

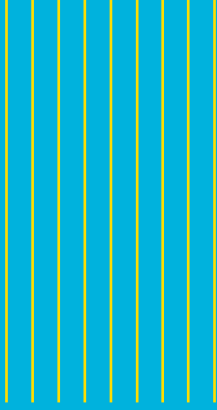
CBRE RESEARCH

2019 SCORING TECH TALENT

Influencing Innovation, Economic & Real Estate Growth
in 50 U.S. & Canadian Markets

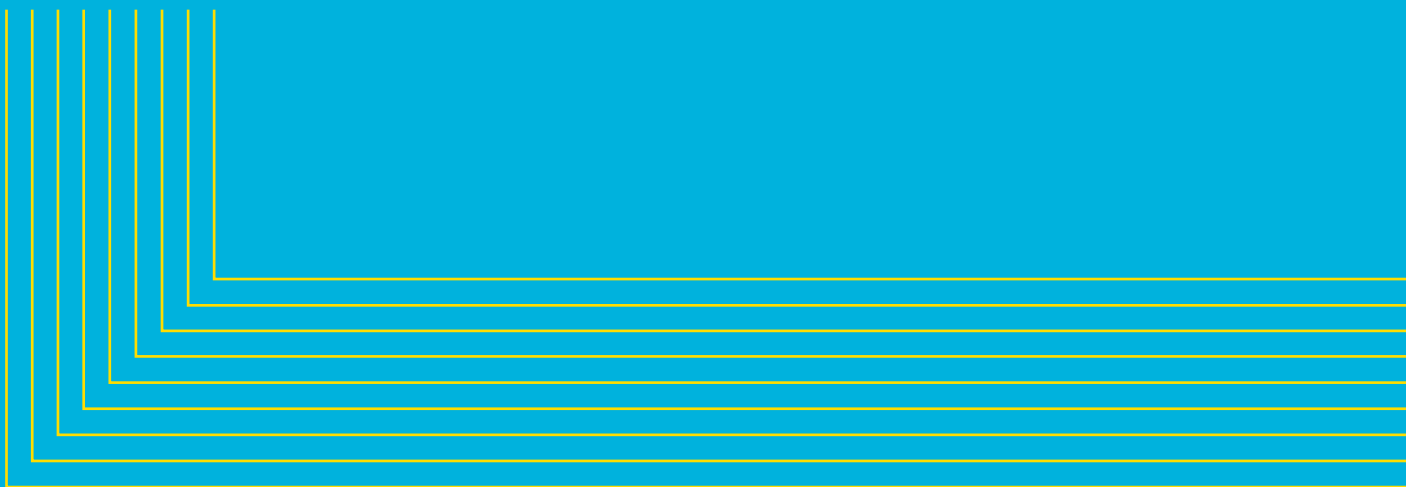


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Scoring Tech Talent is a comprehensive analysis of labor market conditions, cost and quality in the U.S. and Canada for highly skilled tech workers. The top-50 markets were ranked according to their competitive advantages and appeal to both employers and tech talent. The analysis also provides insight into the quality of tech workers, their demographics and how tech talent growth patterns are impacting cities and real estate markets.



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Tech talent is a group of highly skilled workers in more than 20 technology-oriented occupations driving innovation across all industry sectors.

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KEY TAKEAWAYS

More than 6 million highly skilled workers across the U.S. and Canada comprise the tech talent that is leading global innovation by developing the software and devices we depend on and managing the data and systems that ensure functionality of our tech ecosystems.

A strong economy and tight labor market are constraining tech talent job growth, resulting in rising labor and occupancy costs. Even though current demand remains above the known supply for the most sought-after tech skills, rising tech-degree completions should begin to alleviate this imbalance.

MOMENTUM

Tech talent labor pools have deepened during the past five years, but tighter labor markets have lessened the rapid pace of past growth and led to fewer momentum markets. Tech talent job growth accelerated in 15 of 50 markets, with notable surges in Orlando, San Diego, Chicago and Cleveland.

COMPETITIVENESS

Tech talent job creation has outpaced qualified professionals for years, leading to rising labor costs and increased competition to attract and retain talent. Understanding the level of competition by market helps inform labor strategy. The most competitive markets are the San Francisco Bay Area, Seattle, Denver and Austin.

