Music Capital of the World," is a nod to the numerous live music venues.

The health cluster, which employs over 7 percent of Austin's workforce, has also grown significantly in recent years. The second- and third-largest private employers in the city are the Seton Healthcare Family, with 10,900 employees, and St. David's HealthCare, with 8,300 employees.

Chart 1.2: Austin Job Gains Led by Education, Transportation Equipment, Defense and Security, and Business and Financial Services



SOURCES: Texas Workforce Commission; authors' calculations.

Table 1.1: Annual Earnings in Austin Higher than U.S. Average in Several Dominant Clusters

Cluster	Austin					U.S.
	2006	2008	2010	2012	2014	2014
Computer manufacturing	131,343	119,873	130,238	130,009	122,831	105,968
Information technology and telecommunications	107,654	104,378	106,652	106,401	99,768	96,631
Defense and security	85,028	80,165	83,691	85,690	88,538	59,588
Business and financial services	82,730	81,244	87,090	87,779	87,734	92,957
Biomedical	85,520	78,293	77,114	83,974	91,505	91,463
Publishing and information	74,872	76,407	78,568	76,988	80,812	82,107
Government	48,257	48,793	50,534	48,584	51,557	51,726
Mining and energy	87,932	76,810	85,291	87,201	84,773	76,815
Construction	52,963	52,188	50,271	50,652	53,790	55,041
Recreation and food services	21,711	21,591	21,391	21,980	22,430	23,870
Clusters with location quotient >1	69,812	66,530	67,740	68,543	69,158	–
Clusters with location quotient <1	53,350	49,513	49,699	50,452	50,676	–
Average earnings (total)	53,710	52,334	53,132	53,603	54,104	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings data are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Though the concentration of health industry workers remains below that of the U.S. (the LQ is 0.82), cluster employment has increased 47 percent since 2006.

Austin's star and mature clusters pay considerably higher wages than their less-concentrated counterparts (*Table 1.1*). Computer manufacturing, information technology and telecommunications, and business and financial services boast some of the region's best-paying jobs. In fact, the average wage for computer manufacturing was around $122,800 in 2014, more than double the Austin average of $54,100. Overall, Austin residents employed in the base clusters earn a third more on average than those employed in less-concentrated clusters, $69,158 versus $50,676.

Moreover, wages in Austin's top three most-concentrated clusters—computer manufacturing (LQ of 4.3), information technology and telecommunications (LQ of 2.6) and defense and security (LQ of 2.3)—were significantly higher than the national average for those clusters in 2014.

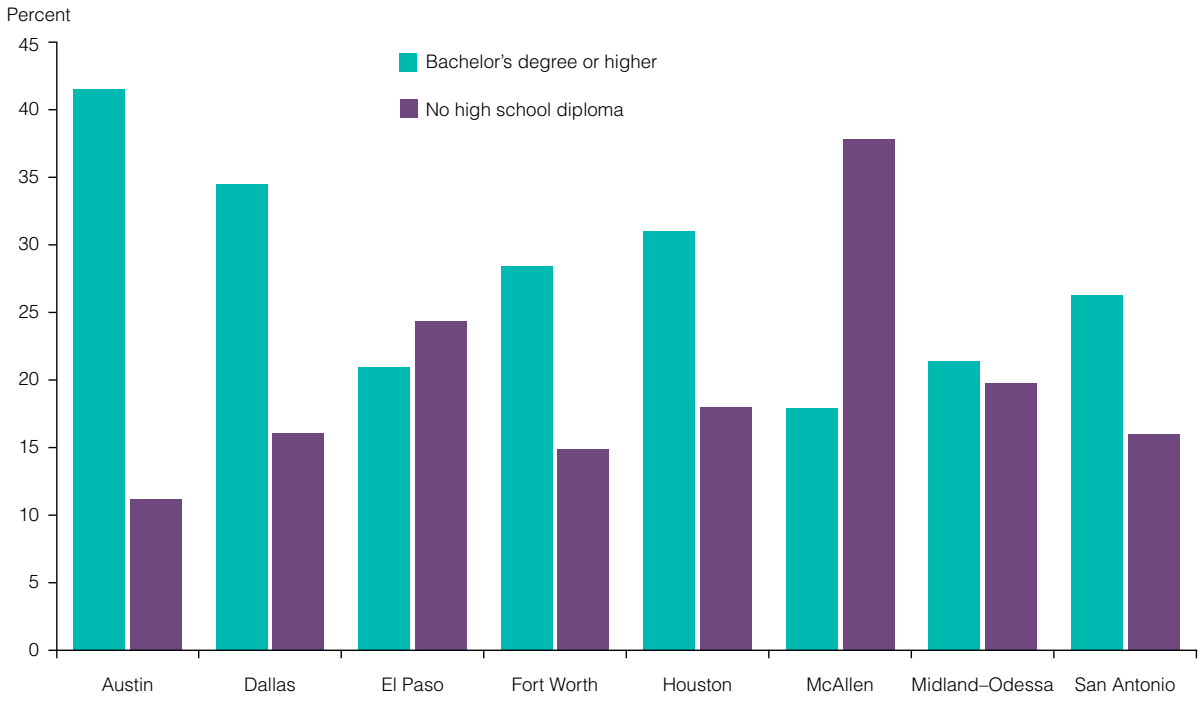
DEMOGRAPHICS: Young, Highly Skilled Talent Pool

The Austin metro area's strength is its young and well-educated workforce—its median age is nearly four years lower than the U.S. median and it ranks No. 1 in college education among the major Texas metros (*Chart 1.3*).

Austin is 15th among the 150 biggest U.S. metros, and it has one of the most educated talent pools in the country, according to a study by WalletHub.[6] Over 41 percent of adults (25 years or older) in the metro area have at least an undergraduate degree, compared with 27.8 percent in Texas and 30.1 percent nationally in 2014. This is one reason the metro area has attracted many high-tech companies and boasts a median household income of $63,603, superior to that of the state and nation.

Austin's population is predominantly non-Hispanic white at 53.2 percent; Hispanics make up 32 percent of the area's inhabitants, less than their share in Texas. Foreign-born residents constitute 14.9 percent of the metro population, lower than their share in Texas but higher than the national average.

Chart 1.3: Austin Has the Most Highly Educated Population Among Texas Metros



NOTES: Chart shows share of population age 25 and over. Data are for 2014.
SOURCE: 2014 American Community Survey.

EMPLOYMENT: Strong Rebound; Unrelenting Growth

Employment declines in Austin during the Great Recession were steep at 3.1 percent (24,100 jobs). However, the area was the first major metro to bounce back, regaining all lost jobs in 26 months. In November 2015, total nonfarm employment was 22 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 November 2015, employment in professional, scientific and technical services increased 63 percent, and payrolls in information services grew 40 percent.[7]

Even as Texas job gains slid with lower oil prices, Austin job growth remained vigorous. During the first 11 months of 2015, Austin augmented its payrolls at an annualized 4.2 percent rate. Unemployment in Austin was nearly a full percentage point below the Texas rate in 2015; it dropped 0.3 percentage points from December 2014 to November 2015. Austin is also a hotbed of entrepreneurial activity, taking the top spot among U.S. metro areas, according to the Kauffman Startup Activity Index.[8]

OUTLOOK: No Slowing in Sight

Austin's economy is heavily dependent on the technology industry, with over 16 percent of its 2014 gross domestic product generated from the information services and professional and technical services sectors combined. Global semiconductor sales, which are considered a barometer for the technology sector, are expected to grow into 2016 and 2017, according to World Semiconductor Trade Statistics.[9] This bodes well for the Greater Austin economy.

Still, some of the area's technology jobs are vulnerable because they 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. In 2015, employment in computer and electronic product manufacturing was flat as oil prices remained at low levels.

UT's presence provides stability and growth to the education, biomedical and health sectors. Also, the area's vibrant and educated workforce will likely continue to attract employers, providing new growth opportunities.

In 2015, several large companies either expanded or began operations in the metro area, including Amazon, General Motors Co., Accenture and Google Inc.[10] Additionally, venture capital investment in the biotechnology sector increased from $25 million in 2011 to $101 million in the first half of 2015, according to the MoneyTree Report, pointing to expansion in the sector.[11]

Both the commercial real estate and housing markets in the metro area are healthy, although some analysts suggest that the luxury apartment market may be overbuilt and will likely experience weakness in coming months.

Austin–Round Rock Growth Outlook

Drivers	Challenges
• A positive growth forecast for global semiconductor demand will drive employment gains in Austin's large technology sector. • The presence of the state government and the University of Texas should provide stability to the area's economy. • Austin's vibrant and educated workforce will further attract employers, fueling new growth. • Increasing venture capital investment in biotechnology will boost growth in the biomedical cluster.	• The impact of low oil prices will adversely affect firms tied to the manufacturing of high-tech instruments and equipment used in hydraulic fracturing. • The area's low unemployment rate will restrain job growth. • Rising rents and home prices will make living in Austin unaffordable for many entry-level employees, including innovators and hospitality workers, who are part of Austin's base clusters.

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.

[3] Individual industry cluster shares add up to more than 100 because some smaller industries (at the three-digit-or-higher NAICS level) are included in multiple clusters, while some industries are not part of any cluster shown. For instance, semiconductor and other electronic component manufacturing (NAICS 3344) is included in both the advanced materials and information technology and telecommunications clusters. (See the Appendix for more information.)

[4] See footnote 2.

[5] The Information technology and telecommunications cluster includes firms categorized in NAICS 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 nine metrics, including the percentage of adult residents with a high school diploma, associate's degree, bachelor's degree, and graduate or professional degree or above; quality of public schools and universities; and the share of students enrolled in the top 200 universities in the U.S. See https://wallethub.com/edu/most-and-least-educated-cities/6656.

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

[8] Data are from the 2015 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.

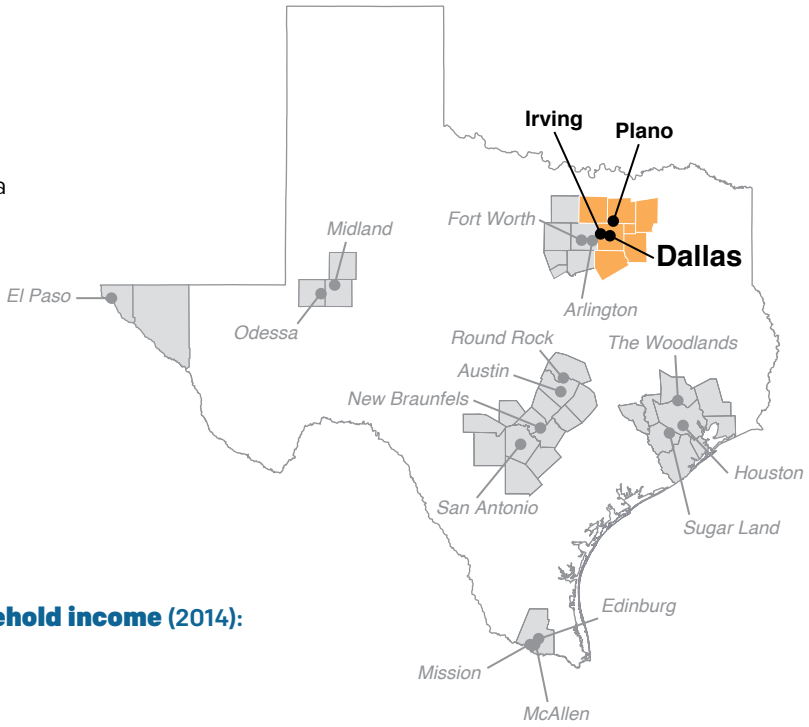
[9] World Semiconductor Trade Statistics' December 2015 release projects that the worldwide semiconductor market will grow 1.4 percent to $341 billion in 2016 and increase 3.1 percent to $352 billion in 2017. See wsts.org/PRESS/Recent-News-Release.

[10] Detail about Austin-area relocations and expansions is from the Austin Chamber of Commerce, www.austinchamber.com/site-selection/business-climate/relocations-expansions-log.php.

[11] Data are from the MoneyTree Report by PricewaterhouseCoopers and the National Venture Capital Association, based on data from Thomson Reuters. See www.siliconhillsnews.com/2015/07/17/austin-dips-in-vc-investments-for-second-quarter-but-still-strong-for-2015.

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 rapid growth over the next two years.



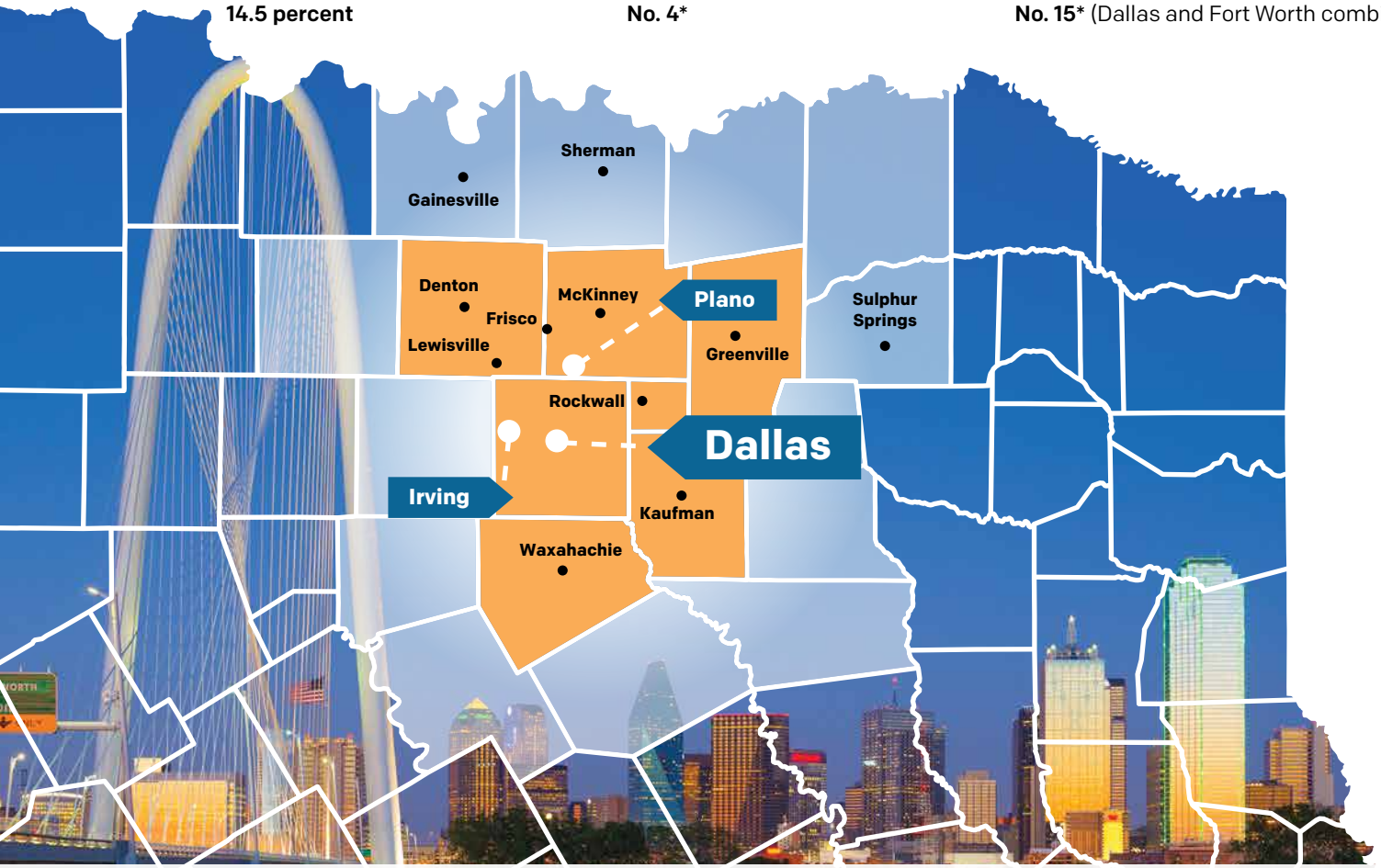
Population (2014):
4.6 million*

Median household income (2014):
$60,231

Population growth (2006–14):
14.5 percent

National MSA rank (2014):
No. 4*

Kauffman Startup Index rank (2015):
No. 15* (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 6.95 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.

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.

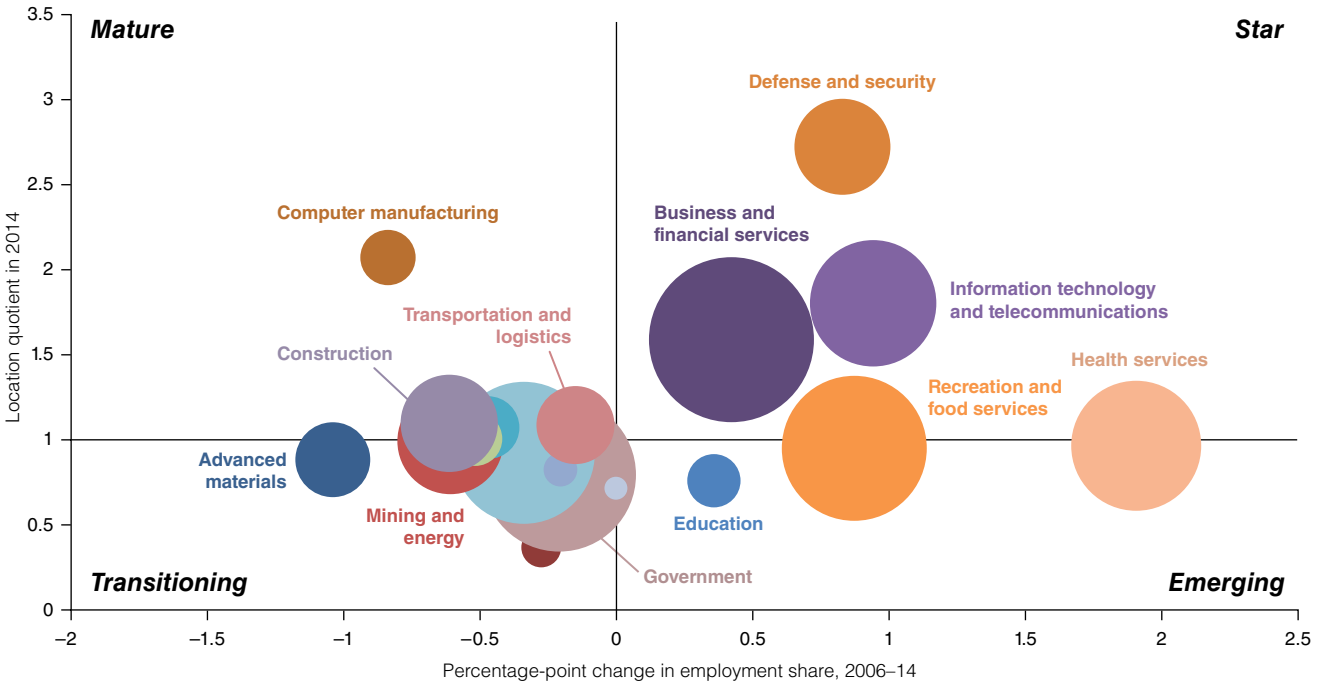
The growth of companies such as Texas Instruments Inc. helped make Dallas the nation's third-largest technology center during the 1950s and '60s. The opening of Dallas/Fort Worth International Airport in 1974 helped attract corporate headquarters to Dallas, further increasing the area's prominence as the state's business and financial center.[1]

INDUSTRY CLUSTERS: Business and Finance Looms Large

Industry cluster concentration is measured by location quotient (LQ), which compares the metro-area economy with the national economy (*Chart 2.1*). Growth within an industry cluster is measured by the percentage-point change in its share of local employment between 2006 and 2014.[2]

Clusters in the top half of Chart 2.1, 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 rapidly ("star") or growing slowly ("mature"). Those in

Chart 2.1: Business and Finance, and IT and Telecom Dominate Dallas



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

the bottom half, such as advanced materials (semiconductors and fiber optics) and education, are less-dominant locally than nationally and, hence, have an LQ below 1. "Emerging" clusters are fast growing, while those expanding slowly are "transitioning."

Not surprisingly, Dallas' most important star clusters are business and financial services, information technology and telecommunications, and defense and security. Business and financial services is the largest cluster, employing around 14 percent of the workforce in 2014. Many of Dallas' largest employers are banks, such as JPMorgan Chase, Bank of America, Comerica and Citigroup, and insurance companies, such as Health Care Service Corp.'s Blue Cross and Blue Shield of Texas unit.

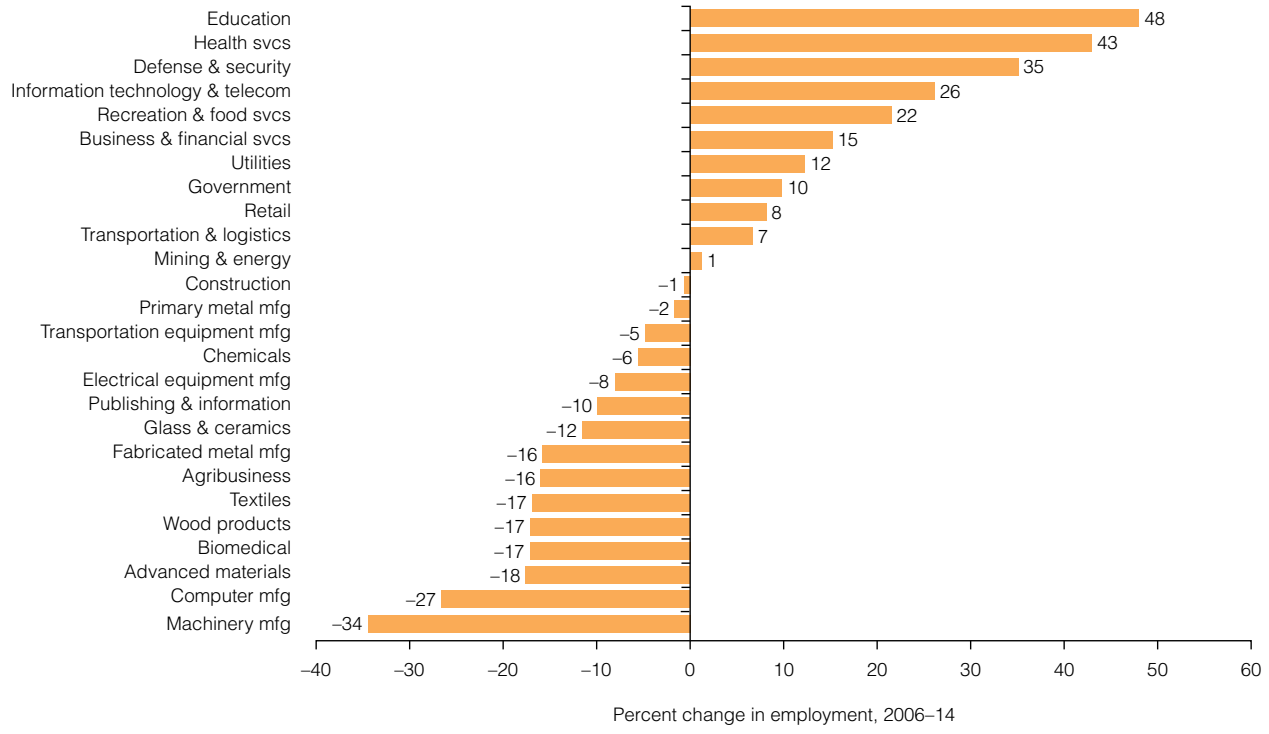
The business and financial services cluster has grown rapidly since 2006, increasing its employment share 0.4 percentage points between 2006 and 2014. Liberty Mutual Insurance and State Farm Insurance are consolidating operations in the Dallas area and bringing thousands of jobs, making insurance one of the metro's fastest-growing industries. The relocations will contribute to growth in the already large business and financial services cluster.

The Dallas area is also home to major technology companies, including Texas Instruments and AT&T. The IT and telecommunications cluster employed about 8 percent of the metro's workforce in 2014 and was among the fastest-growing clusters from 2006 to 2014 (*Chart 2.2*). 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 it has recovered in recent years, adding the operations of numerous companies in technology and other fields.

Defense and security, employing about 5 percent of the workforce, and health care, accounting for nearly 9 percent, have emerged as fast-growing clusters since the Great Recession. Mining and energy's significance declined between 2006 and 2014 as many energy companies moved business operations to Houston. Drilling for natural gas in North Texas' Barnett Shale has slowed because of low gas prices.[3]

Dallas' neighbor, the Fort Worth–Arlington metropolitan division, also has large defense and energy clusters. Fort Worth–Arlington serves as a logistics and distribution hub for the North Texas region. Dallas and

Chart 2.2: Dallas Sees Rapid Job Gains in Its Dominant Clusters and in Education, Health



SOURCES: Texas Workforce Commission; authors' calculations.

Table 2.1: Annual Earnings in Dallas Exceed National Average in Dominant Clusters

Cluster	Dallas					U.S.
	2006	2008	2010	2012	2014	2014
Defense and security	79,821	77,819	79,551	79,018	82,667	59,588
Computer manufacturing	103,414	99,947	107,391	116,169	125,052	105,968
Information technology and telecommunications	97,211	97,227	99,438	101,597	106,007	96,631
Business and financial services	91,458	90,674	89,072	90,211	93,752	92,957
Glass and ceramics	55,564	58,331	54,280	55,604	61,862	51,073
Construction	56,368	54,957	55,338	56,440	58,215	55,041
Transportation and logistics	52,714	51,104	51,724	48,001	51,571	51,043
Publishing and information	74,941	74,756	77,071	80,509	82,535	82,107
Wood products	50,646	49,699	50,378	51,624	52,549	48,793
Clusters with location quotient >1	80,853	79,836	81,722	83,439	86,252	–
Clusters with location quotient <1	52,814	51,693	52,041	52,024	51,889	–
Average earnings (total)	58,315	57,947	57,813	58,489	59,013	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Fort Worth together are home to 21 Fortune 500 companies on the 2015 list.

Dallas' star and mature clusters are relatively high paying and boast an annual average wage ($86,252) that is 46 percent higher than the annual average wage in Dallas ($59,013) (*Table 2.1*). While overall real (inflation-adjusted) wages have grown little since 2006, wages in the star and mature clusters have grown an average of 6.7 percent; wages in other, less-prominent industry clusters have declined 1.8 percent.

DEMOGRAPHICS: A Destination for New Arrivals

The Dallas–Fort Worth metroplex (Greater Dallas and Fort Worth components) has become a favored domestic destination, although it has attracted many residents from other countries as well. New arrivals from other parts of the U.S. accounted for 38 percent of DFW's population increase in 2014 (*Chart 2.3*). The metroplex held one of the top two spots among U.S. metro areas for population gains through total net migration from 2011 to 2014. Overall, it is the fourth-largest metropolitan statistical area in the U.S., with 6.95 million people.[4]

Despite record migration, Dallas' unemployment rate has remained low, averaging 3.9 percent in the first 11 months of 2015. Per capita income and median household income are higher than national and Texas figures. (Dallas' median household income increased 15.7 percent between 2006 and 2014 in nominal terms.)

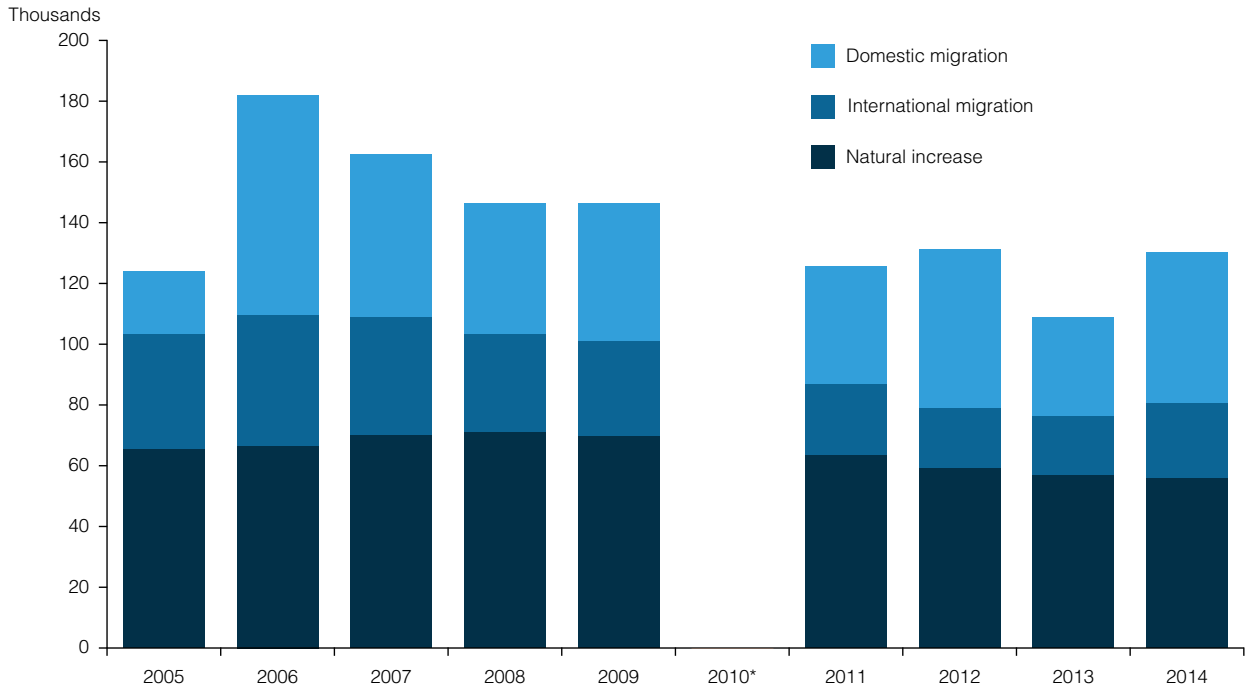
Dallas' population is predominantly non-Hispanic white, 45.2 percent; Hispanics also make up a significant share of the area's inhabitants, 29.5 percent. Foreign-born residents constitute 19.9 percent of the metro population, higher than their shares in Austin and San Antonio. Also, Dallas has a relatively young population, with about 36 percent of the total under age 25, and 43.5 percent between 25 and 54.

Dallas ranks second in educational attainment among the Texas metros in this report, with over one-third of its residents holding a bachelor's degree or higher. This is likely because the defense and security, business and financial services, and information technology sectors make up a large share of the workforce and require an elevated educational skill set.

EMPLOYMENT: Solid After Slow Start to Recovery

The Dallas economy was the hardest hit among the large Texas metros during the Great Recession.[5] The area not only registered the largest drop in employment (5.4 percent), it also was the slowest to recover: Dallas

Chart 2.3: Domestic Migration to Dallas–Fort Worth Accelerates After 2005



*Estimate not available for decennial census year.
NOTE: Components of annual population change are shown.
SOURCE: Census Bureau.

required more than four years to regain all its lost jobs. A major reason is that the national recovery was slow—and the industrial profile of Dallas is a closer match to the U.S. than the profiles of most other large Texas metros (*Table 2.2*). In Dallas, the shares of only five industry clusters significantly differ (by more than 1 percentage point) from the U.S. share.

Accordingly, U.S. job growth in 2014 coincided with gains in Dallas. The metro area added 100,200 jobs—a 4.5 percent growth rate, the fastest among the large Texas metros. Moreover, Dallas and Fort Worth combined recorded the fastest annual increase in employment among the largest metropolitan areas in the country.[6]

Dallas job growth moderated to a 4.1 percent annual rate in the first 11 months of 2015 as the Texas economy slowed, in part due to low oil prices. Still, Dallas employment gains are far outpacing the state's 1.3 percent annual rate, and the unemployment rate dropped in 2015 to near a 14-year low, suggesting a tight labor market.

OUTLOOK: Faster Job Growth than in the State

Although the Dallas area is not immune to the impact of low oil prices, it will likely achieve net job gains in 2016 and outperform the state average. One factor is that only 6 percent of the metro area's workers are employed in the mining and energy cluster. Additionally, the U.S. economy is doing well, and thousands of jobs are coming to the Dallas area as companies such as State Farm, Toyota and Liberty Mutual consolidate operations. Despite a few challenges, the area will continue to realize good growth in the medium term.

Table 2.2: Dallas' Industrial Makeup Closely Matches Nation's

Deviation from U.S. cluster employment share				
	Dallas	**Austin**	**Houston**	**San Antonio**
Number of clusters with more than a 1 percentage-point difference from U.S. share	5	11	6	4
Average percentage-point deviation (in absolute terms, across all clusters) from U.S. share	0.89	1.26	1.10	0.65

NOTES: Data are for 2014. The table compares shares of each metro area's industry clusters with the comparable U.S. share. The percentage-point deviation is the absolute difference between the metro area's share and the U.S. share for each industry cluster.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Dallas–Plano–Irving Growth Outlook

Drivers

- A diversified economy (less dependent on the energy sector) and planned corporate relocations and expansions will help boost job growth and buoy current high levels of office and industrial development.
- A relatively well-educated populace and low unemployment may attract businesses to the area.
- Newcomers to the area will further drive demand for both single-family and multifamily housing.

Challenges

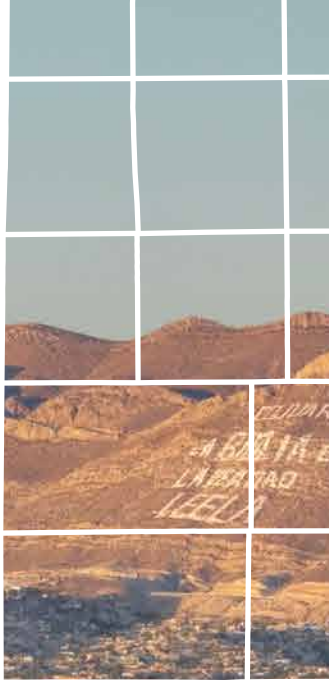
- A slowing Texas economy will suppress job growth relative to 2014.
- A tight housing supply combined with rapid population growth and continued job gains will further push up home prices, eroding the area's low-cost-of-living advantage.
- Rapid population growth will increase strain on existing infrastructure and public resources.

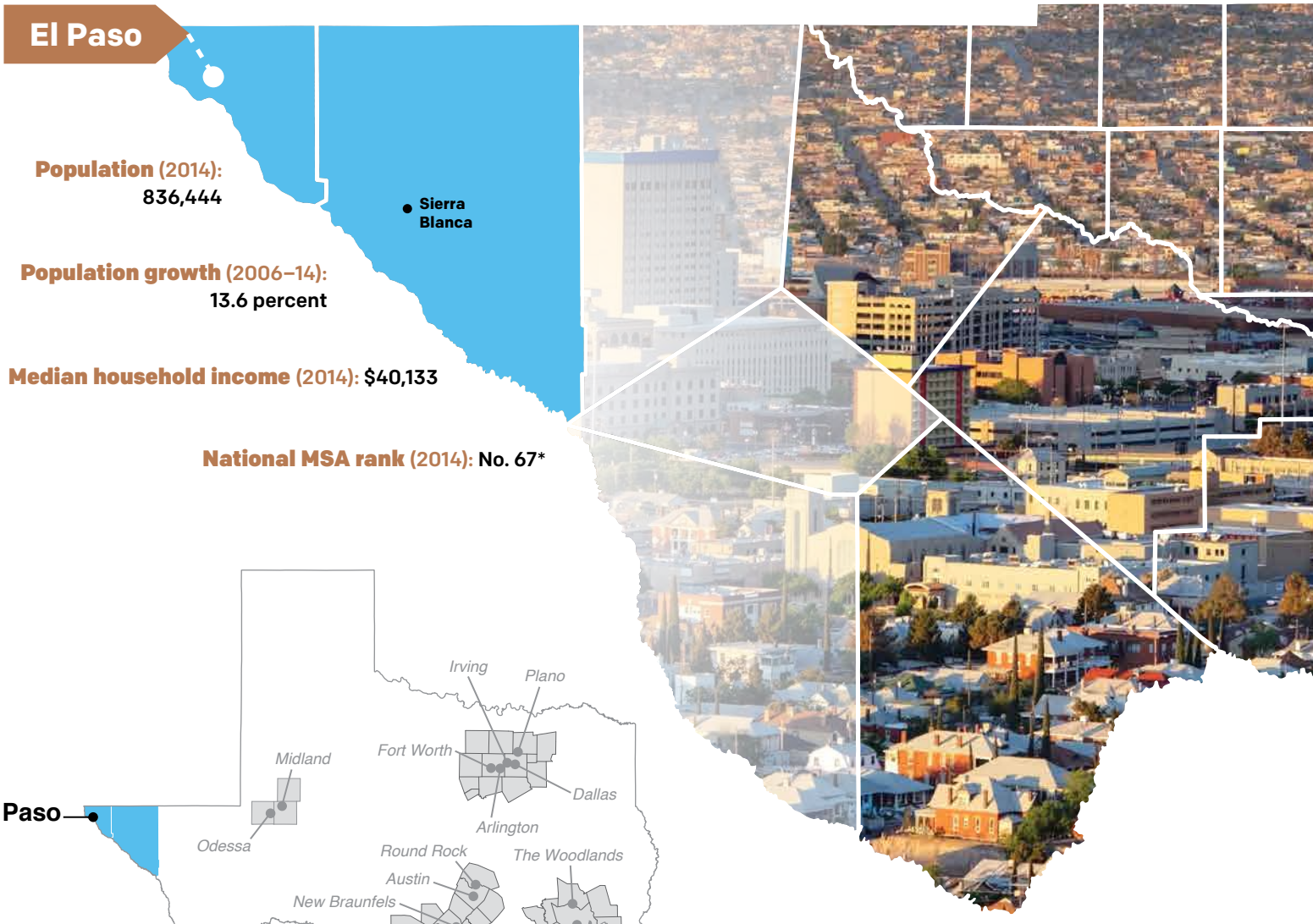
Notes

[1] The history of Dallas is taken from the Texas State Historical Association's *Handbook of Texas*, tshaonline.org/handbook/online/articles/hdd01.
[2] Individual industry cluster shares add up to more than 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. (See the Appendix for more information.)
[3] The mining and energy cluster grew minimally, 1.2 percent, between 2006 and 2014.
[4] 2014 population estimates are from the Census Bureau.
[5] Large Texas metros are Austin, Dallas, Fort Worth, Houston and San Antonio.
[6] See "Dallas Has Largest Percentage Increase in Employment Among Large Metropolitan Areas, December 2014," *The Economics Daily*, Bureau of Labor Statistics (BLS), Feb. 5, 2015, www.bls.gov/opub/ted/2015/dallas-has-largest-percentage-increase-in-employment-among-large-metropolitan-areas-december-2014.htm. The BLS compared 38 large metro areas with employment above 750,000 in 2013.

At a Glance

- The government sector is the largest cluster in El Paso owing to Fort Bliss, but retail, recreation and food services, and transportation and logistics are also important, reflecting the border with Mexico and the region's relationship with Ciudad Juárez across the Rio Grande.
- El Paso wasn't as negatively affected by the Great Recession as Texas overall. El Paso employment growth was slow following the recession, but the metro area outperformed the rest of the state in 2015.
- Federal government workers and the military are dependent on government spending, posing downside risk. However, strong U.S. auto sales spur maquiladora manufacturing growth, aiding trade in El Paso. The strong U.S. dollar will continue to suppress retail sales in the near future.





Population (2014): 836,444

Population growth (2006–14): 13.6 percent

Median household income (2014): $40,133

National MSA rank (2014): No. 67*

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

El Paso:
Gateway to Mexico Relies on Government, Commerce

HISTORY: From Agriculture to Trade Hub

In the days before the Rio Grande marked the border between the United States and Mexico in 1848, 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.

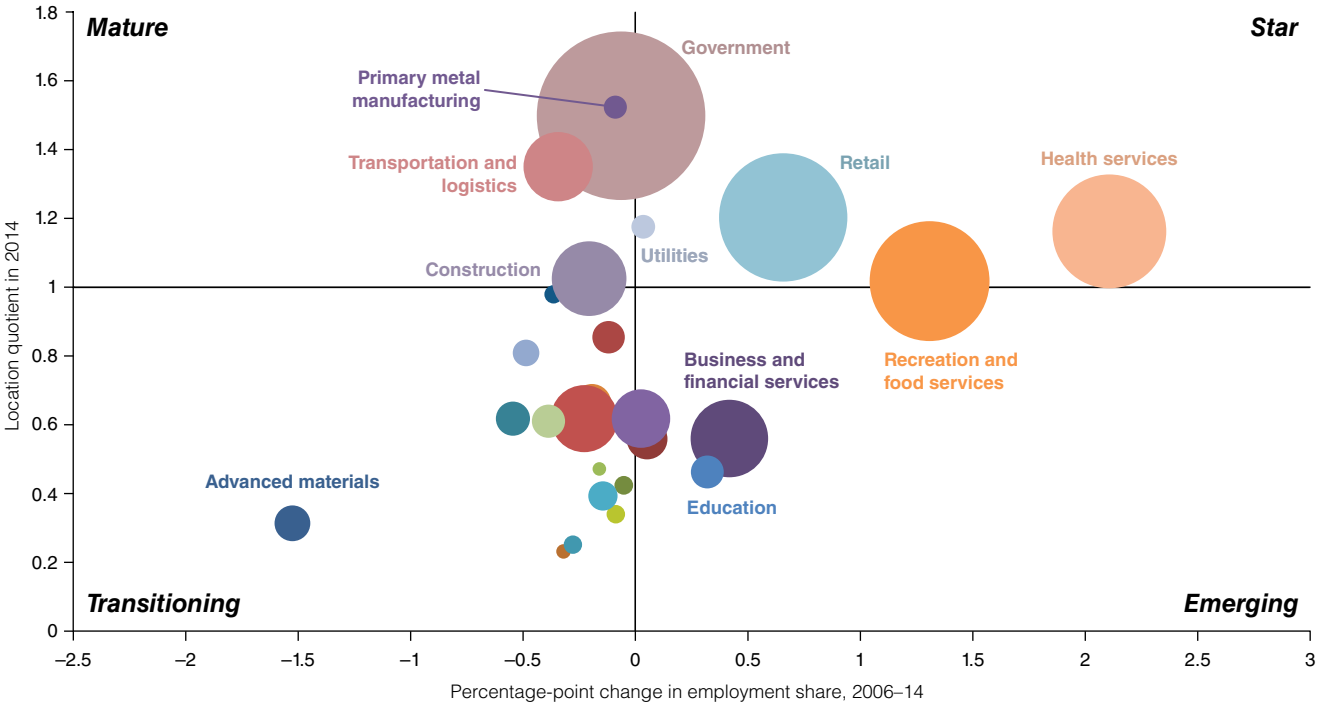
Fort Bliss has been the largest employer in El Paso for over a century. Underscoring the region's commercial standing, El Paso is the second-largest port of entry between the U.S. and Mexico. Retail, consumer services and tourism have also remained important sectors of the local economy.