NEXT 25 – OPPORTUNITY MARKETS

Fostering talent development in lesser-known and under-developed markets could offer additional talent pools to employers seeking to expand their geographical reach and uncover opportunities. These smaller markets show potential and are concentrated in Canada and the U.S. Midwest and South.



#SCORE

Thirteen metrics measure each market's depth, vitality and attractiveness. The top-ranked markets are the San Francisco Bay Area, Seattle and Toronto. Markets registering the greatest rise in the rankings are Vancouver, Madison, Salt Lake City and Portland.

BRAIN GAIN

The number of tech degree graduates were compared with tech talent job creation in each market to determine brain gains or brain drains. Washington, D.C., Boston and Los Angeles produce more graduates than jobs and are the most drained markets, while Toronto, the San Francisco Bay Area, Seattle and Charlotte gained the most tech talent.

\$COST

The typical 500-person tech company needing 75,000 sq. ft. of office space can expect a total annual cost (labor and real estate) to range from \$29 million in Montreal to \$59 million in the San Francisco Bay Area.



WHAT IS TECH TALENT?

Tech talent comprises highly skilled technical workers who create and enable the software and devices that are integrated into nearly everything we do. Computers in the home and at work are commonplace, but new tools (i.e., wearable technology, Wi-Fi-enabled devices and sensors, and voice-activated home assistants) are becoming more universally adopted as expectations for fast deliveries and real-time information updates increase. Technology is the future and companies across all industries are expanding

their innovation capabilities through tech talent to satisfy changing business needs and consumer demands.

More than 6 million highly skilled tech talent workers are leading global innovation that will shape our daily lives and economy for decades to come. These tech talent workers comprise 20 different occupations—from software developers who enable the devices we depend on, to systems and data managers who ensure the





functionality of our tech ecosystems.¹ Although these positions are highly concentrated within the high-tech industry, they are spread across all industry sectors (Figure 1). Therefore, a software developer who works for a logistics or health-care company is included in our data.

The 5.2 million tech talent workers in the U.S. and 833,000 in Canada account for 3.7% and 5.3% of total workers in each country, respectively. This relatively small labor force has an outsized impact on

real estate markets and the economy. The number of tech talent workers has increased by 16% in the past five years, adding 693,000 jobs to the U.S. economy at a pace more than twice the national average. They are fueling innovation and adapting technology within non-traditional tech sectors to increase productivity and strengthen the national economy.

¹Tech talent includes the following occupation categories: software developers and programmers; computer support, database and systems; technology- and engineering-related; and computer and information system managers.





FIGURE 1: TECH TALENT LABOR BY INDUSTRY (2018)*

Tech Talent occupations in each industry as a % of U.S. Tech Talent

37.2% CORE HIGH-TECH*

10.5% PROFESSIONAL, SCIENTIFIC & TECHNICAL SERVICES (EXCLUDING HIGH-TECH)

8.6% OTHER

8.3% FIRE

6.2% MANAGEMENT OF COMPANIES & ENTERPRISES

6.0% GOVERNMENT

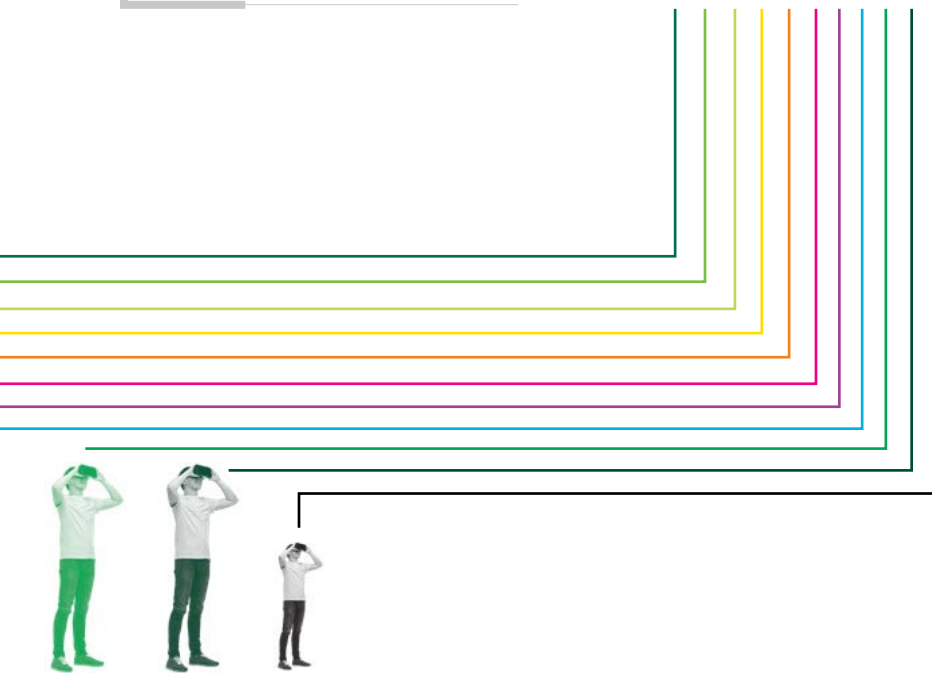
5.8% INFORMATION (EXCLUDING HIGH-TECH)