INDUSTRY CLUSTERS: Prime Site for Government, Retail

Clusters in Chart 3.1 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 2006 and 2014.[2]

"Star" quadrant clusters, such as health services and retail, have a large share of employment relative to the nation (an LQ exceeding 1) and are fast growing; "emerging" industries, like business and financial services, are smaller relative to the nation (an LQ below 1) and fast growing. Industries in the "mature" quadrant, such as transportation and logistics, are more concentrated but slower growing, and "transitioning" industries, such as

Chart 3.1: El Paso's Economy Dependent on Government, Retail and Health Sectors



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

advanced materials, are smaller relative to the nation and slower growing.

Government is the largest sector, accounting for 23 percent of workers. Fort Bliss employed 40,000 people in late 2014 and indirectly supported the jobs of about 18,000 more in 2013, according to a University of Texas at El Paso study.[3] Public school districts and the Department of Homeland Security's Bureau of Customs are also among the top employers.[4]

Retail and recreation and food services continue as star clusters of the El Paso economy, driven by a strong relationship with neighboring Ciudad Juárez and a thriving tourism industry. Mexican shoppers account for approximately 10 to 15 percent of El Paso's retail sales.[5]

The health services cluster has grown significantly since 2006, accounting for more than 10 percent of employment. University Medical Center employs 2,400 people, and Texas Tech University Health Sciences Center has more than 1,500 workers. Large private health care providers such as Tenet Health, Del Sol Medical Center and the Las Palmas Medical Center also rank among El Paso's top employers.

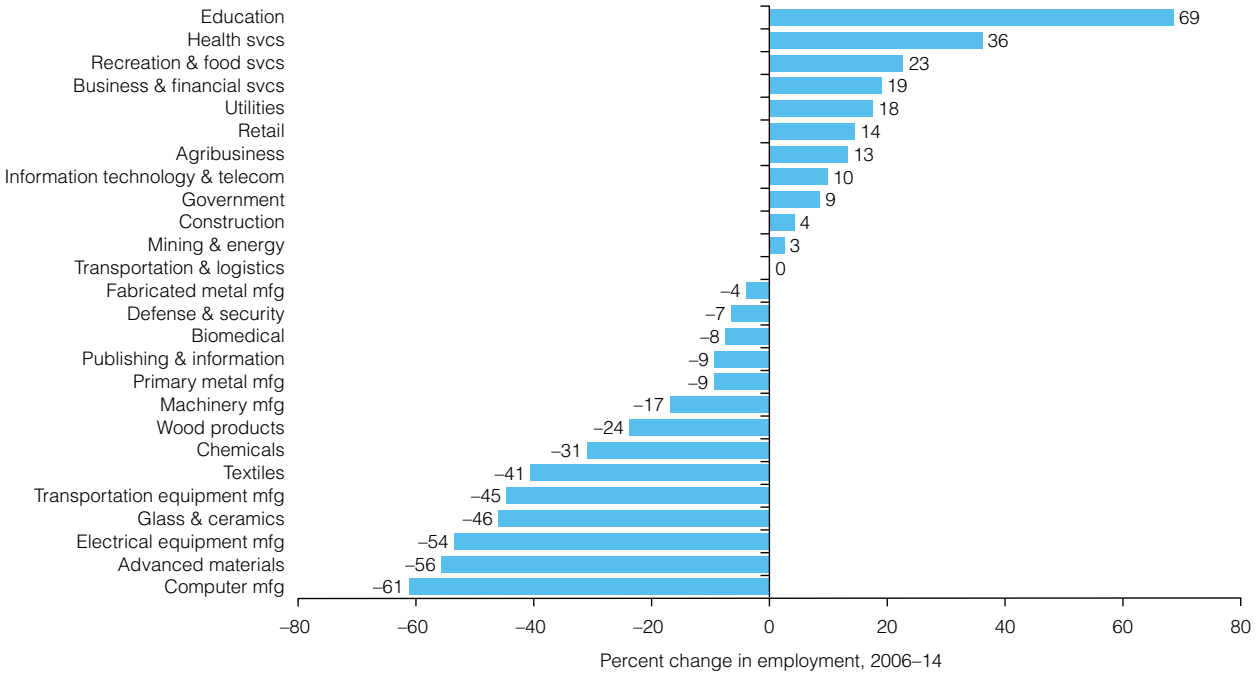
Border crossings, trade with Mexico and the Interstate 10 corridor through El Paso make transportation and logistics an important sector. El Paso is also a historically important railway stop between the Southwest and the rest of Texas.

About 19.1 million personal vehicle passengers, 6.6 million pedestrians and more than 390,000 commercial vehicles crossed the border in 2014.[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]

Education and business and financial services have gained importance since 2006 (*Chart 3.2*). While the education cluster's share of employment in El Paso grew just 0.3 percentage points, sector jobs increased 69 percent between 2006 and 2014.

Similarly, employment in the business and financial services cluster experienced rapid expansion, up 19 percent. Large service employers in the metro include staffing firms such as T&T Staff Management, customer service providers like Alorica and GC Services, and other

Chart 3.2: Education and Health Pace Employment Cluster Growth in El Paso



SOURCES: Texas Workforce Commission; authors' calculations.

Table 3.1: Low-Paying Sectors Depress Annual Average Earnings in El Paso

Cluster	El Paso					U.S.
	2006	2008	2010	2012	2014	2014
Primary metal manufacturing	50,798	51,803	54,707	55,409	57,985	64,454
Government	44,655	46,263	47,708	46,918	47,551	51,726
Transportation and logistics	41,789	40,421	42,396	41,512	41,207	51,043
Retail	24,739	23,454	24,720	24,462	24,567	28,743
Utilities	79,427	78,012	80,651	86,899	72,429	98,149
Health services	40,655	39,471	40,986	39,442	38,945	56,055
Construction	36,612	36,799	37,146	36,425	38,130	55,041
Recreation and food services	14,749	14,886	15,986	15,190	14,925	23,870
Clusters with location quotient >1	34,920	34,940	36,538	35,573	35,346	–
Clusters with location quotient <1	42,316	41,311	42,478	42,114	44,180	–
Average earnings (total)	35,116	35,057	36,266	35,905	35,834	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

business service providers such as Automatic Data Processing Inc. and Datamark.

The star and mature segments are not as high paying as their less-concentrated counterparts, partly due to the nature of the industries that are heavily represented in El Paso (*Table 3.1*).

Recreation and food services and retail generally employ a large number of part-time workers, driving down the overall average, and even full-time employees in these industries are generally not highly paid. However, inflation-adjusted wages have increased much faster than overall wages in some high-concentration industries. While average wages have grown 2 percent since 2006, wages in primary metal manufacturing are up 14 percent, and government sector wages have increased 6.5 percent. Still, wages in El Paso remain below national averages for each cluster.

DEMOGRAPHICS: Population Reflects Border Proximity

El Paso's population is predominantly Hispanic, with 81.2 percent of residents self-identifying as Hispanic, the second-highest percentage among the metros in this report behind McAllen (*Chart 3.3*). Over a quarter of El Paso's population in 2014 was foreign born and migrated to the U.S., with 90 percent of these inhabitants born in Mexico.

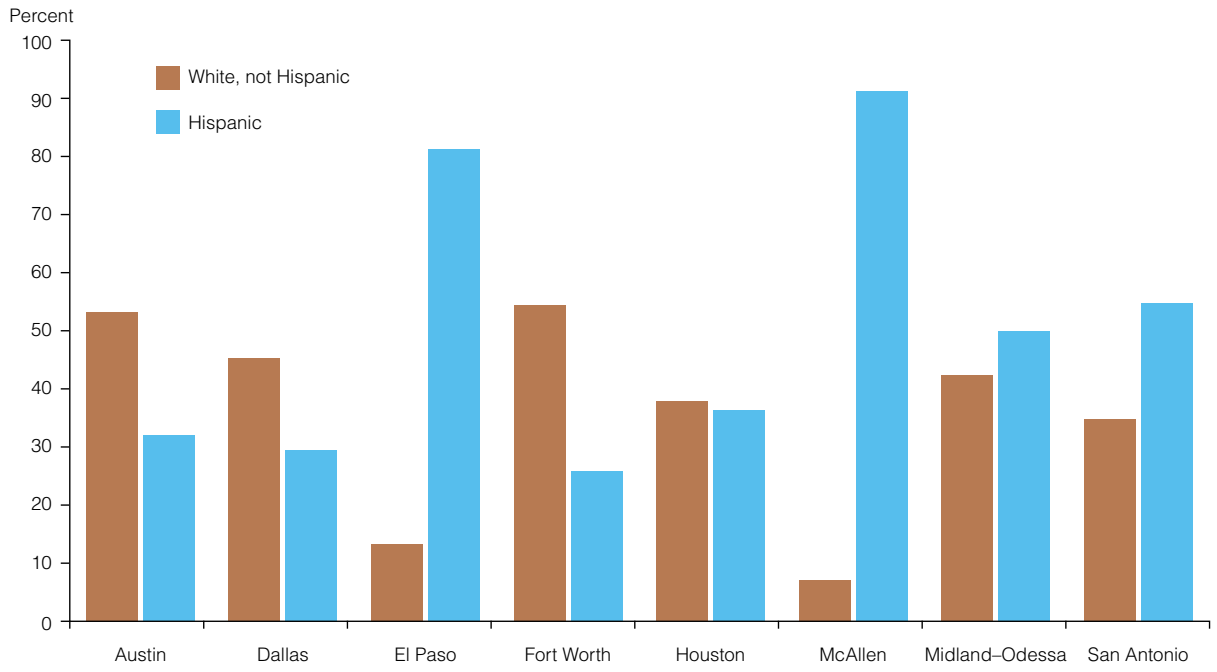
El Paso residents trail those of other metros in measures of education. Seventy-five percent of El Paso adults age 25 and older had at least a high school diploma in 2014. That figure is more than 6 percentage points lower than the Texas average. Only 21 percent of adults had a bachelor's degree or higher, compared with nearly 28 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 skilled or educated workers.

Labor force participation in El Paso is low. Sixty percent of the population age 16 and older is in the labor force. A sizable portion of the population, 16.5 percent, is 15 to 24 years old (a time when young people are generally still in school). The figure is 2 percentage points higher than the Texas average. A large share of the population, 11.3 percent, is also at retirement age (over 64 years old).

EMPLOYMENT: Smaller Job Losses, Slower Recovery

In terms of employment, El Paso wasn't as affected by the Great Recession as the rest of Texas. Between the prerecession peak in February 2008 and the trough in May 2009, El Paso lost 2.7 percent of its jobs, while Texas lost 4.1 percent from peak to trough. However, job growth after the peak was slower in El Paso. The region required

Chart 3.3: El Paso's Population Is Mostly Hispanic



SOURCE: 2014 American Community Survey.

40 months to regain prerecession levels of employment, and of the major metros, only Dallas and Fort Worth took longer to recover.

Moreover, while El Paso employment grew 7 percent between December 2009 and December 2014, Texas employment expanded 15 percent. Government spending cuts likely led to El Paso's sluggish job gains, owing to the area's greater dependence on government. (El Paso's concentration of government and military workers ranked fifth nationally in 2012, immediately after the District of Columbia.)[9]

However, El Paso outperformed the rest of Texas in 2015, expanding at a 3.5 percent annual rate, compared with 1.3 percent for Texas overall. El Paso's economy is heavily tied to Mexico due to the cross-border trade of goods and services. Thus, the slump in the energy sector that has suppressed employment growth in Texas has had little effect in El Paso so far, though slowing growth in Mexico may be felt in the future.

OUTLOOK: Ties to Mexico Bring Risks, Benefits

El Paso's close economic ties to Mexico may be a downside risk in the near future. The strong dollar may negatively affect retail and recreation and food services, which benefit from cross-border tourism. As U.S. goods and services become relatively more expensive, tourists from Mexico may visit and spend less. Improving security in Juárez may shift spending from El Paso to Juárez.

Mexico's economic outlook for 2016 reflects the possibility of falling government revenue—a result of lower oil prices and the potential negative effect of higher import prices (due to the falling peso) on economic activity.

While Fort Bliss has been an economic generator, a general decline in government spending such as that experienced in 2013 could significantly affect the military base, stifling growth in El Paso. Fort Bliss contributes an estimated $6 billion per year to the local economy.[10]

However, continued strong U.S. auto sales during the first half of 2016 could further boost Juárez maquiladoras, providing a tailwind to El Paso's economy. The maquiladoras typically have positively affected overall employment in El Paso.

Though the strong dollar may discourage foreign tourists from crossing the border to shop in El Paso's many retail areas, the decline in energy prices could provide a boost to retail spending from other regional tourists and El Paso residents. Similarly, falling fuel prices are a boon to a strong transportation industry.

Mexican energy reform, allowing private investment (particularly for oil and gas exploration) and private participation in the sale, transport and distribution of energy products, could boost trade and investment ties in the medium to long term.

El Paso Growth Outlook

Drivers	Challenges
• Strong U.S. auto sales stimulate growth in manufacturing in the maquiladoras in adjacent Juárez and the rest of the state of Chihuahua. • Low fuel prices boost retail consumer spending and benefit the transportation industry. • A burgeoning health services industry will continue to expand to meet the needs of both an aging local population and Mexicans who visit to acquire health services. • Mexico energy reforms could boost cross-border trade and investment over the medium to long run.	• Additional declines in government spending could negatively impact Fort Bliss, the largest employer in El Paso. • A strengthening U.S. dollar will negatively affect cross-border trade and retail sales. • Mexico confronts the possibility of lower oil revenues, which may depress Mexican government spending and economic growth and damp economic activity in El Paso.

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 each cluster add up to more than 100 because some industries are counted in multiple clusters and some industries are not counted at all based on the cluster definitions. For instance, semiconductor manufacturing (NAICS 3344) is included in both the advanced materials and information technology and telecommunications clusters. (See the Appendix for more information.)

[3] See "The Economic Impact of Fort Bliss and William Beaumont Army Medical Center in El Paso County, Texas," by David A. Schauer, Roberto Tinajero, David Ramirez and Dennis L. Soden, Technical Report no. 2013-01, Institute for Policy and Economic Development, University of Texas at El Paso, February 2013, www.elpaso.org/_/documents/armedforce/EconomicImpactofFortBlissandWilliamBeaumontHospitalinElPasoTexas2013_Final.pdf.

[4] Detail on top employers in the El Paso metro area is from the Borderplex Alliance and Texas A&M Real Estate Center, www.borderplexalliance.org/regional-data/el-paso/overview/major-employers and https://assets.recenter.tamu.edu/documents/mktresearch/El%20Paso_Top_Employers.pdf.

[5] "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/assets/documents/research/swe/2012/swe1204g.pdf.

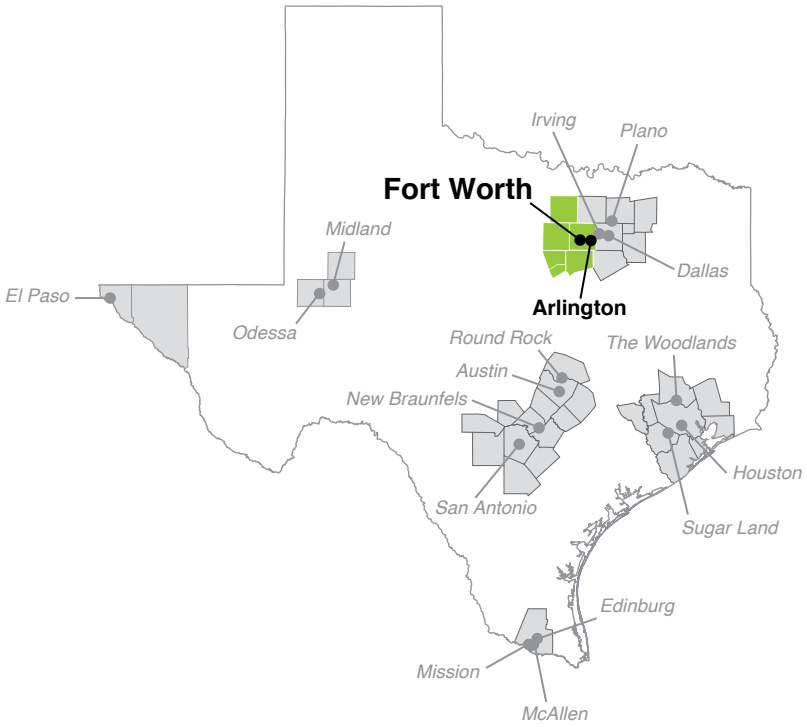
[6] Border crossings data are from the Bureau of Transportation Services, transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BCQ.html.

[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] "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.

[10] See note 3.



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 relatively less-well-educated populace provides a ready workforce for the manufacturing sector but may be a factor shifting some types of employment toward its regional neighbor, Dallas.
- Depressed energy prices limit exploration of the area's natural gas reserves but provide support to Fort Worth's strong transportation sector.

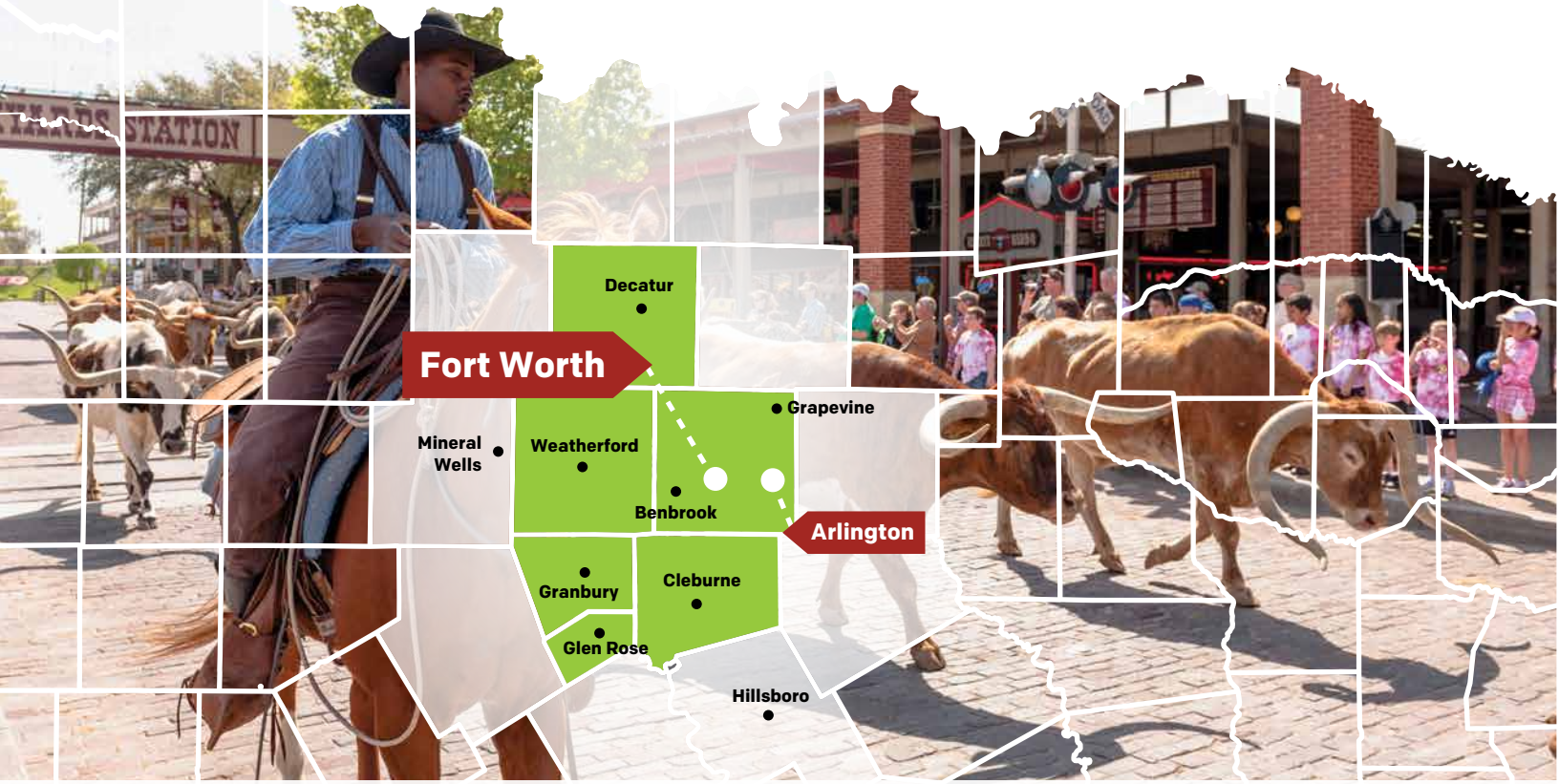
Population (2014):
2.3 million*

Population growth (2006–14):
18.4 percent

National MSA rank (2014): **No. 4***

Median household income (2014): **$58,132**

Kauffman Startup Index rank (2015):
No. 15* (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 6.95 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

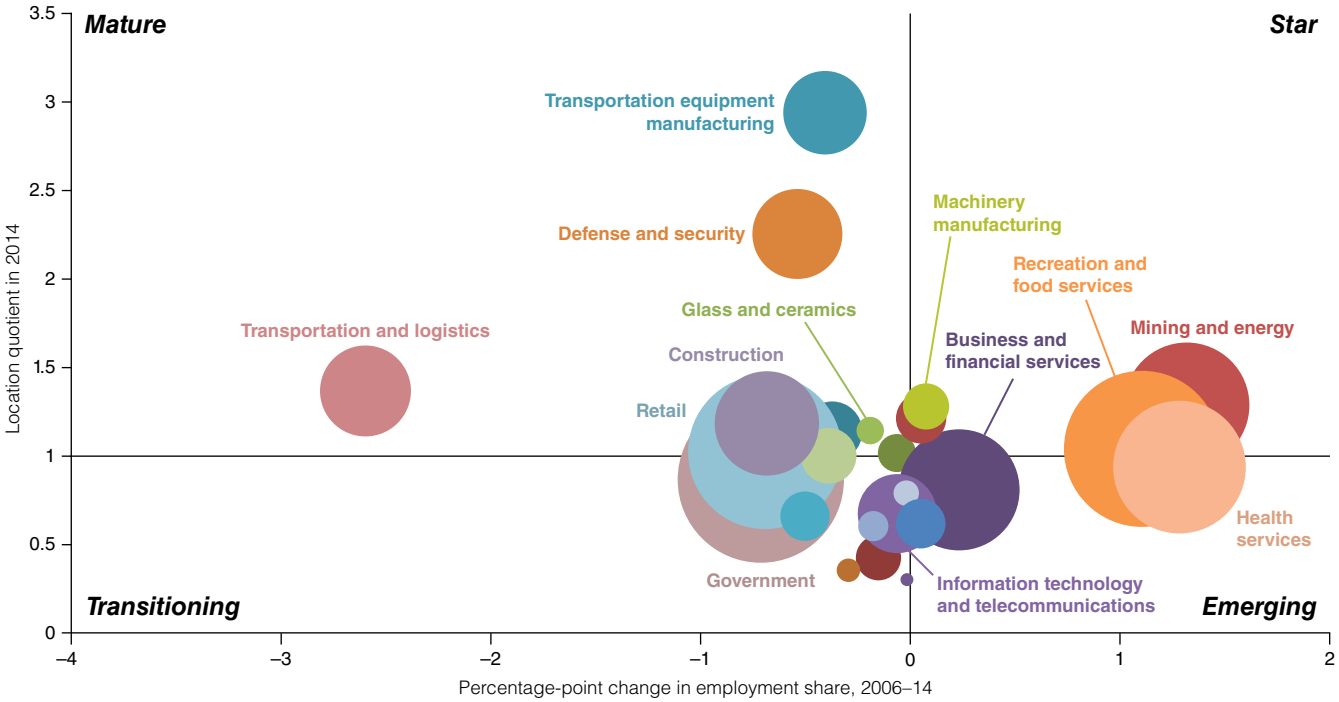
Fort Worth, established as an Army fort near the Clear Fork of the Trinity River in 1849, is named after Mexican War hero U.S. Army Gen. William Jenkins Worth. He had proposed a series of 10 forts from Eagle Pass to North Texas to mark the western Texas frontier. Shortly after Fort Worth's inception, 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.

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 big oil in Texas in 1901, refinery and pipeline firms came to Fort Worth, leading to the establishment of oil stock exchanges. 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.[1]

Chart 4.1: Transportation Clusters Drive Fort Worth's Economy



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

INDUSTRY CLUSTERS: Transportation Manufacturing, Defense Vital

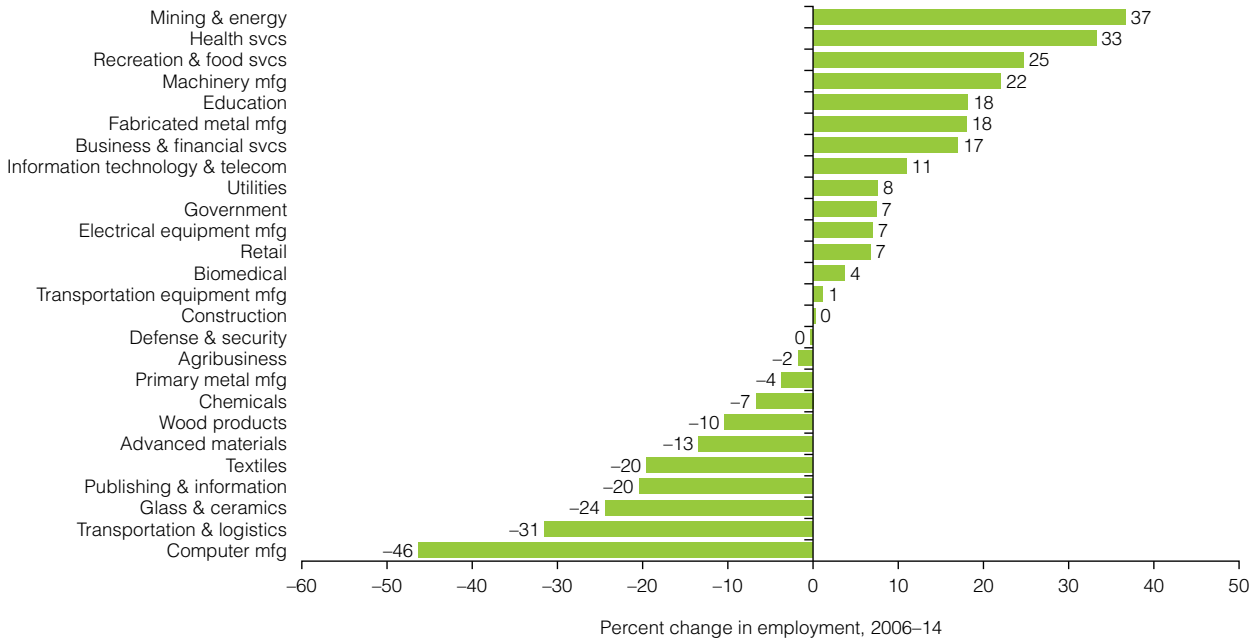
Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, are a convenient way of assessing key drivers in an economy. An LQ exceeding 1 indicates that a specific industry cluster carries more relative weight locally than nationally. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2006 and 2014 (*Chart 4.1*).[2]

Clusters in the top half of Chart 4.1, such as transportation equipment manufacturing, defense and security, and mining and energy, 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 information technology and telecommunications, are less-dominant locally than nationally and, hence, have an LQ less than 1. "Emerging" clusters, such as business and financial services and health services, are fast growing; those growing slowly are "transitioning."

The relatively 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 of activity. Additionally, General Motors Co. has operated an assembly plant in Arlington since 1954 and continues to invest in its growth, recently unveiling a $1.4 billion upgrade and expansion. The plant specializes in larger sport utility vehicles.

Government, which saw employment growth of 7 percent during the 2006–14 study period, is the largest cluster (*Chart 4.2*). The Fort Worth metropolitan division is a regional federal employment center supporting a defense and security cluster that also includes Lockheed Martin Corp. and Bell Helicopter. Jobs in recreation and food services, the second-largest cluster, expanded 25 percent during the period. This includes growth at Arlington's Six Flags Over Texas amusement park, whose parent company, Six Flags Entertainment Corp., is based in nearby Grand Prairie. Arlington is the site of two premier sports facilities—AT&T Stadium, where the Dallas Cowboys football team has played since it moved from Irving in 2009, and Globe Life Park (formerly the Ballpark in Arlington), home field of the Texas Rangers baseball team.

Chart 4.2: Energy Sector Employment Growth Leads Fort Worth Gains



SOURCES: Texas Workforce Commission; authors' calculations.

Table 4.1: Transportation and Defense Sectors Pace Earnings

Cluster	Fort Worth					U.S.
	2006	2008	2010	2012	2014	2014
Transportation equipment manufacturing	91,891	86,307	90,998	92,760	91,066	71,570
Defense and security	87,189	82,426	84,467	84,506	85,350	59,588
Transportation and logistics	59,676	48,906	48,954	56,451	48,164	51,043
Mining and energy	72,359	72,649	80,370	73,236	76,008	76,815
Machinery manufacturing	61,635	68,351	63,782	67,174	65,604	66,715
Fabricated metal manufacturing	47,487	48,896	50,730	51,500	53,572	53,130
Construction	51,110	50,735	48,734	49,983	52,717	55,041
Glass and ceramics	51,387	50,721	50,156	53,140	58,214	51,073
Chemicals	79,827	75,367	95,256	89,891	84,615	69,856
Biomedical	134,348	117,066	145,951	133,680	121,426	91,463
Recreation and food services	22,471	20,571	20,667	21,221	20,505	23,870
Retail	32,350	31,217	30,907	30,324	30,598	28,743
Wood products	46,257	44,639	45,906	46,639	47,825	48,793
Clusters with location quotient >1	52,716	49,921	51,491	51,578	50,889	–
Clusters with location quotient <1	58,196	58,050	59,307	59,146	59,955	–
Average earnings (total)	49,718	48,617	49,544	49,103	50,170	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings data are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Mining and energy was the cluster with the fastest employment growth, up 37 percent in 2006–14. Fort Worth was a center for oil exchanges 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 roughly 15 percent of its July 2008 high in the first week of November 2015—has prompted some retrenchment.

On average, clusters with a greater employment concentration than the national economy paid about $50,900 annually, less than those with a relatively smaller presence at $60,000 (*Table 4.1*). However, certain locally concentrated clusters such as biomedical boasted the region's best-paying jobs at more than $121,400 per year. Transportation equipment manufacturing—with three times the national employment share (LQ of 3)—also pays well at $91,100, as does defense and security (LQ of 2.3) at $85,400. By comparison, recreation and food services (straddling the star and emerging categories) and the large retail cluster (sitting between the mature and transitioning categories) were among the lowest paying at about $20,500 and $30,600 a year, respectively.

DEMOGRAPHICS: In-Migration Plays Key Growth Role

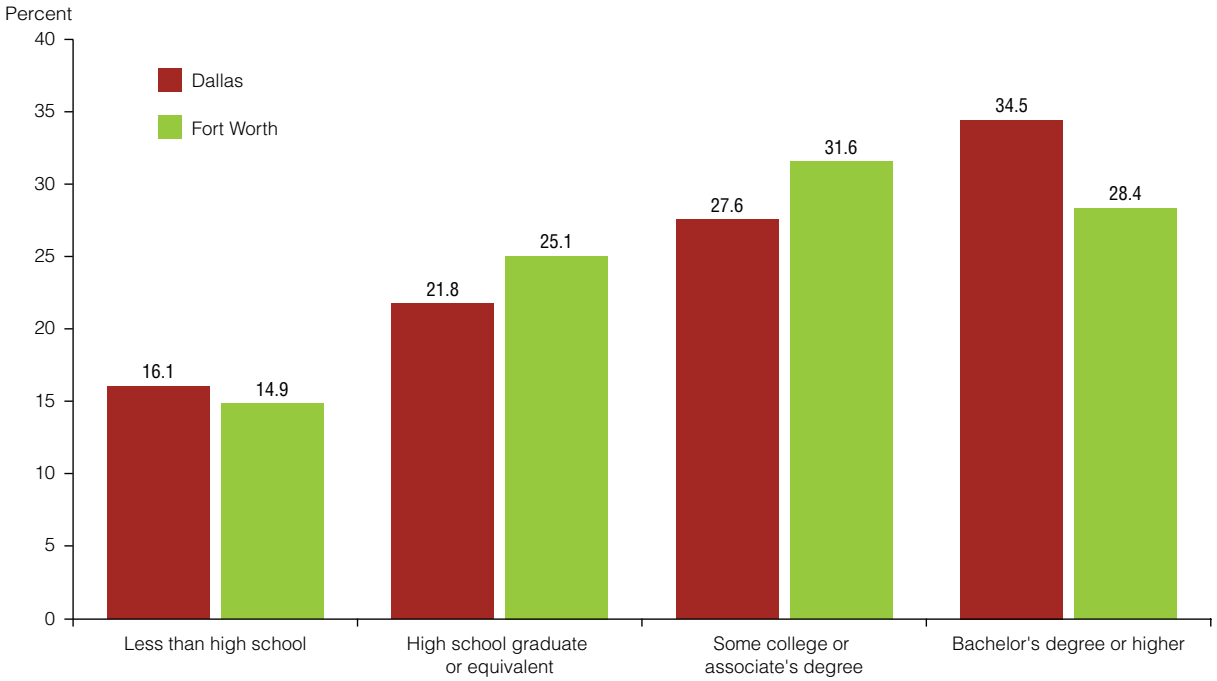
Fort Worth and its larger neighbor, Dallas, make up the Dallas–Fort Worth metroplex—the fourth-largest MSA in the country, with 6.95 million people.[3] New residents from elsewhere in the U.S. accounted for 38 percent of the metroplex's population growth in 2014, and the region took one of the two top spots nationally for total net migration from 2011 to 2014.

About 61.5 percent of the Fort Worth area's foreign-born population came from Latin America, less than the almost 70 percent share for Texas.

Fort Worth's per capita income of $28,629, while about 8 percent lower than Dallas', was close to the U.S. figure of $28,889. However, Fort Worth's median household income—the midpoint at which half of incomes are above and below—was $58,132, exceeding the U.S. median of $53,657 and trailing Dallas.

Consistent with the area's manufacturing emphasis, 28.4 percent of workers age 25 or older hold a bachelor's or higher degree, less than Dallas at 34.5 and the U.S. at 30.1 but nearly on par with Texas at 27.8 percent (*Chart 4.3*). The share of adults with only a high school diploma in Fort Worth exceeds the share in Dallas.

Chart 4.3: Share of College Graduates Lower in Fort Worth Relative to Dallas



NOTE: Chart shows share of population age 25 and over in each grouping.
SOURCE: 2014 American Community Survey.

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 1.3 makes it more prominent locally than nationally—likely helped Fort Worth get a quicker start than its sister 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 42 months.

The situation was reversed in 2015, with the steep decline of oil and gas prices restraining the Fort Worth area's expansion.

Through much of 2012 and 2013, the Fort Worth area's unemployment rate was 0.2 percentage points lower than Dallas'. A similar spread, this time favoring Dallas, emerged during 2015 as the energy slump deepened. Employment growth in Fort Worth was uneven in 2015 as well, and through the first 11 months, job gains clocked in at a mere 0.2 percent annual rate. This compares with 4.1 percent for Dallas. Despite the slowdown, Fort Worth unemployment averaged around 4 percent through 2015, compared with 5.3 percent for the U.S.[4]

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 concentration in energy, transportation and defense. In the near term, those industries' performance will help set the course for Fort Worth.

Federal budget constraints could, over the long term, limit the outlook for the historically powerful defense and security cluster and the 4 percent of the workforce it represents. Continuing price weakness in energy, which makes up 7.7 percent of the region's employment and is classified as a star among Fort Worth's clusters, will damp prospects and limit natural gas exploration along the Barnett Shale. Conversely, relatively low fuel prices will support demand for air travel and autos, such as the large SUVs that GM's Arlington plant builds.

Fort Worth—Arlington Growth Outlook

Drivers

- Manufacturing operations, defense industry installations and transportation facilities provide a strong foundation of well-paying jobs.
- The government cluster continues to provide stability as the region's population expands and the low unemployment rate serves as a lure to new residents.
- Lower energy prices will continue to drive transportation growth.

Challenges

- Weakness in oil and gas prices will damp growth within the energy sector, which had benefited from its proximity to the Permian Basin and Barnett Shale.
- A relatively less-well-educated populace 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.

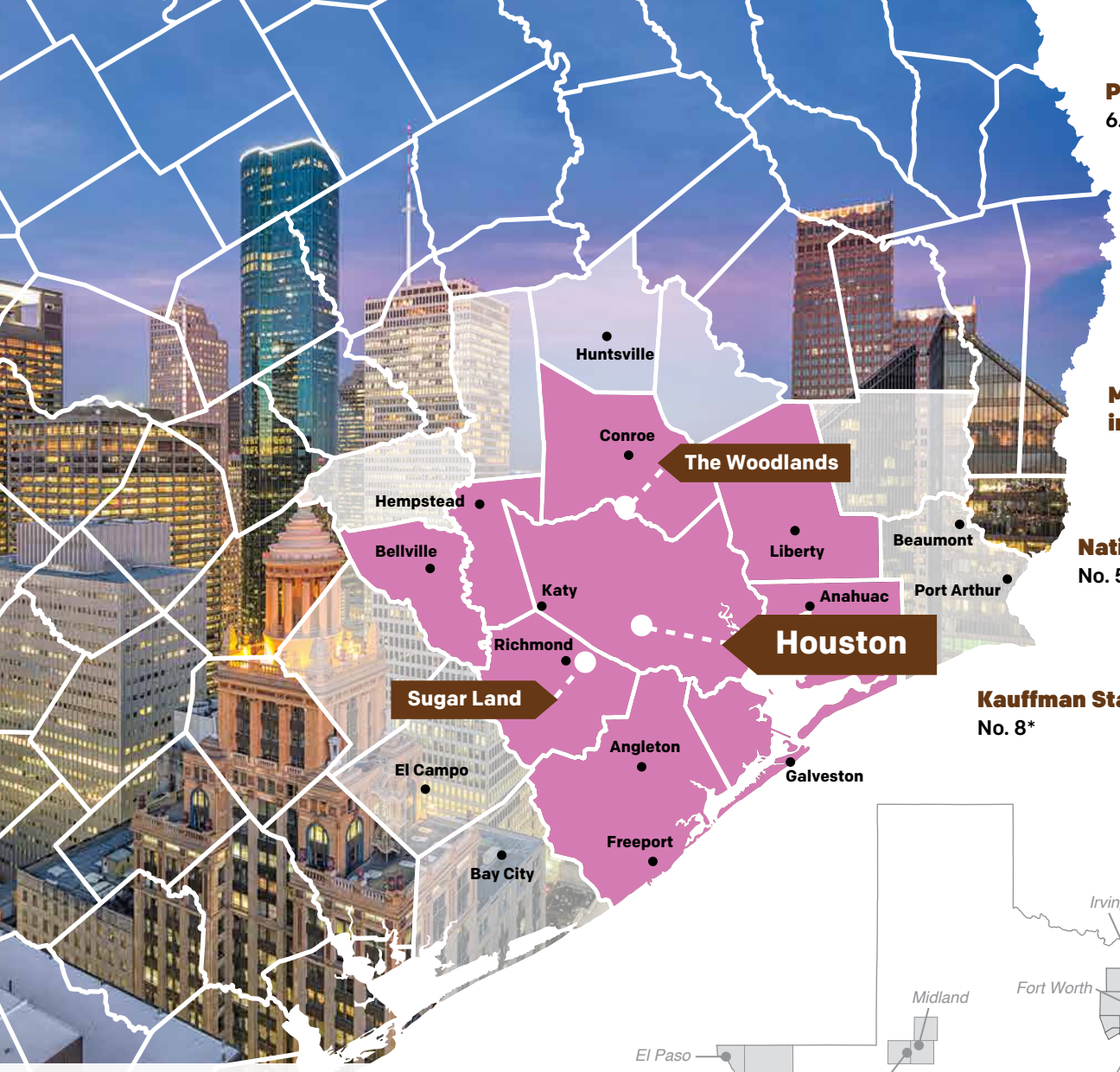
Notes

[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] Individual industry cluster shares add up to more than 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.

[3] The 2014 population estimates are from the Census Bureau. The three largest MSAs are New York–Newark–Jersey City, Los Angeles–Long Beach–Anaheim and Chicago–Naperville–Elgin.

[4] Data are from the Bureau of Labor Statistics and Texas Workforce Commission and are seasonally adjusted by the Federal Reserve Bank of Dallas.



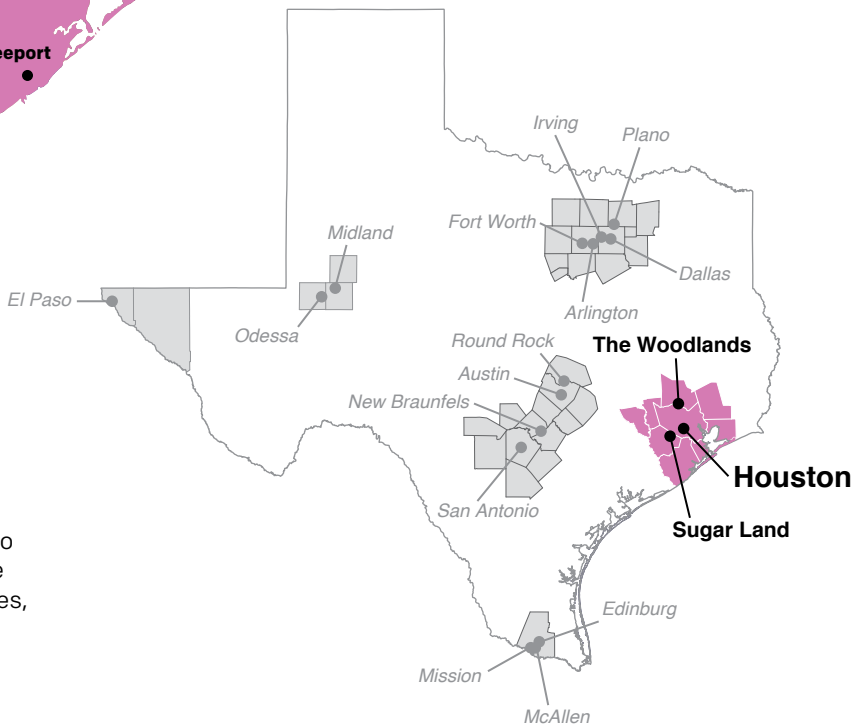
Population (2014): 6.5 million

Population growth (2006–14): 17.1 percent

Median household income (2014): $60,072

National MSA rank (2014): No. 5*

Kauffman Startup Index rank (2015): No. 8*



At a Glance

- Houston began as a port city, rising to prominence as one of the top three busiest deepwater ports in the U.S.
- The Texas oil boom began at Spindletop, 75 miles to the east, and 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, Houston has diversified, and the manufacturing, chemicals and health industries have grown in importance.
- Falling oil prices and a decline in exports pose a challenge to the Houston economy, and a strongly growing health industry can't pick up all the slack.