4.9% TRANSPORTATION, WAREHOUSING & WHOLESALE

4.8% MANUFACTURING (EXCLUDING HIGH-TECH)

4.8% EDUCATION

2.9% HEALTH CARE



Source: U.S. Bureau of Labor Statistics (National), April 2019.
*Includes computer software and services and computer product manufacturing

WHICH ARE THE TOP-RANKED TECH TALENT MARKETS?

The highly competitive and supply-constrained market for tech talent has accelerated the expansion of tech talent pools beyond major hubs and into smaller markets. These previously undersupplied regions are gaining demand for tech talent from start-ups and established companies. Accordingly, demand for commercial real estate to accommodate this growing workforce is on the rise.

Fifty of the largest markets by number of tech talent professionals in the U.S. and Canada were analyzed to create a scorecard ranking them comparatively (Figure 2). The scorecard uses 13 metrics to measure each market's depth, vitality and attractiveness to companies seeking tech talent and to tech workers seeking employment. Each metric is weighted by the relative importance to job creation and innovation. Tech talent concentration metrics have the highest weights because they signify clustering of tech workers. Labor costs for tech talent are weighted more heavily than office rents because companies allocate more capital to labor than to real estate.

The top-three markets are the San Francisco Bay Area, Seattle and Toronto. Comparing the 2019 market rankings with the previous year, a few markets shifted positions. Six of the top-10 markets retained the same rankings, with Toronto taking the third position from fourth-ranked Washington, D.C. and Denver taking the eighth position from 10th-ranked Raleigh-Durham.

Supported by strong tech-centric universities, Vancouver and Madison rose the most—by 12 and 10 spots, respectively. Migration and expansion of tech companies also caused Salt Lake City and Portland to rise by seven and five spots, respectively.

Demand for tech talent is high in both large and small markets across all industries as companies expand technology capabilities. Major gateway markets such as New York, Toronto and the San Francisco Bay Area dominate overall tech talent growth because of their size. These markets, along with others with a tech talent labor pool of more than 50,000 workers, are categorized as “large,” while those below this threshold are categorized as “small.” Both large and small markets have their advantages: While large markets tend to have a deeper pool of talent, small markets typically offer business and cost-of-living savings.

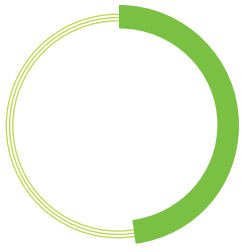
Tech labor concentration—the percentage of total employment—is an influential factor in how “tech” the market is and its growth potential. Tech talent comprises 10.0% of total employment in the San Francisco Bay Area and 9.9% in Ottawa—the highest concentrations of the

top-50 markets and more than three times the national average of tech talent density. Toronto, Seattle and Washington, D.C. round out the top-five most concentrated tech markets, ranging from 7.9% to 8.3% of their total employment. This sizeable concentration of highly skilled workers offers an environment conducive to innovation.