*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.

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, Houston 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, soon ranking among the top three ports by volume in the U.S.

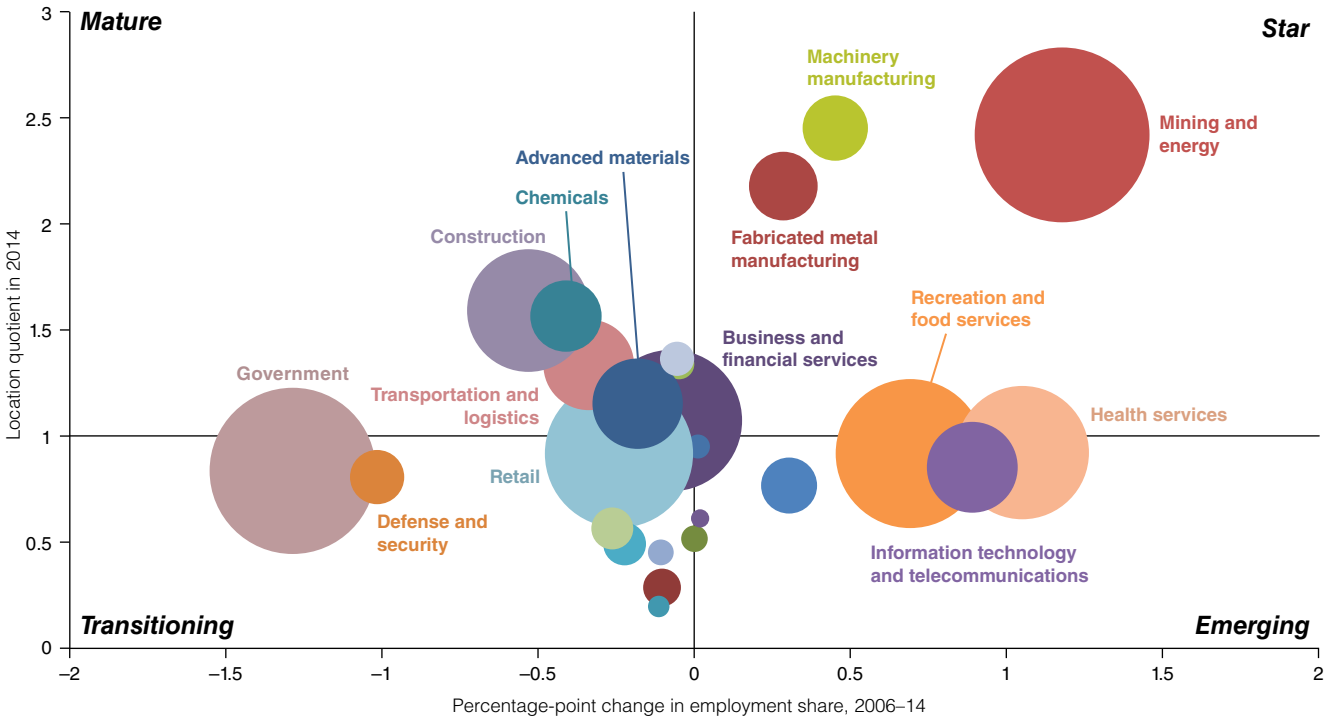
Drillers struck oil in 1901 at Spindletop, 75 miles to the east near Beaumont, catalyzing the oil boom in Texas. Sinclair Oil Co. built the first major oil refinery in Houston in 1918, and many others followed, constructing facilities along the Houston Ship Channel.

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 suffering during the 1980s bust.[1]

INDUSTRY CLUSTERS: Energy and Related Industries Dominate

Chart 5.1 shows the composition of industry clusters in Houston, organized by location quotient (LQ), a measure of a cluster's share of local employment relative

Chart 5.1: Energy and Related Manufacturing Among Houston's Dominant Clusters



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

to its share nationally. Each cluster is plotted based on employment share change between 2006 and 2014.[2]

Clusters in the "star" quadrant, such as mining and energy, have a large share of employment relative to the nation (an LQ exceeding 1) and are fast growing; "emerging" industries, such as health, are smaller relative to the nation (an LQ less than 1) but also fast growing. "Mature" sectors, such as the chemical 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 by far make up the largest cluster in Houston, employing 14 percent of the workforce. Houston has more Fortune 500 companies than any other Texas city, and out of the 26 local companies on the list in 2015, only four were unrelated to the energy industry. Apart from Fortune 500 firms such as Phillips 66, ConocoPhillips and Marathon Oil Corp.—whose headquarters are in Houston—the city's largest employers include units of Exxon Mobil Corp. and Shell Oil Co., each employing more than 13,000 workers locally.[3]

Related oilfield manufacturing and services companies that support the energy extraction firms include National Oilwell Varco, Schlumberger and Halliburton. This network has led to a high concentration of machinery and fabricated metal manufacturers.

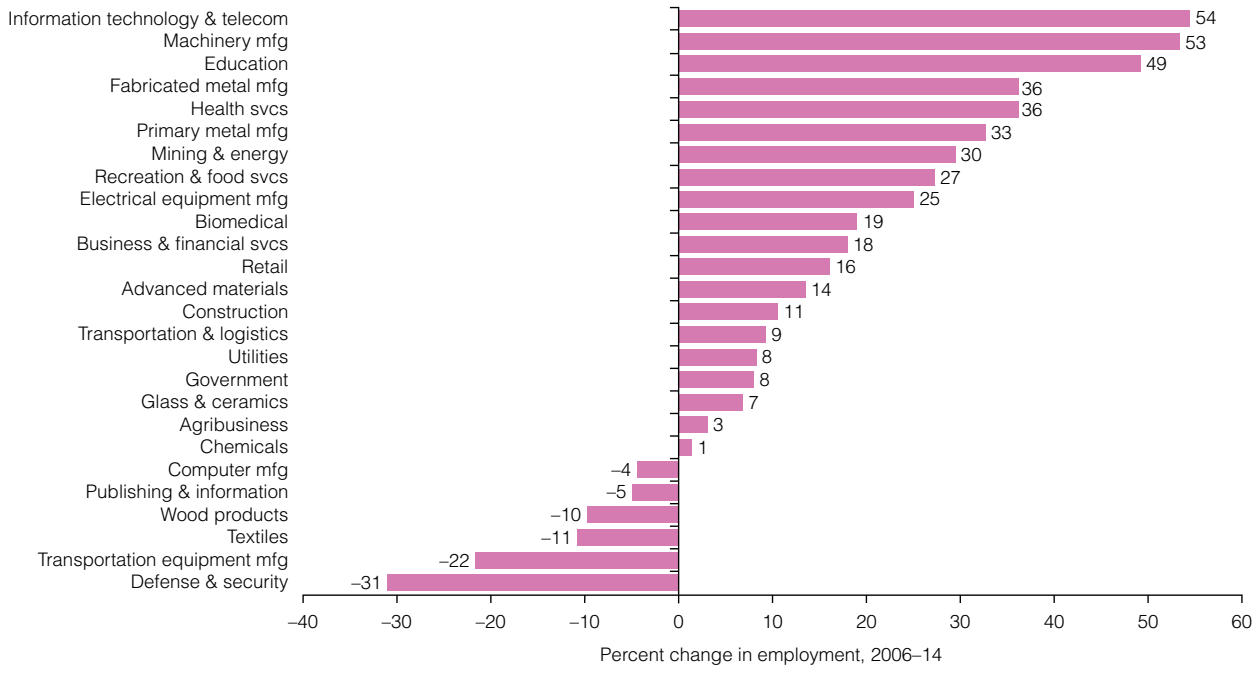
Similarly, the chemical industry is a major cluster, though its relative size has declined recently. Dow Chemical Co., for example, employs 6,600 workers. Many of the major energy companies, including Exxon Mobil, also manufacture chemicals.

Although its share of transportation and logistics employment has declined since 2006, Houston retains its position as a major port city and regional commercial hub. The United Airlines hub, the carrier's largest, is located at George Bush Intercontinental Airport. The airline employs 17,000 people in Houston.

The health cluster, accounting for 8 percent of Houston's workforce, has also grown significantly in recent years. The area's two largest employers, with more than 19,000 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 0.92), employment grew 36 percent from 2006 to 2014 (*Chart 5.2*).

The major industry clusters in Houston pay significantly more than other industries (*Table 5.1*). The average annual wage for mining and energy, for example, is $120,000; the average worker in Houston earns $64,500. Overall, workers employed in the most concentrated clusters—those with LQs greater than 1—earn on average

Chart 5.2: IT and Energy-Related Manufacturing Lead Employment Growth in Houston



SOURCES: Texas Workforce Commission; authors' calculations.

Table 5.1: Energy and Related Clusters Drive Houston Workers' Earnings

Cluster	Houston					U.S.
	2006	2008	2010	2012	2014	2014
Machinery manufacturing	88,556	88,741	93,793	98,364	98,975	66,715
Mining and energy	109,553	113,440	115,480	120,750	120,088	76,815
Fabricated metal manufacturing	59,181	62,989	61,517	65,198	65,436	53,130
Construction	60,914	63,960	63,739	66,701	70,413	55,041
Chemicals	94,390	95,397	97,286	99,784	102,907	69,856
Defense and security	72,245	68,189	69,999	69,372	72,203	59,588
Utilities	119,634	124,107	115,164	120,369	122,414	98,149
Glass and ceramics	52,639	56,232	51,331	54,750	55,285	51,073
Transportation and logistics	64,039	66,232	73,449	81,226	75,998	51,043
Advanced materials	82,363	82,287	82,884	85,188	86,434	79,703
Business and financial services	93,974	97,049	98,450	100,147	102,094	92,957
Clusters with location quotient >1	86,686	89,375	91,422	95,495	95,981	–
Clusters with location quotient <1	44,979	45,021	46,064	45,704	46,100	–
Average earnings (total)	58,969	60,930	60,876	63,235	64,512	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

more than twice as much as workers in less-concentrated clusters ($96,000 versus $46,100). While real (inflation-adjusted) wages have increased 9.4 percent overall since 2006, pay has grown 10.7 percent in the most concentrated clusters and 2.5 percent in less-concentrated ones.

DEMOGRAPHICS: Houston Population More Diverse

Demographics in Houston—the state's most populous metro, with 6.5 million residents—differ from the other major metros. While Austin, Dallas and Fort Worth all have dominant non-Hispanic white populations, Houston's Hispanic population of 36.3 percent is nearly as large as the white non-Hispanic population of 37.8 percent. The black share, 17.2 percent, and Asian share, 7.3 percent, are higher than in any other Texas metro area in this report (*Chart 5.3*).

Rapid job growth in the high-paying energy industry has made Houston a popular destination for migrants, domestic and foreign. Apart from the Texas border metros, Houston has the largest foreign-born population share, 23.1 percent. Roughly two-thirds of the foreign born are from Latin America, and about a fourth are from Asia.

Houston trails Dallas and Austin in 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-one percent of Houston's population holds a bachelor's degree or higher; the Texas average is 27.8 percent.

EMPLOYMENT: Impact of Shale Boom and Bust

Houston 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 DFW lost more. However, Houston bounced back 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 percent per year during the period.

Houston's rapid postrecession growth is largely due to the shale oil boom. With such a high concentration of firms in energy or related industries, shale exploration fueled Houston's employment prospects,

Chart 5.3: Population More Diverse in Houston than in Other Major Texas Metros

SOURCE: 2014 American Community Survey.

driving growth directly and indirectly. 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.

However, energy-fueled booms are sensitive to price busts. In response to crashing oil prices in late 2014, the Houston job market wavered in 2015. Between December 2014 and November 2015, employment was nearly flat. Job losses were not only concentrated in goods-producing sectors such as energy and manufacturing, but also in some service sectors. Professional and business services and real estate also experienced labor market declines in 2015.

OUTLOOK: No Recession ... Yet

Houston's economy is heavily tied to energy, with nearly 16.4 percent of 2014 real gross domestic product attributed to the industry. Thus, an energy price decline negatively affects the area economy, slowing job gains, damping energy-related investment and creating downward pressure on demand for various services and commercial real estate, especially office space. The effects of low oil prices are not expected to be as drastic as those during the 1980s oil bust because Houston is more diversified, largely due to its health care and export sectors.

Because Houston is a port city, exports are vital to the economy and support more than 400,000 area jobs, by some estimates.[4] However, the export industry faces challenges in the short term as the unusually strong U.S. dollar increases costs for foreign buyers, reducing export demand. Additionally, the International Monetary Fund lowered 2016 global growth projections from 3.6 percent to 3.4 percent, dimming export growth prospects.[5]

Still, parts of the energy industry will expand over the long term. New petrochemical plants and liquefied natural gas terminals are under contract, with construction expected to start in 2016. These projects will initially provide employment for many construction workers, although the plants will require relatively few operations employees once they're complete.

Additionally, Houston's large health care industry is expected to grow to support a burgeoning aging population. More than 600,000 Houston residents are over age 65, and this cohort is expected to grow significantly in the coming decades as baby boomers age.

Houston—The Woodlands—Sugar Land Growth Outlook

Drivers	Challenges
• Refinery operators and petrochemical producers are benefiting from low oil and gas prices. • Construction of new petrochemical plants and liquefied natural gas terminals planned in coming years will boost construction employment in the medium term. • A strong health care industry will continue to expand along with expected population gains, especially with a projected increase in the 65-and-older population in the next few decades.	• Low oil prices negatively impact growth in the upstream energy industry and beyond. • Energy-related jobs will decline further given the plunge in rig counts. • Demand for commercial real estate may wane further. • Apartment and single-family home growth may diminish. • Slowing exports due to a stronger dollar and weaker global growth will damp port activity.

Notes

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

[2] Individual industry cluster shares add up to more than 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. (See the Appendix for more information.)

[3] Data on major Houston employers are taken from the Greater Houston Partnership's 2015 *Houston Facts*, www.houston.org/assets/pdf/economy/Houston%20Facts_web.pdf.

[4] See the Greater Houston Partnership's *2015* Houston Employment Forecast, Dec. 11, 2014, www.houston.org/pdf/research/quickview/Employment-Forecast.pdf.

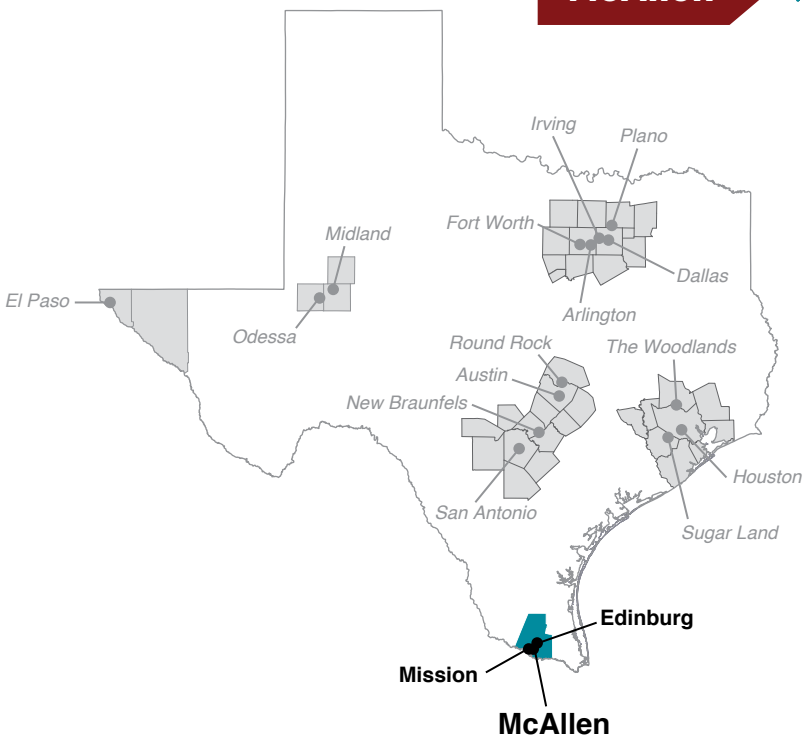
[5] See the International Monetary Fund's World Economic Outlook, October 2015, www.imf.org/external/pubs/ft/weo/2015/02/pdf/text.pdf.

Population (2014): 831,073

Population growth (2006–14): 18.6 percent

Median household income (2014): $34,801

National MSA rank (2014): No. 68*



At a Glance

- Health services, government and retail trade are the three largest clusters in McAllen, though transportation and logistics is also an important sector, attributable to the border crossings with Mexico.
- In terms of employment, McAllen wasn't hit as hard as the rest of the state during the Great Recession, and the border metro rebounded to prerecession levels before other major metros. McAllen wasn't notably affected by slowing elsewhere in the state during 2015.
- Talent flight is a challenge for McAllen's economy, but investments in retail, transportation infrastructure and health care could boost future economic activity.

*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.

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.

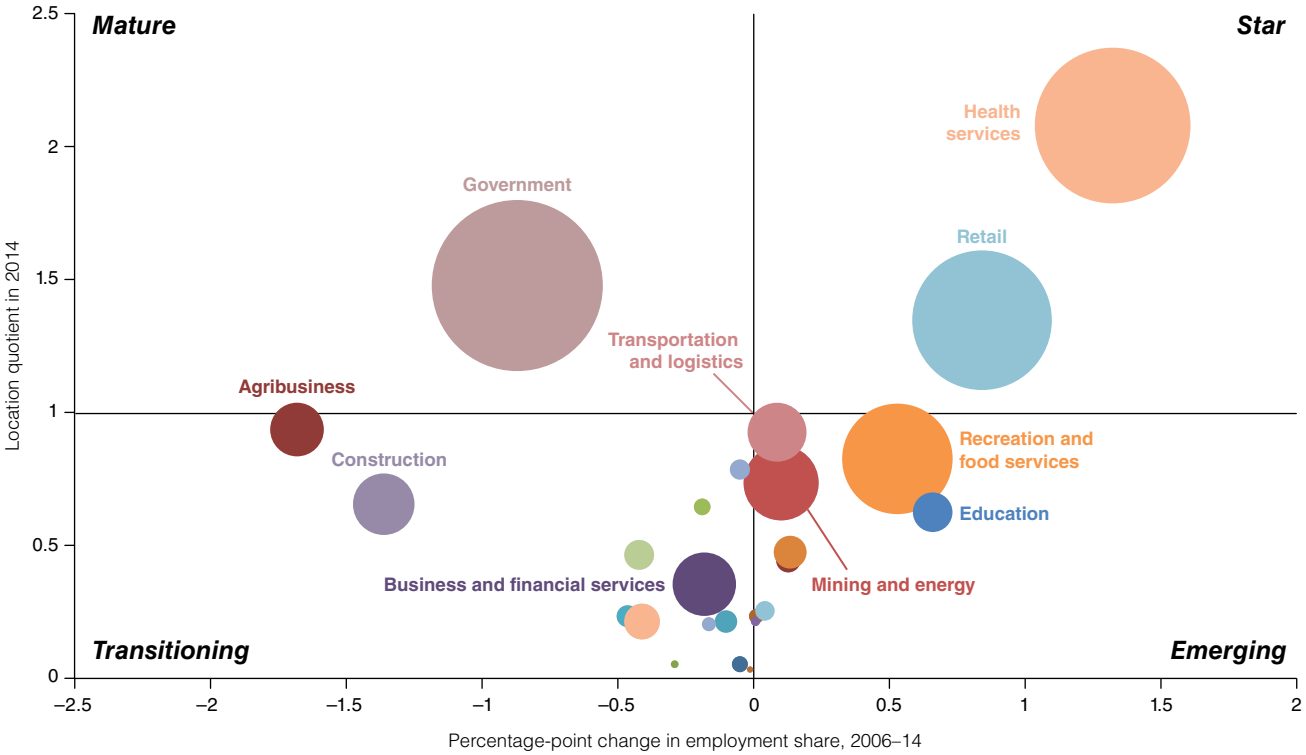
McAllen's economy was primarily agriculture-based, with some oil exploration, in the early 20th century. In 1941, the city built a suspension bridge across the Rio Grande to Reynosa, Mexico. The McAllen–Hidalgo–Reynosa International Bridge increased tourism and trade, helping establish McAllen as an 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. Foreign trade and tourism remain important to the region's economy.[1]

INDUSTRY CLUSTERS: Retail, Health Drive Economy

McAllen's cluster composition is shown in Chart 6.1. Clusters are organized by location quotient (LQ), which represents the share of local employment in each cluster

Chart 6.1: Health Care Dominates McAllen Clusters



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

relative to the nation, and the change in employment share between 2006 and 2014.[2] "Star" quadrant clusters, such as health services and retail, have a larger share of employment relative to the nation (an LQ exceeding 1) and are fast growing. "Emerging" industries, such as recreation and food services, are smaller relative to the nation (LQ less than 1) and fast growing. Industries in the "mature" quadrant, such as government, are more concentrated but slower growing, and "transitioning" industries, like business and financial services, are smaller relative to the nation and slower growing.

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. Nearly 19 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]

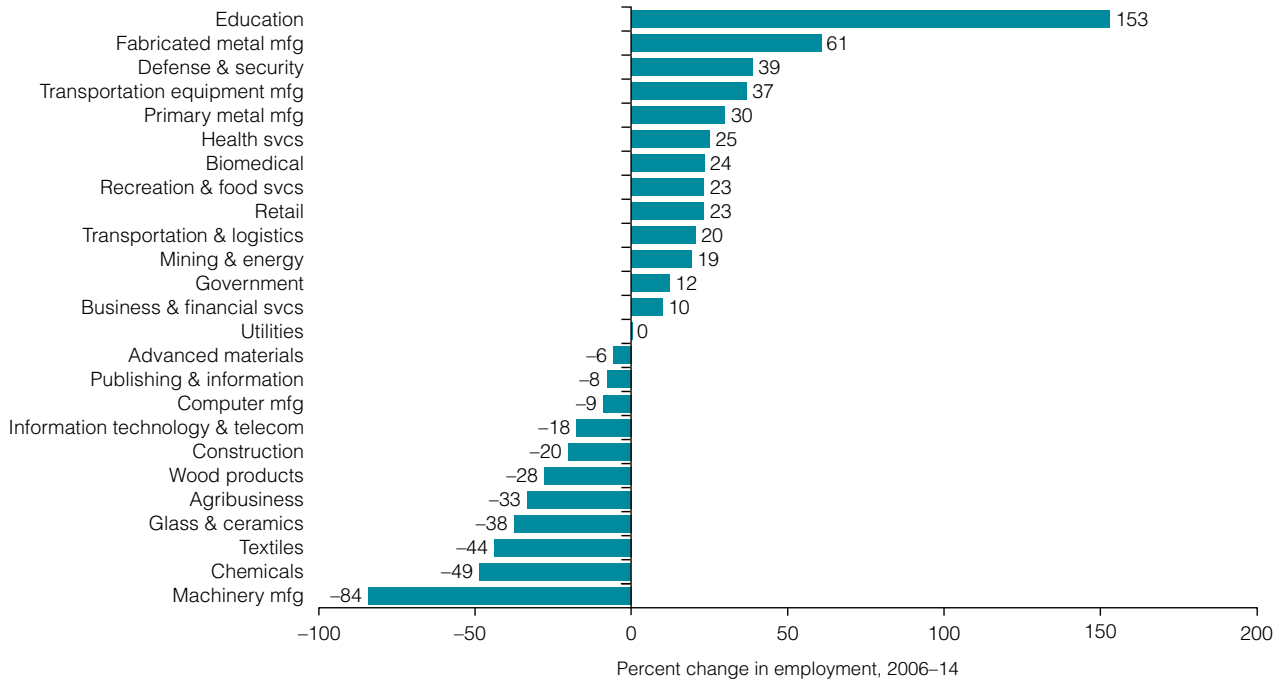
Retail is typically big in the larger border communities, and this star cluster employs more than 15 percent of McAllen's workers. The metro area serves as the retail trade center of South Texas and northern Mexico. Retail tourism draws customers from as far as Monterrey, Mexico's third-largest metro area, which is 150 miles southwest of McAllen. Mexican shoppers account for an estimated 30 to 40 percent of retail activity.[4]

Overall, retail trade makes up nearly 13 percent of McAllen's total output.[5] In terms of gross sales (overall taxable sales including wholesale trade and services), 56 percent come from retail in McAllen, compared with about 25 percent for the state.[6]

Government employees figure prominently in border economies, and McAllen is no exception. They make up the largest share of workers in McAllen at nearly 23 percent. While the government sector's workforce has grown since 2006, other clusters have expanded significantly faster (*Chart 6.2*). Thus, government's share of total employment has declined.

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. Public school systems, however, dominate the government sector. Fifty-eight percent of all government employees work for elementary and secondary schools.[7]

Chart 6.2: Education Sector Grows the Fastest Among McAllen Clusters



SOURCES: Texas Workforce Commission; authors' calculations.

Table 6.1: Earnings Across Dominant McAllen Clusters Trail U.S. Performance

Cluster	McAllen					U.S.
	2006	2008	2010	2012	2014	2014
Health services	32,504	33,058	33,892	30,305	31,235	56,055
Government	39,579	41,356	42,538	41,576	42,311	51,726
Retail	24,671	23,449	24,328	25,013	25,522	28,743
Clusters with location quotient >1	33,496	33,948	35,103	33,394	34,150	–
Clusters with location quotient <1	29,136	29,104	29,219	30,492	31,347	–
Average earnings (total)	31,368	31,353	32,301	31,586	32,000	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Although public education has not grown significantly, the private education sector, which includes private schools and colleges, has expanded rapidly since 2006.

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.[8] Consequently, transportation and logistics is an important emerging industry. While its concentration (LQ of 0.9) isn't as significant locally as nationally, the sector has grown since 2006, adding workers and increasing its share of total McAllen employment.

The highly concentrated sectors—those with LQs greater than 1—are higher paying in McAllen than their less-concentrated counterparts (*Table 6.1*). However, real (inflation-adjusted) wages overall remain significantly lower than U.S. industry averages, and wage growth in the star and mature industries, at 2 percent, is slower than in the less-concentrated sectors, at 7.6 percent. Reduced government spending in recent years may have slowed public sector wage growth, while pay in the retail sector remains low.

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, in McAllen's health cluster, more than 51 percent of workers are employed in home health care services.[9] Many are unlicensed, nonmedical caregivers, and the average salary for these jobs is significantly lower—$13,900 in 2014—than for the entire sector. The rest of the health industry averaged about $49,000 in 2014.

DEMOGRAPHICS: Poorer and Younger than the State

McAllen's population is much younger than that of the other metros (*Chart 6.3*). The median age of 29.2 is almost five years less 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 more than 4 people per family, compared with 3.4 for Texas.

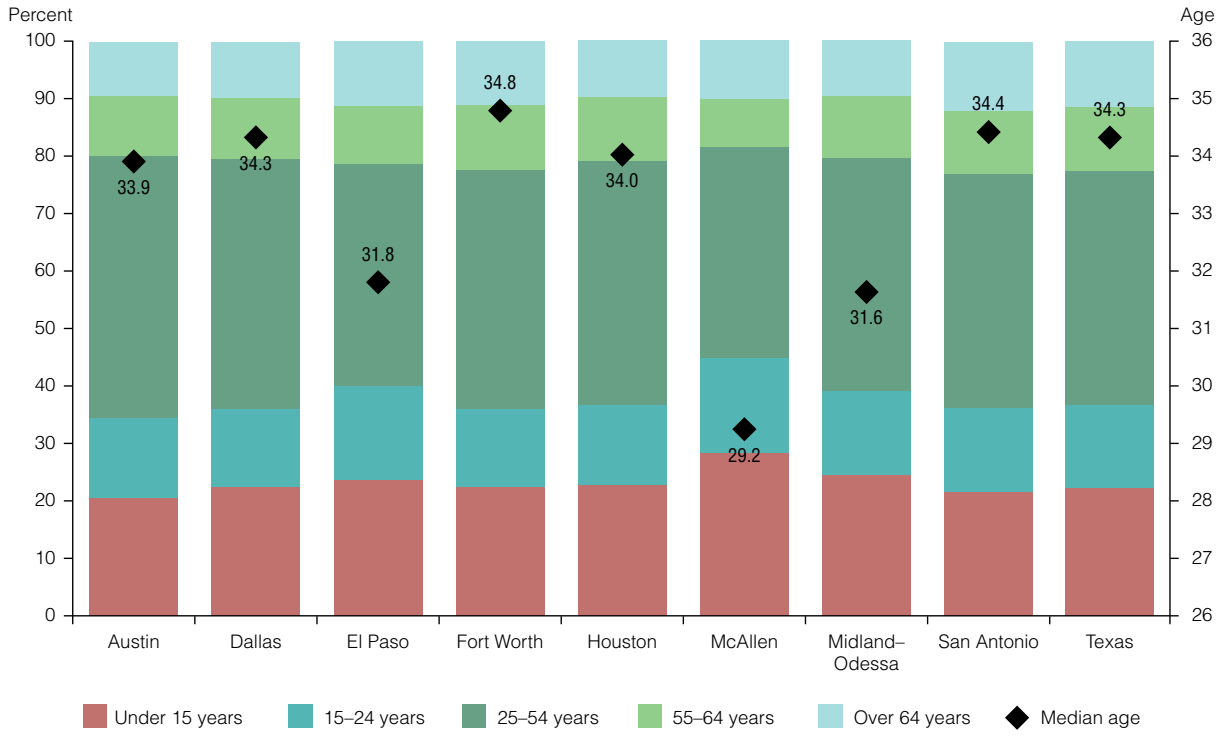
The population is predominantly Hispanic at over 91 percent, and more than 88 percent of the population self-identifies as being of Mexican descent. McAllen has the largest foreign-born population of any metro in the report at nearly 28 percent, illustrating the city's deep ties with Mexico.

McAllen is also home to a large group of seasonal residents who, at an average age of 71, 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 find a more temperate climate. In 2014, the approximately 100,000 migrants spent nearly $710 million locally. While their numbers have declined over the past several years, in part due to border violence concerns, their household spending has increased strongly and is up nearly 35 percent since 2006.[10]

McAllen trails the state in terms of educational outcomes. Nearly 38 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 28 percent in Texas.

Chart 6.3: McAllen Has Youngest Population of Major Metros



SOURCE: 2014 American Community Survey.

McAllen has a high poverty rate—34 percent of the population lived below the poverty line in 2014, compared with 17 percent in Texas—and its median household income of $34,801 was two-thirds of the Texas figure, $53,035.

EMPLOYMENT: Quick 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. McAllen also was the first metro to recover, reaching pre-recession employment levels after only 24 months.

Job growth in the postrecession period, however, was significantly slower than in the rest of the state. From December 2009 to December 2014, McAllen employment grew about 12 percent, or an average of 2.3 percent per year—slower than the Texas annual average of 2.8 percent.

In 2015, McAllen performed better than the rest of the state—growing at an annualized rate of 2.0 percent through November, compared with 1.3 percent for Texas overall. Manufacturing employment in McAllen increased at an annual 7.2 percent rate over the same period despite widespread weakness in this sector across the state and nation. Also, trade, transportation and utilities and education and health expanded last year.

OUTLOOK: Mixed, Dependent on Ties to Mexico

Many highly educated McAllen residents seek employment elsewhere because of the higher pay offered in the bigger cities. This situation may change in the future; McAllen has greatly improved the quality and availability of education. Nevertheless, the emerging industries that employ highly educated workers are not yet dominant enough to retain much of the young, educated workforce.[11]

While a strong dollar is hurting retail sales in the near term, cross-border retail trade will continue to provide support to the area's economy over the long run. A stable outlook for Mexico in 2016, along with energy reforms in that country, may spur new activity that bodes well for growth in this border metro.

Recent investments in several sectors in McAllen could bolster the area. Announced expansions to La Plaza Mall, among the largest retail hubs, will add a new wing—space for an 80,000-square-foot, two-level anchor store; two junior anchors; more than 50 smaller specialty stores; and up to eight restaurants.[12]

The McAllen Miller International Airport announced $26.5 million in improvements that will nearly double the size of the terminal.[13] A new toll road, state Highway 365, will facilitate increased cross-border trade.[14] Additionally, Doctor's Hospital at Renaissance announced a $200 million expansion that will double the number of available beds.[15]

McAllen–Edinburg–Mission Growth Outlook

Drivers

- Significant expansion to La Plaza Mall will increase retail sales and attract retail tourists from beyond the region.
- Investments in transportation infrastructure, including highways and the airport, will provide new opportunities for trade and the transportation industry.
- An announced $200 million hospital expansion, which would more than double patient capacity, should aid growth in the health care sector.
- Mexico energy and banking reforms may open up new opportunities for U.S. businesses, stimulating trade through McAllen.

Challenges

- Skill shortages continue to be an issue. It is hard to attract skilled workers—and young, educated people tend to leave the region to find higher-paying jobs elsewhere.
- A strong dollar will continue to negatively affect retail sales in the short to medium term.
- A population that is relatively poorer and less-educated than the Texas average may limit area growth.

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] Individual industry cluster shares add up to more than 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. (See the Appendix for more information.)

[3] Information about McAllen's top employers is from the McAllen Economic Development Corp., www.mcallenedc.org/info/mcallen-top-employers.php.

[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) 2014 gross domestic product by industry is from the Bureau of Economic Analysis.

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

[7] See definition in NAICS 6111 (local government only), elementary and secondary schools.

[8] 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.

[9] See definition of home health care workers in NAICS 6216.

[10] See "Winter Texan 2013–2014 Survey," Business and Tourism Research Center, University of Texas–Pan American, issuu.com/utpa/docs/winter_texan_2014.

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

[12] See La Plaza Mall's expansion announcement, May 15, 2015, www.simon.com/mall/la-plaza-mall/stream/major-expansion-planned-for-la-plaza-mall-3373936.

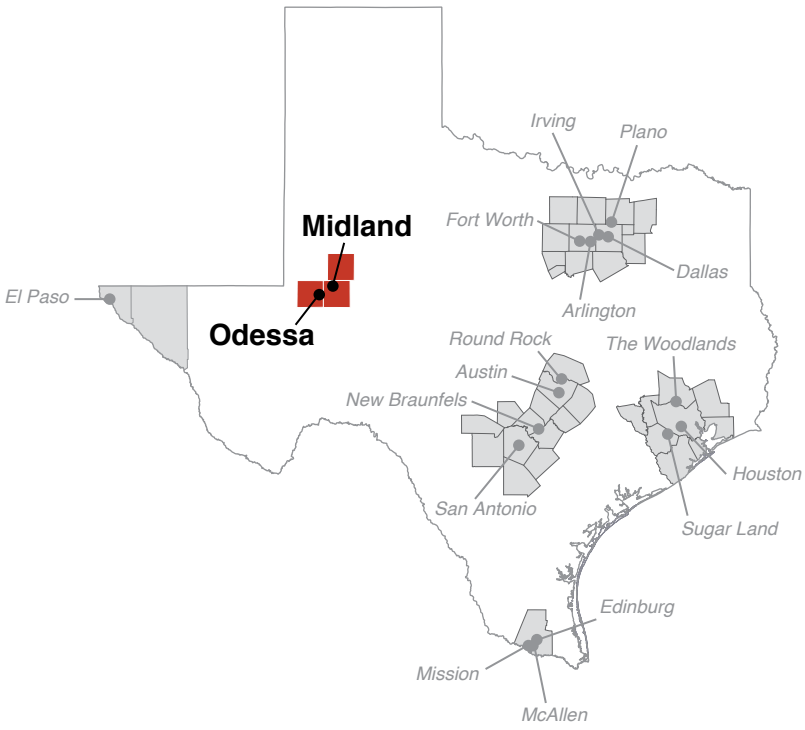
[13] See "McAllen Airport Unveils $26.5M Expansion," by Kristen Mosbrucker, *The Monitor,* May 5, 2015, www.themonitor.com/premium/mcallen-airport-unveils-m-expansion/article_78f14dda-f38e-11e4-89ec-8b2d03de8b92.html.

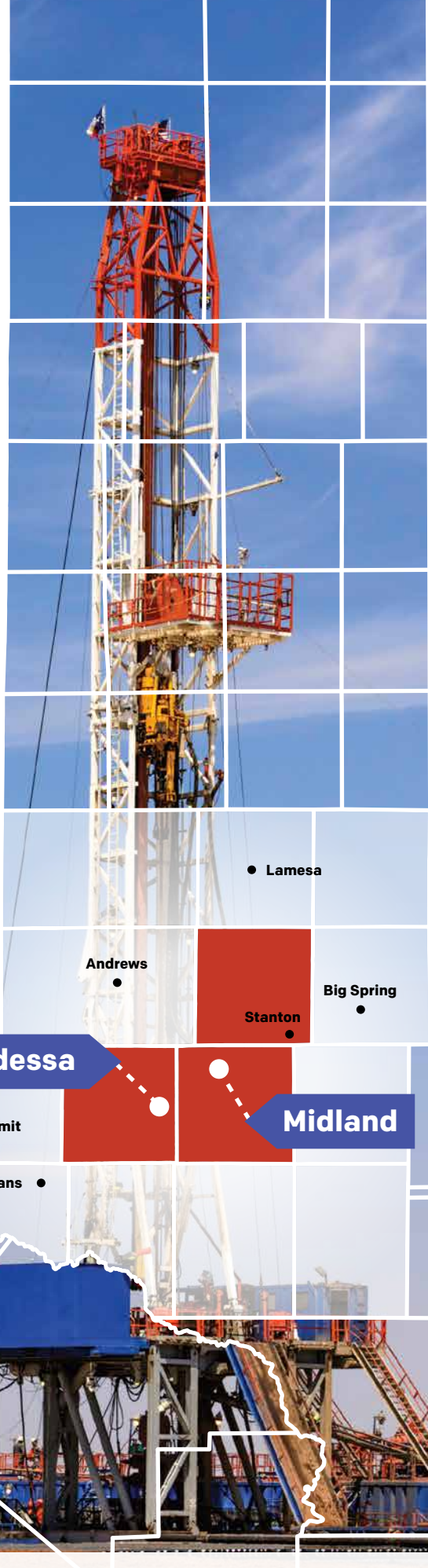
[14] Based on KRGV-TV's State Highway 365 report, July 7, 2015.

[15] See "Doctor's Hospital Looks to Expand," by Kristen Mosbrucker, *Valley Morning Star*, July 18, 2015, www.valleymorningstar.com/news/local_news/article_0e675c9a-2dbb-11e5-90c0-03ec4e65216f.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 shifted the economic focus to energy.
- After years of decline following the 1980s oil bust, the shale boom spurred economic growth, dominated by the energy industry but supported by manufacturing and transportation.
- Household income grew faster in Midland–Odessa than in any other Texas metro in this report between 2006 and 2014.
- The oil price bust will likely bring hardship to the area, but new investments in aerospace and alternative energy could buoy growth in the future.





Population (2014): 317,374

Population growth (2006–14): 26 percent

Median household income (2014): $68,215

National MSA rank (2014): Midland, No. 254*; Odessa, No. 265*

*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 sister cities about 20 miles apart and are jointly promoted as "Two Cities, No Limits." 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.[1]

The beginnings of the oil boom in the Permian Basin arrived in the 1920s. Scores of investors and oilfield workers moved to the area, and by 1929, 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.

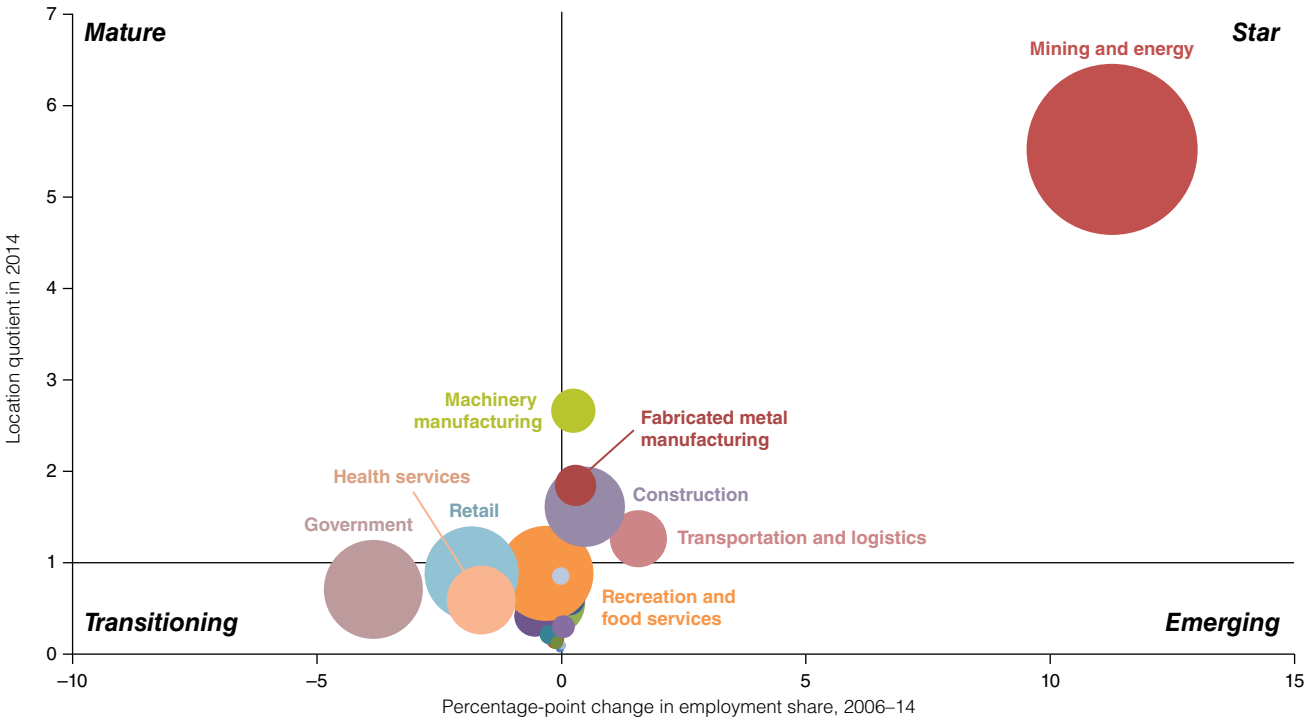
From that point forward, the area's economy was closely tied to the energy industry, rising with the oil booms and contracting with the busts. After years of decline that began with the 1980s oil bust, the Permian Basin and its economic center, Midland–Odessa, were regenerated by the recent shale oil boom.