FIGURE 2: TECH TALENT SCORECARD RANKING

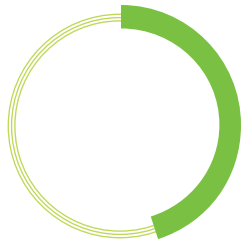




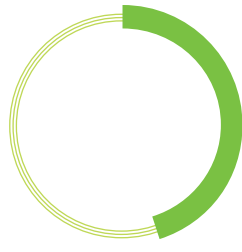
Orange County, CA



Columbus, OH



Newark, NJ



Tampa, FL



Charlotte, NC



Pittsburgh, PA



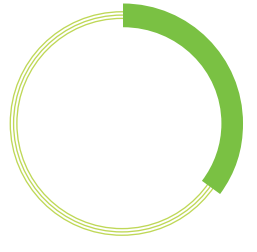
Kansas City, MO



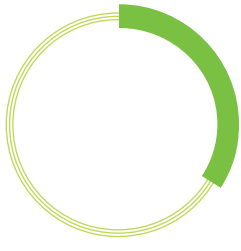
Orlando, FL



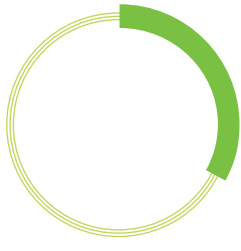
Houston, TX



St. Louis, MO



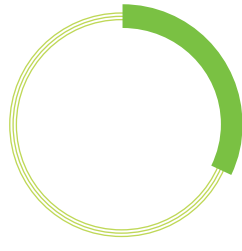
Indianapolis, IN



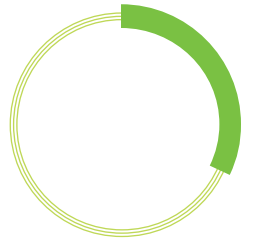
Cleveland, OH



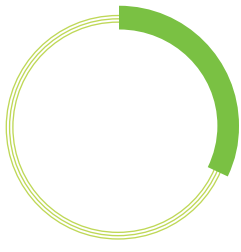
Sacramento, CA



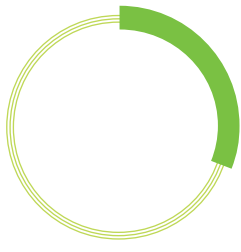
Hartford, CT



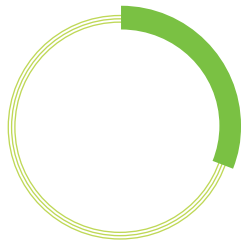
Cincinnati, OH



Rochester, NY



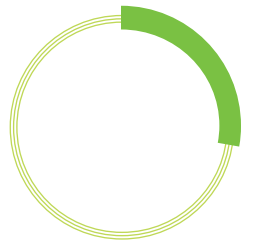
Long Island, NY



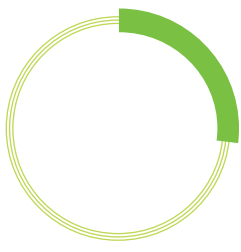
Fort Lauderdale, FL



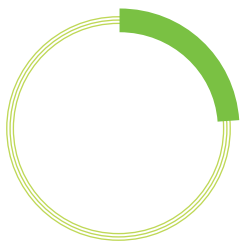
Milwaukee, WI



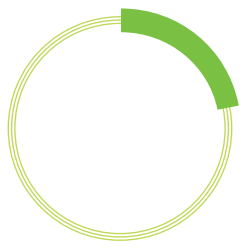
Nashville, TN



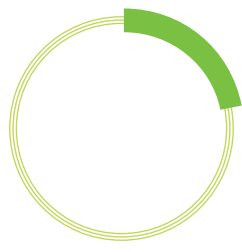
Jacksonville, FL



San Antonio, TX



Miami, FL



Richmond, VA



Norfolk, VA

Source: CBRE Research, CBRE Econometric Advisors, U.S. Bureau of Labor Statistics, Statistics Canada, Moody's Analytics, The National Center of Education Statistics, National Science Foundation, Axiometrics, 2019.





WHAT ARE TECH TALENT MOMENTUM MARKETS?

To evaluate up-and-coming markets and determine their growth momentum, we considered “large” and “small” categories separately. Except for Washington, D.C., which has remained about the same size, the 10 fastest-growing large markets increased their tech labor pools by between 20% and 54% over the past five years (Figure 3). Smaller tech talent markets also grew quickly. The top-10 small tech markets increased by more than 21%. Toronto grew at the fastest pace of all 50 markets, increasing by 54%.

All but two tech talent markets have deepened their labor pool during the past five years, but the rapid pace of growth that was possible then is unattainable now given low unemployment and the deceleration is reflected in the near-term momentum of these markets. Tech talent job growth accelerated in 15 of 50 markets over the past two years (2017 and 2018), compared with the previous two-year period. Notable surges occurred in Orlando, San Diego, Chicago and Cleveland, each growing at least 7% faster during the recent two-year period (Figure 4). Nine markets effectively maintained their momentum with less than 1% change in tech talent job growth during the past two years. Tech talent job growth has a multiplier effect that positively impacts economic growth, which in turn can have an immense impact on commercial real estate.

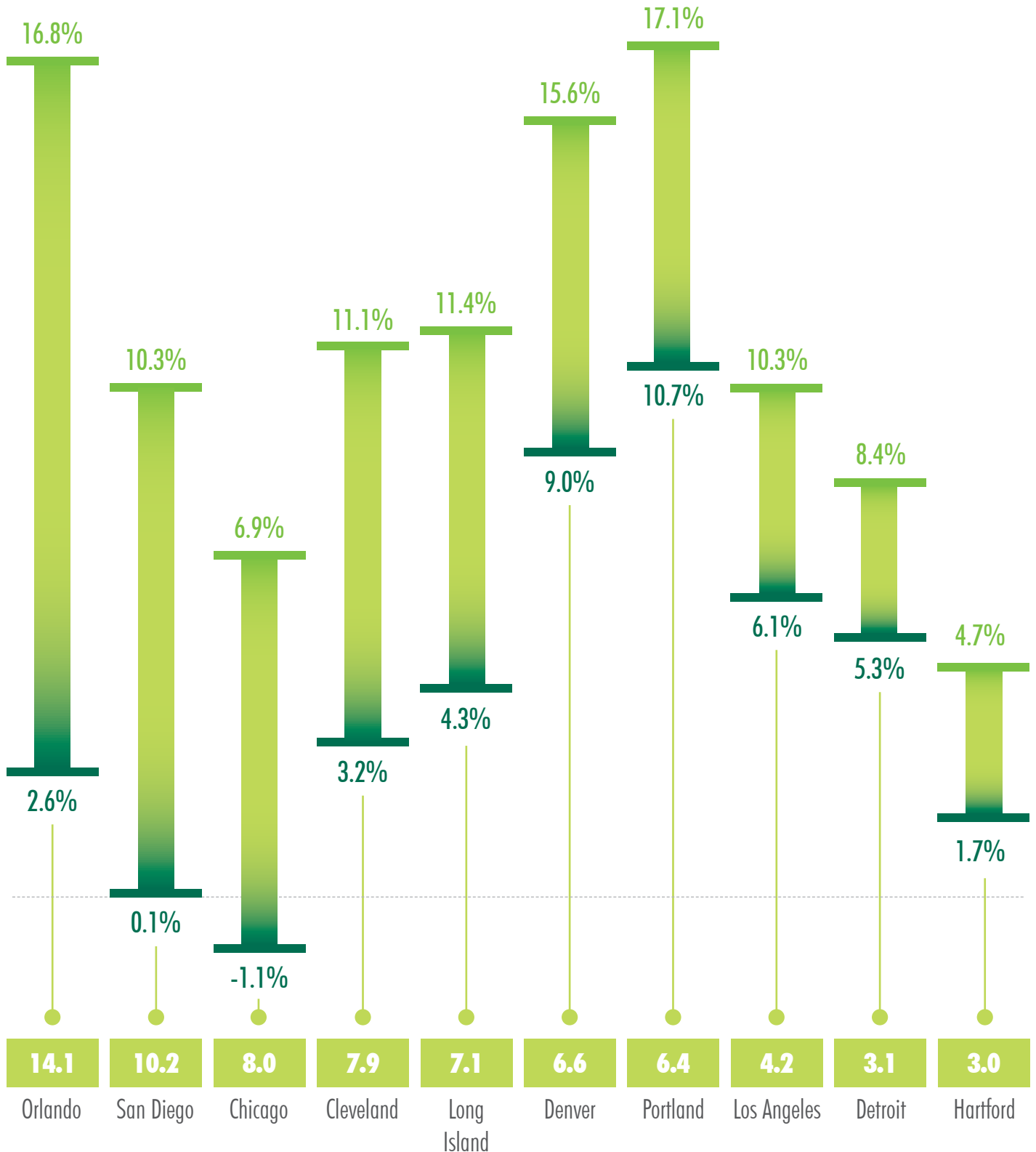
FIGURE 3: TECH TALENT LABOR POOLS (2018)