INDUSTRY CLUSTERS: Energy-Driven Economy

The composition of industry clusters in Midland–Odessa is shown in Chart 7.1. It is organized by location quotient (LQ), a measure of a cluster's share of local employment relative to its share nationally, and the change in employment share between 2006 and 2014.[2]

Clusters in the "star" quadrant, such as mining and energy, have a large share of employment relative to the nation (an LQ far exceeding 1, in this case) and are fast growing. "Emerging" industries are relatively smaller than they are nationally (an LQ less than 1) but are fast

Chart 7.1: 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; authors' calculations.

growing. "Mature" sectors are more concentrated relative to the U.S. (an LQ exceeding 1) but are slower growing; "transitioning" clusters, such as government, are smaller relative to the nation and are slower growing.

The Midland–Odessa economy is overwhelmingly energy driven. A third of the workforce is employed by companies in the energy sector, and that cluster has experienced rapid growth. More than twice as many people worked for energy companies in Midland–Odessa in 2014 than in 2006.

Among the largest employers are Halliburton and Baker Hughes, oilfield services firms with a combined 3,000 employees in the two cities in 2014. A number of large and small energy production companies also have local offices.[3]

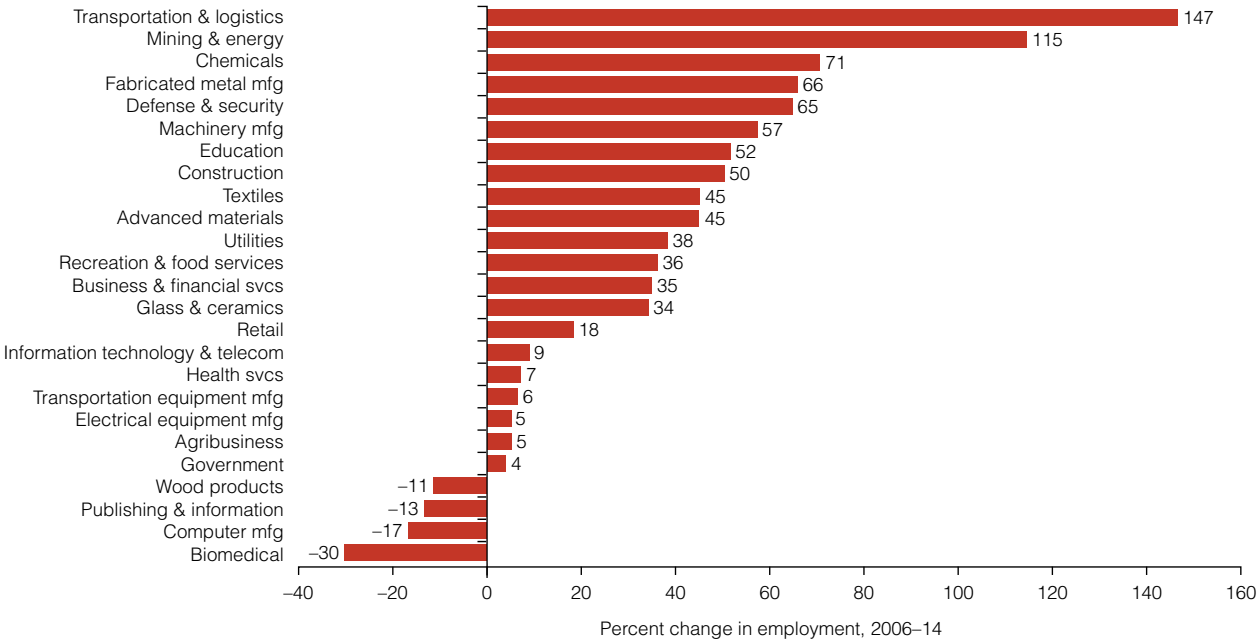
Midland–Odessa's other important industries have grown in support of its outsized energy sector. Machinery and fabricated metal manufacturers such as Warren Equipment (with almost 600 workers in Midland) primarily make oilfield equipment. The construction industry is also particularly concentrated. The shale-led boom created demand for many large projects, including new office buildings, and single-family and multifamily residences.

The transportation and logistics cluster employs only 4 percent of the workforce but is the fastest-growing industry cluster in Midland–Odessa, its size nearly tripling since 2006 (*Chart 7.2*). Growth has been focused in truck transportation and pipeline transportation serving the oil and gas production industry. Additionally, the region remains an important midway point between El Paso and Dallas.

Driven by high-paying energy jobs, inflation-adjusted annual wages have grown significantly since 2006 (*Table 7.1*). The average worker in Midland–Odessa made one-third more in 2014 than in 2006 in real terms.

Wages in industries with an LQ greater than 1 have driven the average up significantly; in 2014, workers in the most concentrated industries (star and mature clusters) made $85,000 annually on average, compared with $45,000 in less-concentrated industries. However, wage growth hasn't been limited to more-concentrated sectors. Even in industries with LQs of less than 1, wages grew 23 percent between 2006 and 2014.

Chart 7.2: Employment Growth in Midland–Odessa Driven by Shale Boom



SOURCES: Texas Workforce Commission; authors' calculations.

Table 7.1: Annual Earnings in Midland–Odessa Rise Steeply with Shale Oil Boom

Cluster	Midland–Odessa					U.S.
	2006	2008	2010	2012	2014	2014
Mining and energy	76,627	83,014	84,235	87,067	93,264	76,815
Machinery manufacturing	67,181	67,898	68,230	70,535	79,774	66,715
Fabricated metal manufacturing	60,727	63,672	62,020	67,078	75,532	53,130
Construction	46,164	57,425	53,865	61,984	65,885	55,041
Chemicals	62,128	72,216	70,884	80,021	76,743	69,856
Transportation and logistics	55,157	57,141	57,814	64,002	67,772	51,043
Clusters with location quotient >1	67,634	74,933	74,929	79,463	85,441	–
Clusters with location quotient <1	36,857	39,231	40,370	43,391	45,478	–
Average earnings (total)	46,986	52,002	52,202	58,341	63,532	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

DEMOGRAPHICS: Income Rises, Poverty Declines

Employment and wage gains attributable to the shale boom have translated into explosive growth in household income in Midland–Odessa. Between 2006 and 2014, nominal median household income grew 59 percent, more than in any other Texas metro area (*Chart 7.3*). Median household income was $68,215 in 2014—more than $15,000 above the Texas median and the highest among the metros in this report. Midland–Odessa also has the lowest poverty rate among all the metros in the group, 8.9 percent.

Despite relative economic success, Midland–Odessa trails the state in educational attainment. About 80 percent of residents age 25 or older are high school graduates—2 percentage points below the state average. Midland–Odessa also has the third-lowest share of population with a bachelor's degree or higher, 21.4 percent, ahead of only McAllen and El Paso and more than 6 percentage points lower than the Texas average of 27.8 percent. This is likely because many oilfield jobs do not require a college education.

Midland–Odessa's population is predominantly Hispanic (50 percent) and white (42 percent). The area's importance as the heart of the Permian Basin has boosted domestic migration. From 2010 to 2014, domestic migration accounted for nearly 62 percent of the area's population increase. While just 1 percent of the Texas population lives in Midland–Odessa, 4 percent of all domestic migrants to Texas moved to Midland or Odessa from 2010 to 2014.[4]

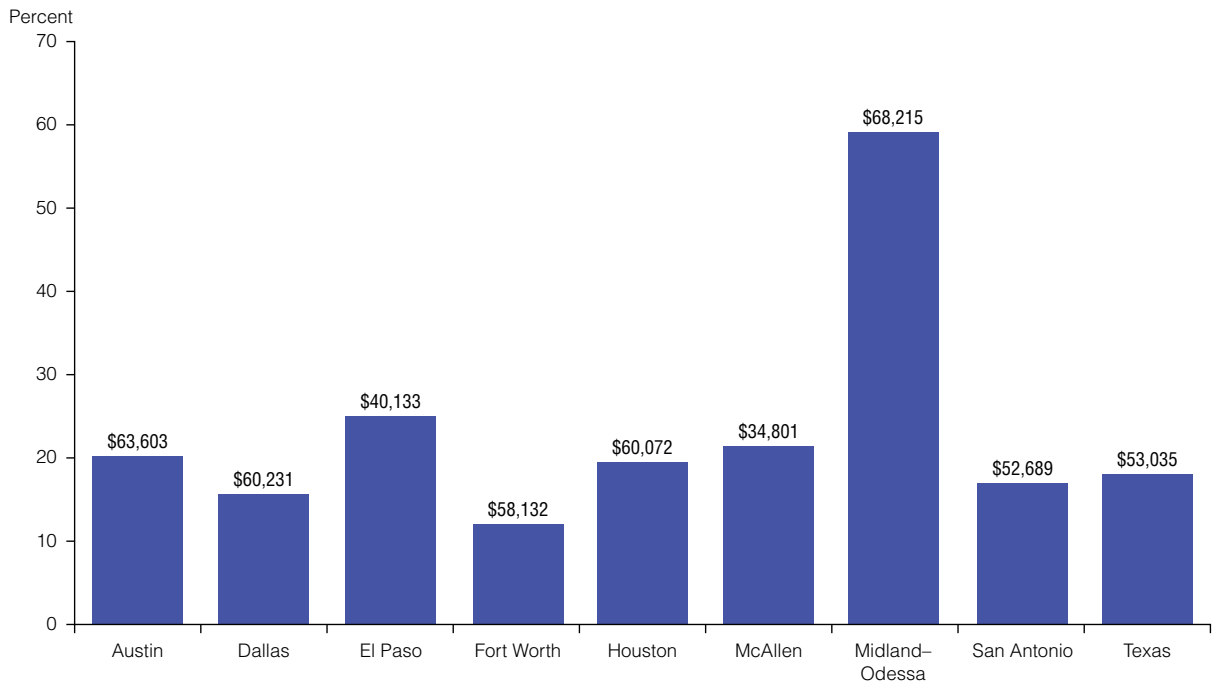
EMPLOYMENT: A Tale of Boom and Bust

Before the shale oil boom, Midland–Odessa was hit hard by the Great Recession, losing more jobs as a share of total employment than any other Texas metro. Between October 2008 and August 2009, employment fell nearly 10 percent. The area's economy has long been tied to oil prices, and the nearly 77 percent decline in the price of West Texas Intermediate (WTI) crude that accompanied the Great Recession severely affected employment—even more profoundly than in Houston, with its more diverse industry mix. However, Midland–Odessa, like Houston, benefited from the tailwind of the shale boom following the Great Recession.

Employment climbed back to prerecession levels by March 2011 and grew at a far faster pace than in other major Texas metros—42 percent between December 2009 and December 2014, or 7.2 percent per year, and 1.8 times faster than in postrecession Austin (4 percent per year over the same period).

After every oil boom comes an oil bust. With WTI prices in November 2015 at 62 percent below their 2014 peak, Midland–Odessa lost 3,800 jobs in the first 11 months of 2015, a 2.3 percent annualized rate of decline.[5] Of the two cities, low oil prices have hit Odessa the hardest. The unemployment rate has increased

Chart 7.3: Household Income Grows Explosively in Midland–Odessa



NOTES: Chart shows nominal median household income growth from 2006 to 2014. Median income figures are from 2014.
SOURCES: 2006 and 2014 American Community Surveys.

faster in Odessa than Midland. Despite Odessa's smaller workforce, it accounts for 50 percent of jobs lost in the area since December 2014.

OUTLOOK: New Industry Holds Promise

The oil price collapse poses a major challenge for Midland–Odessa's economy, with the energy industry accounting for a third of the area's employment and nearly half of total wages earned in 2014. Overall employment has already begun to decline, and a new push in the energy industry to cut costs may diminish wage growth. The shale boom drove up demand for housing and commercial development; the bust will impact construction and real estate along with manufacturing and transportation.

Despite the seeming pervasiveness of commodity market weakness, the downturn is unlikely to be permanent. The Permian Basin has a long history of ups and downs—drilling and extraction have occurred for more than 90 years—and the industry will eventually recover as prices rebound. Area reserves could likely sustain drilling for another half-century or more.[6] The area also has the potential to produce alternative energy sources, such as wind power. The Permian Basin is home to 11 wind farms, with more such projects planned.[7]

Midland is also attempting to diversify its economic base. The Federal Aviation Administration has granted the Midland International Air and Space Port a commercial space launch site license, making it the first commercial airport in the U.S. designated as a spaceport.[8] Aerospace research and development firm XCOR Aerospace and aerospace equipment manufacturer Orbital Outfitters have indicated interest in the area, and plans for a spaceport business park could potentially draw additional related firms, building a new industry that could bring future employment and economic growth.

Midland—Odessa Growth Outlook

Drivers

- A commercial spaceport may draw aerospace research and development and high-tech manufacturing companies to the area.
- A long history of drilling in the Permian Basin suggests that the industry will eventually recover along with prices and that production will grow again.
- Investments in alternative energy could help damp the impact of future oil price busts.
- Transportation and distribution industries will continue to grow as Midland–Odessa remains an important midway point between Dallas and El Paso.

Challenges

- Low oil prices threaten to slow or reverse growth in energy and related manufacturing and services industries.
- The energy-related job base will contract as rig counts decline.
- Industry cost cutting may halt wage growth.
- A recent real estate boom driven by energy industry expansion may turn to bust and result in increased vacancies in single-family, multifamily and commercial properties.

Notes

[1] The histories of Midland and Odessa are adapted from the Texas State Historical Association online at tshaonline.org/handbook/online/articles/hdm03 and tshaonline.org/handbook/online/articles/hdo01.

[2] The percentage shares of each cluster add up to more than 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 and Odessa's top employers was compiled from several local websites: www.midlandtexas.gov/ArchiveCenter/ViewFile/Item/182, odessatex.com/major-employers and www.midlandtxchamber.com/allcategories.

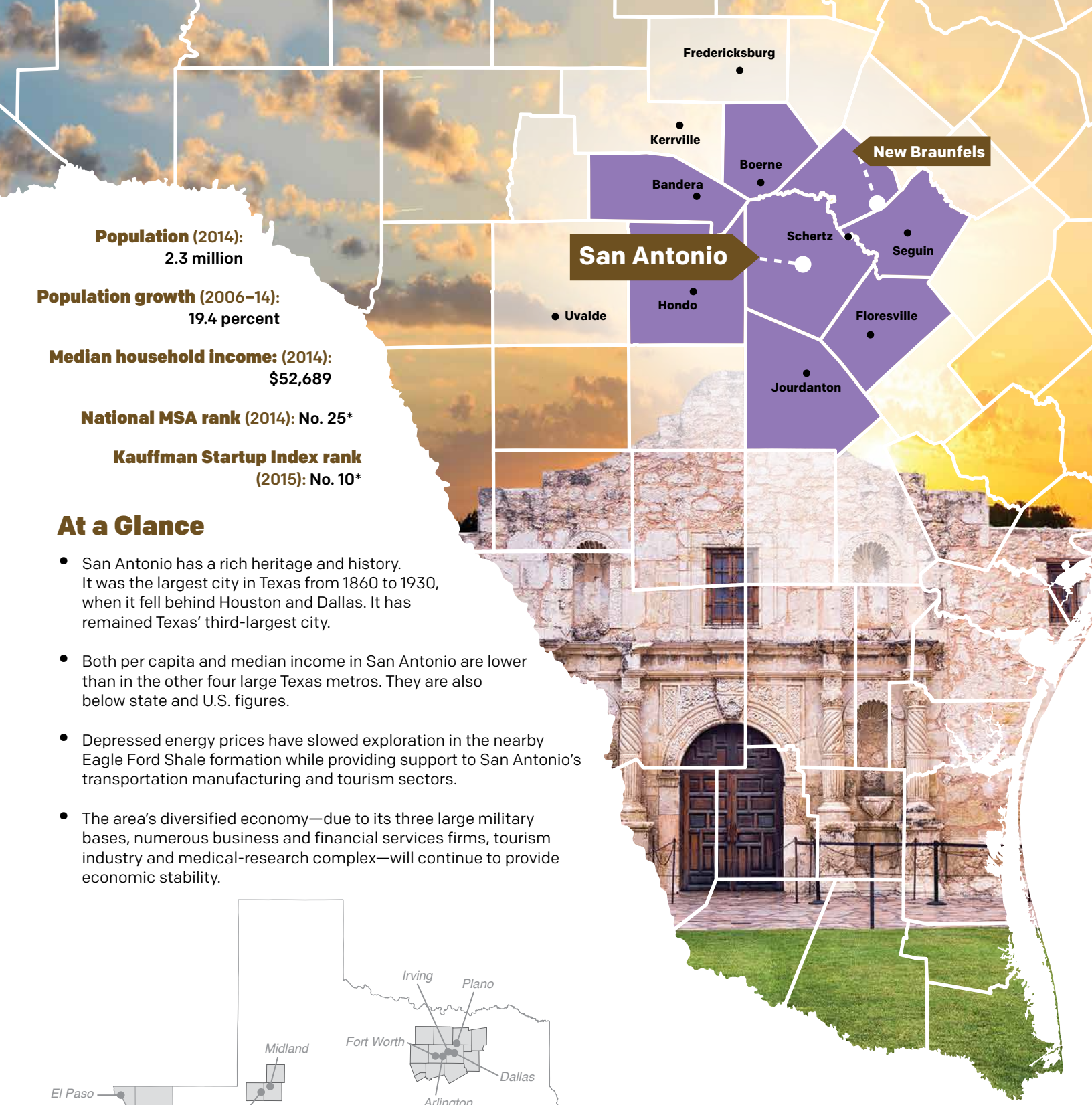
[4] The estimates are based on the 2010 census and reflect changes to the April 1, 2010, population due to the Count Question Resolution program and geographic program revisions.

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

[6] Data are from the Odessa Chamber of Commerce presentation on Odessa economic development, May 2014, odessatex.com.

[7] 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.

[8] The Midland commercial spaceport development detail is from the Midland Development Corp. website, midlandtxedc.com/commercial-spaceport-development.



Population (2014): 2.3 million

Population growth (2006–14): 19.4 percent

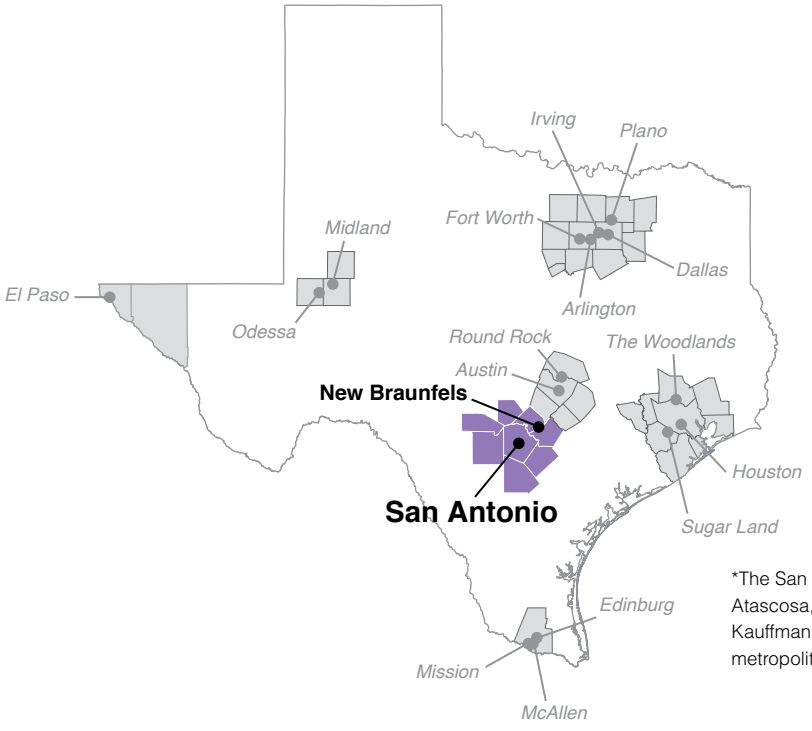
Median household income: (2014): $52,689

National MSA rank (2014): No. 25*

Kauffman Startup Index rank (2015): No. 10*

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 city.
- Both per capita and median income in San Antonio are lower than in the other four large Texas metros. They are also below state and U.S. figures.
- Depressed energy prices have slowed exploration in the nearby Eagle Ford Shale formation while providing support to San Antonio's transportation manufacturing and tourism sectors.
- The area's diversified economy—due to its three large military bases, numerous business and financial services firms, tourism industry and medical-research complex—will continue to provide economic stability.



*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, which was built to defend the San Antonio mission, and the San Fernando de Béxar, which 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.