| Large Tech Talent Markets (>50,000 Labor Pool) | | | | | Small Tech Talent Markets (<50,000 Labor Pool) | | | | |
|--|-------------------|-----------------------------|------------------------|----------------------------|--|-------------------|-----------------------------|------------------------|----------------------------|
| Market | Tech Talent Total | Percent Change ¹ | by Volume ² | Concentration ³ | Market | Tech Talent Total | Percent Change ¹ | by Volume ² | Concentration ³ |
| SF Bay Area, CA | 353,760 | 33.4% | 88,500 | 10.0% | Tampa, FL | 49,120 | 27.6% | 10,630 | 3.7% |
| New York, NY | 264,373 | 20.5% | 44,920 | 3.9% | Columbus, OH | 48,600 | 8.1% | 3,660 | 4.6% |
| Washington, D.C. | 253,660 | 2.2% | 5,520 | 8.1% | Salt Lake City, UT | 47,760 | 38.6% | 13,290 | 5.0% |
| Toronto, ON | 228,500 | 54.0% | 80,100 | 8.3% | Pittsburgh, PA | 45,440 | 20.7% | 7,800 | 4.0% |
| Dallas/Ft. Worth, TX | 169,290 | 15.7% | 22,960 | 4.7% | Orlando, FL | 41,240 | 34.2% | 10,520 | 3.3% |
| Chicago, IL | 166,620 | 10.5% | 15,790 | 3.6% | Sacramento, CA | 39,110 | 12.6% | 4,390 | 4.0% |
| Boston, MA | 160,070 | 2.4% | 3,710 | 5.8% | Cincinnati, OH | 37,820 | 13.2% | 4,410 | 3.5% |
| Seattle, WA | 156,770 | 24.3% | 30,680 | 7.9% | Indianapolis, IN | 37,650 | 24.1% | 7,310 | 3.6% |
| Atlanta, GA | 141,580 | 29.1% | 31,880 | 5.3% | Cleveland, OH | 35,700 | 17.2% | 5,230 | 3.4% |
| Los Angeles, CA | 139,774 | 16.4% | 19,704 | 3.1% | Long Island, NY | 33,271 | 19.9% | 5,521 | 2.5% |
| Montreal, QC | 130,200 | 14.6% | 16,600 | 6.8% | Milwaukee, WI | 31,620 | 10.1% | 2,910 | 3.7% |
| Philadelphia, PA | 109,670 | 13.9% | 13,400 | 3.8% | San Antonio, TX | 30,170 | 15.6% | 4,070 | 3.0% |
| Denver, CO | 107,170 | 30.9% | 25,290 | 6.5% | Nashville, TN | 29,120 | 28.0% | 6,370 | 3.0% |
| Houston, TX | 95,640 | 3.1% | 2,860 | 3.2% | Norfolk, VA | 26,120 | -5.5% | -1,520 | 3.5% |
| Minneapolis, MN | 92,830 | 13.2% | 10,860 | 4.7% | Ft. Lauderdale, FL | 25,838 | 46.8% | 8,238 | 3.1% |
| Detroit, MI | 86,090 | 18.4% | 13,370 | 4.4% | Hartford, CT | 25,770 | 9.4% | 2,210 | 4.4% |
| Phoenix, AZ | 85,060 | 12.3% | 9,310 | 4.1% | Richmond, VA | 25,560 | 11.6% | 2,650 | 4.0% |
| Baltimore, MD | 75,150 | 11.9% | 7,990 | 5.5% | Miami, FL | 25,289 | 35.4% | 6,609 | 2.2% |
| Vancouver, BC | 74,700 | 42.6% | 22,300 | 6.4% | Madison, WI | 23,470 | 47.0% | 7,500 | 6.0% |
| San Diego, CA | 73,170 | 15.5% | 9,820 | 5.0% | Rochester, NY | 22,180 | 15.0% | 2,890 | 4.3% |
| Orange County, CA | 72,699 | 13.9% | 8,889 | 4.4% | Jacksonville, FL | 21,490 | 40.7% | 6,220 | 3.1% |
| Austin, TX | 72,360 | 12.6% | 8,080 | 7.0% | | | | | |
| Ottawa, ON | 64,500 | -5.3% | -3,600 | 9.9% | | | | | |
| Raleigh-Durham, NC | 61,040 | 11.2% | 6,170 | 6.5% | | | | | |
| Portland, OR | 59,580 | 35.3% | 15,540 | 5.0% | | | | | |
| Charlotte, NC | 55,430 | 48.4% | 18,070 | 4.6% | | | | | |
| St. Louis, MO | 54,020 | 6.5% | 3,320 | 4.0% | | | | | |
| Kansas City, MO | 53,360 | 25.6% | 10,870 | 5.0% | | | | | |
| Newark, NJ | 53,168 | 9.7% | 4,696 | 4.5% | | | | | |