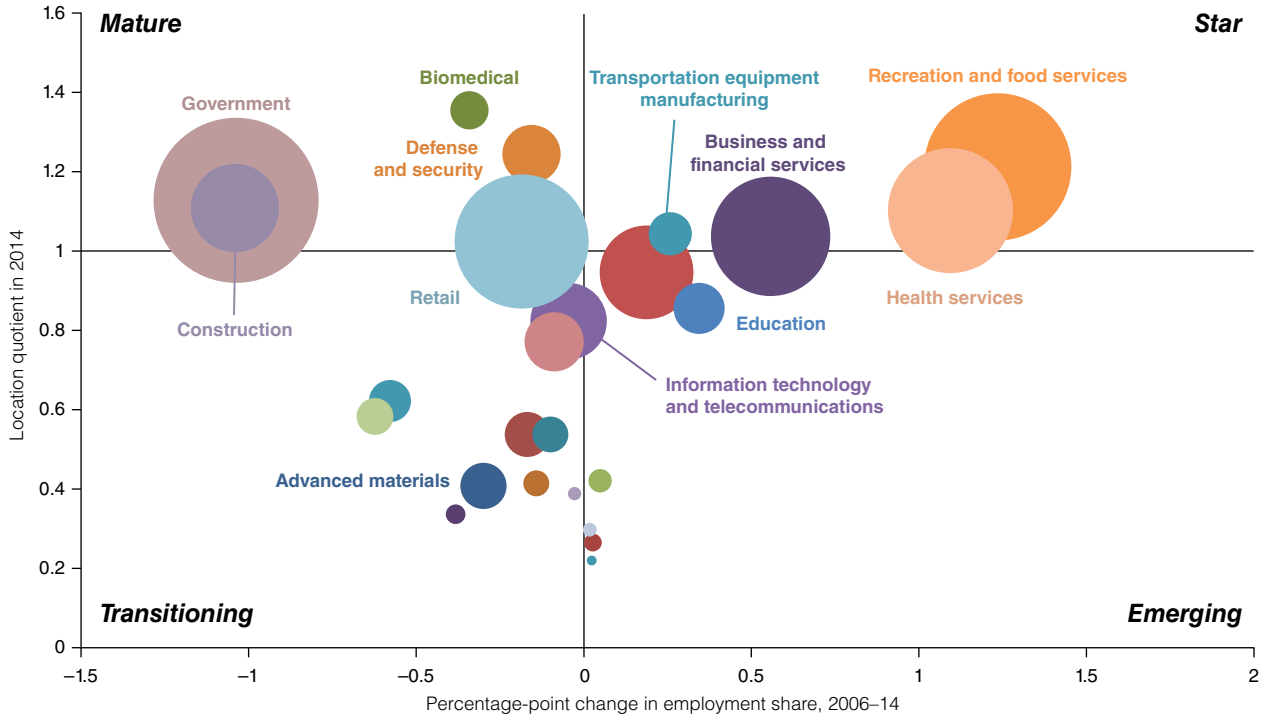
In 1860, San Antonio surpassed Galveston to become the largest city in Texas and, following the Civil War, it thrived as a center for the cattle industry. The 1877 arrival of San Antonio's first railroad—the Galveston, Harrisburg and San Antonio Railway—fueled the city's economic growth and spurred additional railroad connections to other parts of the country by 1900.[1]

However, San Antonio's population fell behind that of Houston and Dallas by 1930, and San Antonio has remained the third-largest urban area in Texas since then.

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 stable 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

Chart 8.1: 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; authors' calculations.

Fort Sam Houston chosen as site of the U.S. Army Medical Field Service School, the hospital was renamed Brooke Army Medical Center. It marked the beginning of the area's ties to medical research.

INDUSTRY CLUSTERS: Military, Health and Tourism Dominate

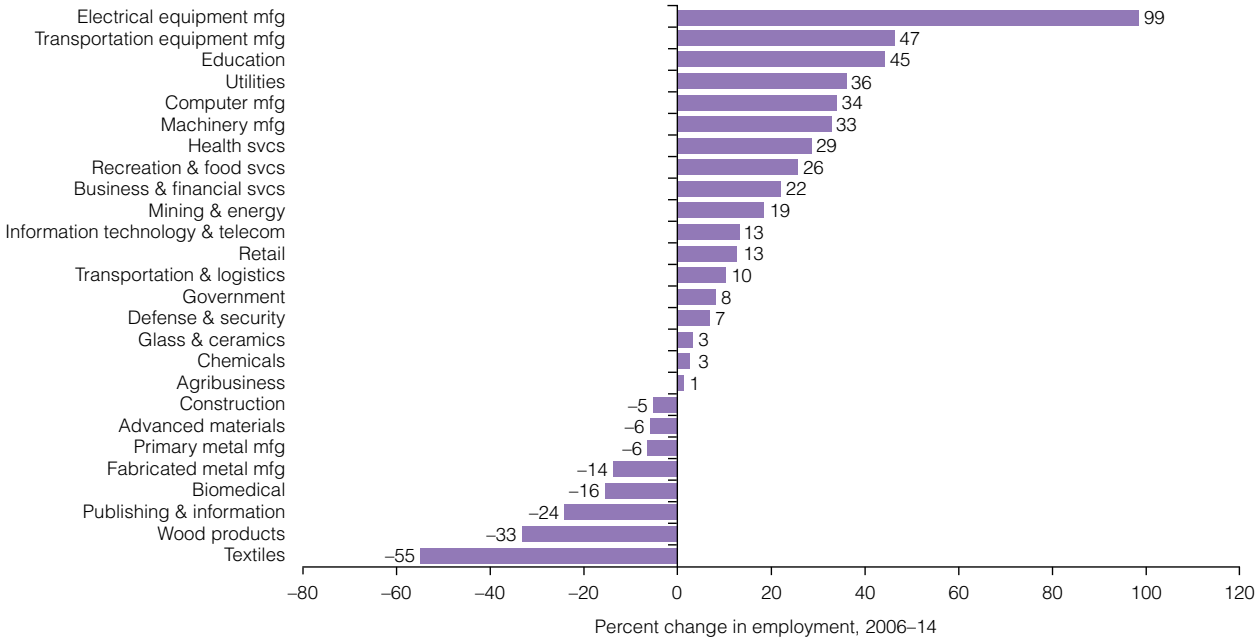
Location quotients (LQs), which compare the relative concentration of various industry clusters locally and nationally, can be used to assess key drivers in an economy. An LQ exceeding 1 indicates that a specific industry cluster is more dominant locally than nationally. Industry cluster growth is measured by the percentage-point change in its share of local employment between 2006 and 2014 (*Chart 8.1*).[2]

Clusters in the top half of the chart, such as recreation and food services, defense and security, and government 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 rapidly ("star") or growing slowly ("mature"). Those in the bottom half, such as information technology and telecommunications, are less dominant locally than nationally and, hence, have LQs below 1. "Emerging" clusters, such as education, are fast growing; those growing slowly are "transitioning."

The relatively larger LQs of recreation and food services, defense and security, and government reflect their outsized role in the San Antonio area. Government is the largest cluster on the strength of the region's three large military installations, which together employ more than 80,000 residents.[3] The military bases support employment in the defense and security and health clusters.

The health and biomedical sectors also have a strong foothold in the area, with a combination of private and government operations. Employment in private health-related institutions accounts for about 10 percent of San Antonio's workforce, higher than in other major Texas metros, including Houston, and its share grew in the 2006–14 period. Medical research facilities in San Antonio include the Brooke Army Medical Center's San Antonio Military Medical Center—the nation's largest military hospital—and Wilford Hall Ambulatory Surgical Center at Lackland Air Force Base, the University of Texas Health Science Center at San Antonio, the Texas Biomedical Research Institute and the 1,200-acre Texas Research Park.

Chart 8.2: Electrical and Transportation Manufacturing Jobs Fastest Growing in San Antonio



SOURCES: Texas Workforce Commission; authors' calculations.

Table 8.1: Pay in San Antonio's Dominant Clusters Lags U.S.

Cluster	San Antonio					U.S.
	2006	2008	2010	2012	2014	2014
Biomedical	65,526	71,371	70,047	65,948	70,291	91,463
Defense and security	52,859	43,852	45,621	56,526	57,278	59,588
Recreation and food services	22,266	21,193	21,609	21,002	21,501	23,870
Government	46,459	48,473	51,600	50,647	51,786	51,726
Construction	46,438	46,614	47,506	49,066	50,854	55,041
Health services	46,058	46,192	48,098	47,314	47,027	56,055
Transportation equipment manufacturing	59,817	51,767	56,579	56,573	60,535	71,570
Business and financial services	68,651	67,033	71,303	74,267	73,708	92,957
Retail	30,128	28,570	29,254	29,824	30,065	28,743
Clusters with location quotient >1	42,816	42,364	44,407	44,645	45,017	–
Clusters with location quotient <1	57,006	55,462	55,814	57,433	58,132	–
Average earnings (total)	43,172	42,850	44,176	44,288	44,868	51,361

NOTES: Clusters are listed in order of location quotient (LQ); clusters shown are those with LQs greater than 1. Earnings are in 2014 dollars.
SOURCES: Texas Workforce Commission; Bureau of Labor Statistics; authors' calculations.

Electrical equipment manufacturing—which includes household appliance, electrical lighting equipment and electrical component manufacturers—was the fastest-growing cluster from 2006 to 2014 as employment increased 99 percent (*Chart 8.2*). Transportation equipment manufacturing grew 47 percent during the period, thanks to a Toyota USA plant that began operations in 2006. It produces the Toyota Tundra, a full-size pickup, and added the Tacoma truck in 2010. Toyota employs 2,900 workers in its facility and relies on a host of area suppliers.

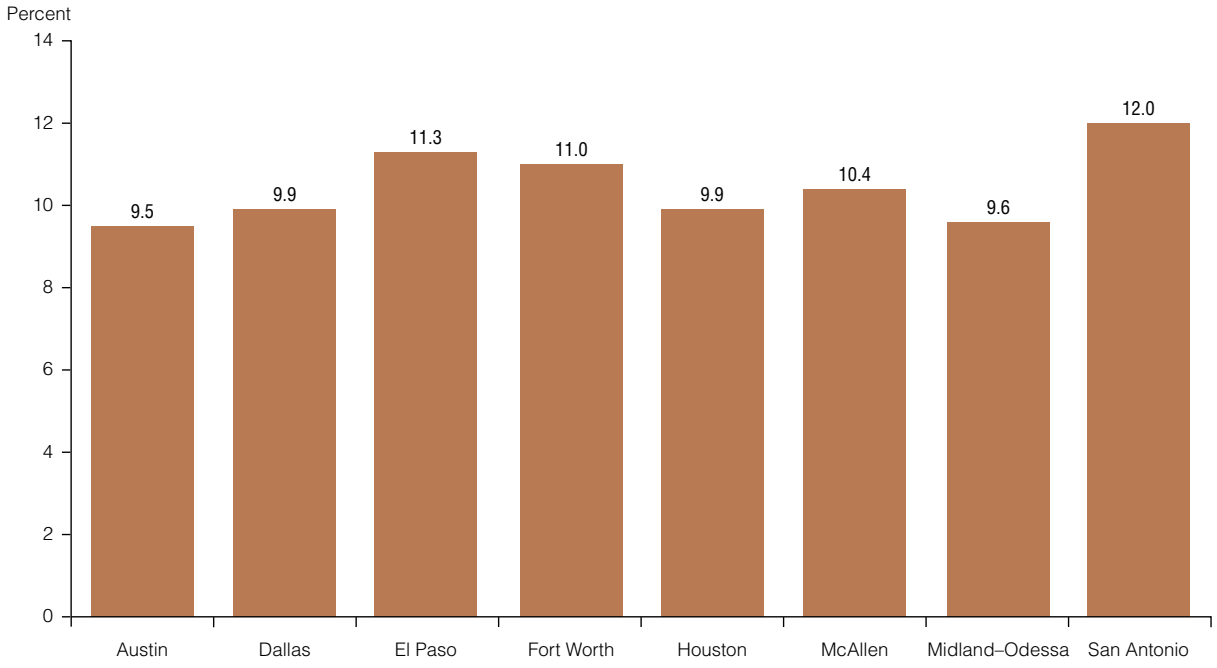
Tourism is one of the area's most important industries—local attractions draw millions of visitors annually—and, along with the travel industry, generated $13.4 billion in economic impact in 2013.[4] San Antonio is also a top U.S. convention city. Employment in recreation and food services, the second-largest cluster, expanded 26 percent (26,100 jobs) from 2006 to 2014. San Antonio is home to two of the region's premier theme parks—SeaWorld, the largest of three such parks in the U.S., and Fiesta Texas, a 200-acre amusement park. Other notable attractions include the River Walk and the Alamo.

Business and financial services, the metro's fifth-largest cluster, accounts for 9 percent of the local workforce—roughly equivalent to its national presence. San Antonio is headquarters of Cullen/Frost Bankers Inc. and USAA (United Services Automobile Association), a Fortune 500 financial services group. Employment in the business and financial services cluster expanded 22 percent from 2006 to 2014.

On average, clusters with a greater employment concentration in San Antonio than in the U.S. paid less, about $45,000 annually, than those with a relatively smaller presence, $58,100 (*Table 8.1*). The average wage is lower because San Antonio's dominant clusters are in industries that typically command less pay. These include recreation and food services at $21,500 annually and retail at $31,000. Still, some locally concentrated clusters—biomedical and business and financial services—are among the highest paying at $70,300 and $73,700 annually, respectively.

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, 24,000 people work in home health care services.[5] Many are unlicensed, nonmedical caregivers, and the average salary for these jobs—$19,600 in 2014—is significantly lower than for others in the sector. With home health workers removed, the rest of the health cluster averaged approximately $56,800 in 2014, on par with the U.S. at $56,100.

Chart 8.3: San Antonio's Senior Population Share Is Highest Among Large Texas Cities



NOTE: Data reflect share of population over 64 years old.
SOURCE: 2014 American Community Survey.

DEMOGRAPHICS: More Seniors, Low Incomes

San Antonio has the largest share of seniors among metros in this report at 12 percent (*Chart 8.3*). Still, the median age is 34.4 years, in line with the Texas median of 34.3. 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.

The population is predominantly Hispanic, 55 percent—the highest share among the five large Texas metros and well above the Texas share of 38.6 percent.[6] Despite the higher proportion of Hispanics, the metro area has the lowest foreign-born population among the metros in this report at 12 percent. This compares with the foreign-born share of 16.8 percent in Texas and 13.3 percent in the U.S.

San Antonio trails the state in educational outcomes. Twenty-six percent of the population age 25 and over holds a bachelor's degree or higher, compared with the Texas average of 28 percent. The metro's less-educated populace relative to other large Texas metros, combined with its high concentration of low-paying service jobs in sectors such as recreation and retail, has restrained per capita and median incomes. San Antonio trails other large Texas metros as well as state and national averages in both measures of income.

EMPLOYMENT: Steady As She Goes

Its large government presence (an LQ of 1.1), along with somewhat less-dominant business and financial services and manufacturing sectors, likely helped San Antonio weather the Great Recession better than other major Texas metros. San Antonio lost 2.6 percent of its jobs between the prerecession peak in August 2008 and the recession trough in September 2009, while Texas lost 4.1 percent of its jobs. The Alamo City regained prerecession levels of employment faster than any of the major metros except Austin.

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 11.7 percent above its 2008 high, just a tad higher than Texas' overall increase of 10.4 percent from its 2008 peak.

Thanks in part to San Antonio's relatively limited dependence on the slumping mining and energy sector—

the cluster accounts for 5.6 percent of its workforce—the metro's annualized job growth in the first 11 months of 2015 was vigorous at 3.6 percent, compared with the state rate of 1.3 percent. Unemployment at year-end 2014 fell below 4 percent, where it remained through 2015.[7]

OUTLOOK: Employment Stability Lifts Economy

San Antonio's industry profile is as unique as its history, with a concentration in biomedical, defense and security, government, health, and recreation and food services. In the near term, those industries' performance will set the course for the area's economy.

San Antonio's dependence on military and government jobs—government accounted for nearly 17 percent of the area's 2014 output—provides stability, though federal budget constraints will likely limit growth.[8] San Antonio ranked ninth in 2012 among metro areas with the largest concentrations of government and military workers.[9]

Depressed oil prices have hurt drilling in the nearby Eagle Ford, where in November 2015 the total rig count was 68 percent below prior-year levels. However, relatively low fuel prices have been beneficial for oil refiners such as San Antonio-based Valero Energy Corp. and for the sale of large vehicles such as the trucks Toyota's San Antonio plant builds. Low fuel prices have also given consumers greater disposable income, boosting tourism and supporting growth in the recreation and food services cluster and the 13.8 percent of the workforce it represents.

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.

San Antonio—New Braunfels Growth Outlook

Drivers	Challenges
• The government cluster continues to provide stability as the region's population expands and the low unemployment rate attracts new residents. • Low energy prices will aid transportation equipment manufacturing and tourism growth. • Biomedical and health services should support job growth in the area.	• Weakness in energy prices has dampened growth in the nearby Eagle Ford Shale formation, which may adversely impact the area's economy. • A relatively short supply 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 to federal budget cuts in the future.

Notes

[1] The history of San Antonio is taken 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] Individual industry cluster shares add up to more than 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.

[3] Data on the largest employers in San Antonio were obtained from the San Antonio Economic Development Foundation, www.sanantonioedf.com/business-profile/major-employers.

[4] See "The Economic Impact of San Antonio's Hospitality Industry," www.sanantoniotourism.com/downloads/research/TourismReport.pdf.

[5] See definition of home health care workers in NAICS 6216.

[6] Texas' major metros are Austin, Dallas, Fort Worth, Houston and San Antonio.

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

[8] Output data are from the Bureau of Economic Analysis.

[9] 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.

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 metro areas.[3] We included the Retail, Construction and Utilities NAICS supersectors and added a Government sector that includes federal, state and local government workers. We took hospitals and health and personal care stores out of the Biomedical StatsAmerica cluster and created a separate Health cluster that includes personal care stores, hospitals and ambulatory health care services.

We combined the StatsAmerica Mining and Energy clusters, and aggregated all of the mining and support activities subsectors up to the three-digit level. We modified StatsAmerica's Education and Knowledge Creation cluster to include only educational services. We also added food services back into Arts, Entertainment and Recreation (called Recreation and Food Services) by including all the Accommodation and Food Services supersector. 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 Austin, Houston, San Antonio, El Paso and McAllen. For Dallas and Fort Worth, we used the Census Bureau's definitions of metropolitan divisions. For Midland–Odessa, we combined the two MSAs into one. (See A.3 for the list of counties included in each metro.)

We used 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 each metro and for Texas overall were retrieved from the Texas Workforce Commission (TWC), while data for 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. Data from the TWC are suppressed to a lesser degree than those from the BLS. TWC data are only available quarterly, so annual employment data were calculated by taking the average of quarterly employment, and 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. 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.[4] 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. The most recent available data are from 2014; we compared those with data from the 2006 survey. In both 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 startup firms per 100,000 residents.

A.2. Changes to StatsAmerica Cluster Definitions

- Split Manufacturing grouping into individual subcluster components.
- Changed Education and Knowledge Creation to include just Educational Services (NAICS 61). Removed NAICS 51111 (Newspaper Publishers), NAICS 51112 (Periodical Publishers), NAICS 51113 (Book Publishers) and NAICS 516 (Internet Publishing and Broadcasting, which are already counted in Printing and Publishing). Moved NAICS 519 (Other Information Services) to Printing and Publishing cluster.
- Removed NAICS 51911 and NAICS 51919 from Printing and Publishing to avoid double counting.
- Combined the Mining and Energy clusters.
- Aggregated all subsectors in NAICS 212 and 213.
- Removed NAICS 621 and NAICS 446 from Biomedical cluster and created a Health sector that includes NAICS 621, NAICS 622 and NAICS 446, with no exclusions. NAICS 623 was not included.
- Added Retail (NAICS 44–45), Construction (NAICS 23) and Utilities supersectors (NAICS 22).
- Added a Government sector, which includes total federal, state and local government workers.
- Aggregated the individual NAICS subsectors 7211 and 7212 up to the NAICS 72 sector level in the Recreation cluster. All other industries in the original Stats America cluster Arts, Entertainment, Recreation and Visitor Industries were included as is.

A.3. Metropolitan Statistical Area (MSA) County Definitions[5]

Austin–Round Rock MSA: Bastrop, Caldwell, Hays, Travis, Williamson
Dallas–Plano–Irving Metropolitan Division: Collin, Dallas, Denton, Ellis, Hunt, Kaufman, Rockwall
El Paso MSA: El Paso, Hudspeth
Fort Worth–Arlington Metropolitan Division: Hood, Johnson, Parker, Somervell, Tarrant, Wise
Houston–The Woodlands–Sugar Land MSA: Austin, Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, Waller
McAllen–Edinburg–Mission MSA: Hidalgo
Midland–Odessa Combined Statistical Area: Ector, Martin, Midland
San Antonio–New Braunfels MSA: Atascosa, Bandera, Bexar, Comal, Guadalupe, Kendall, Medina, Wilson

A.4. Location Quotient and Average Wage Equations

1. 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. 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.5. 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 list of metro areas and their definitions.
[4] See A.4 for the full equations.
[5] See Office of Management and Budget Bulletin 13-01, Feb. 28, 2013, www.whitehouse.gov/sites/default/files/omb/bulletins/2013/b-13-01.pdf.