¹ 2013-2018; ² 2013-2018; ³ 2018.
Source: U.S. Bureau of Labor Statistics (Metro) April 2019, Statistics Canada (Metro), 2019.

FIGURE 4: MOMENTUM OF TECH TALENT LABOR POOLS

■ Momentum Change in % Points (Past 2 years minus Prior 2 years) ■ Employment Growth Past 2 Years (2017-2018) ■ Employment Growth Prior 2 Years (2015-2016)



Source: U.S. Bureau of Labor Statistics (Metro), April 2019.

WHAT DEFINES A TECH TALENT MARKET?

Two key aspects that top tech talent markets share are high educational attainment and a preference by tech workers to live in the city proper. Two-thirds of the top-50 tech talent markets have a city-level educational attainment rate above the U.S. average (31.3%). The top-10 cities have 49% or more of residents over 25 years old with a bachelor's degree or higher (Figure 5). Seattle, Washington, D.C. and Madison have rates of 56% or more.

Education, particularly with a focus on technology,² is best analyzed through degrees completed and issued from higher educational institutions. Metro areas that produced the largest number of tech graduates, based on the latest available data, were New York, Washington, D.C., Los Angeles, Boston and the San Francisco Bay Area (Figure 6). Large tech talent markets dominate the top-10 degree-granting regions. Demand is high for tech-related classes and degrees, and tech-related degree completions have grown by an average of 44% across all markets since 2013. These numbers provide insight into which markets will produce the highest amount of tech talent entering the labor pool each year.

Graduates do not always remain in the labor market where they earn their degrees; they often migrate to locations that offer the best pay or have the most job

opportunities. Analyzing tech-related graduation data and tech-related employment growth (Figure 7) shows the difference between where tech talent workers are employed and where they were educated. Tech degrees cover the most recent five-year period available (2012-2017) and tech talent jobs added cover the period when most graduates would be counted in employment figures (2013-2018). Toronto and the San Francisco Bay Area stand out as strong tech talent job creators, each adding at least 54,000 more tech talent jobs than graduates. On the other end of the spectrum, Washington, D.C., Boston and Los Angeles post the deepest deficits in employing their tech graduates locally.

Reflected in the brain gain/drain calculation, the increase in tech-degree graduates is beginning to better supply the labor market for tech talent. This year, fewer markets posted a brain gain, but there still is a high level of demand and inadequate supply for the most sought-after tech skills.

² Tech degree fields include computer engineering and information sciences; mathematics and statistics; electrical and electronics engineering; mechanical and industrial engineering; other engineering.



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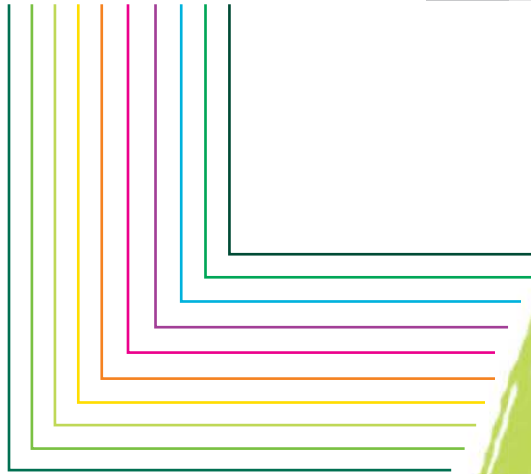
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FIGURE 5: TOP-10 MARKETS FOR EDUCATIONAL ATTAINMENT

25+ Years Old, Bachelor's Degree or Higher
U.S. Average = 31.3%

- #01 SEATTLE, WA // 62.6%
- #02 WASHINGTON, D.C. // 57.3%
- #03 MADISON, WI // 57.0%
- #04 LONG ISLAND, NY // 52.7%
- #05 DENVER, CO // 52.3%
- #06 AUSTIN, TX // 51.0%
- #07 MINNEAPOLIS, MN // 50.8%
- #08 RALEIGH-DURHAM, NC // 50.3%
- #09 PORTLAND, OR // 49.9%
- #10 SF BAY AREA, CA // 49.3%



Source: U.S. Census Bureau (City), 2019.

FIGURE 6: TOP-10 MARKETS FOR TECH DEGREE COMPLETIONS (2017)

Tech Degree Completions (2017) and % Growth (2012-2017)

#01 NEW YORK, NY // 13,337 // 48.0%

#02 WASHINGTON, D.C. // 11,278 // 31.1%

#03 LOS ANGELES, CA // 9,621 // 37.7%

#04 BOSTON, MA // 9,429 // 61.0%

#05 SF BAY AREA, CA // 8,225 // 46.3%

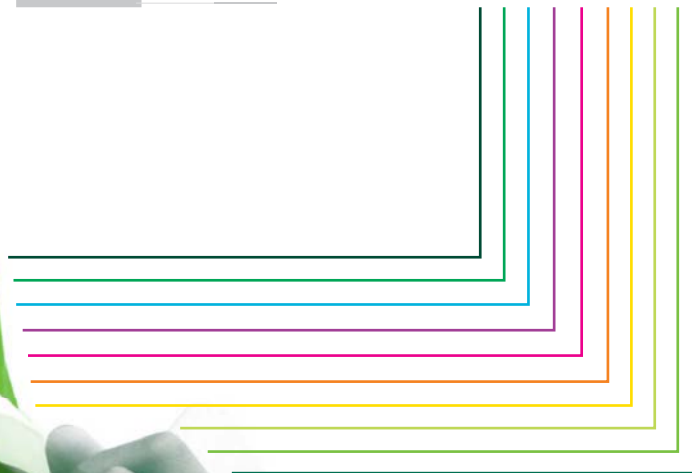
#06 CHICAGO, IL // 7,375 // 36.9%

#07 ATLANTA, GA // 7,050 // 47.5%

#08 DALLAS/FT. WORTH, TX // 6,503 // 98.5%

#09 DETROIT, MI // 5,726 // 32.0%

#10 TORONTO, ON // 5,397 // 37.8%



Source: The National Center for Education Statistics (Region),
Canadian Universities, 2019.
Note: Bachelor's Degree or Higher.

FIGURE 7: WHERE ARE TALENT WORKERS COMING FROM AND WHERE ARE THEY HEADED?

| Market | Tech Degrees (2012-2017)* | Tech Jobs Added (2013-2018)* | Brain Gain or Drain? | Market | Tech Degrees (2012-2017)* | Tech Jobs Added (2013-2018)* | Brain Gain or Drain? |
|----------------------|---------------------------|------------------------------|----------------------|--------------------|---------------------------|------------------------------|----------------------|
| Toronto, ON | 22,466 | 80,100 | 57,634 | Cleveland, OH | 9,427 | 5,230 | -4,197 |
| SF Bay Area, CA | 33,809 | 88,500 | 54,691 | St. Louis, MO | 8,065 | 3,320 | -4,745 |
| Seattle, WA | 15,213 | 30,680 | 15,467 | Montreal, QC | 21,403 | 16,600 | -4,803 |
| Charlotte, NC | 5,885 | 18,070 | 12,185 | Minneapolis, MN | 16,185 | 10,860 | -5,325 |
| Vancouver, BC | 11,140 | 22,300 | 11,160 | San Diego, CA | 15,300 | 9,820 | -5,480 |
| Portland, OR | 8,375 | 15,540 | 7,165 | Long Island, NY | 11,493 | 5,521 | -5,972 |
| Denver, CO | 18,793 | 25,290 | 6,497 | Newark, NJ | 10,849 | 4,696 | -6,153 |
| Kansas City, MO | 6,040 | 10,870 | 4,830 | Columbus, OH | 10,399 | 3,660 | -6,739 |
| Jacksonville, FL | 1,851 | 6,220 | 4,369 | Salt Lake City, UT | 20,096 | 13,290 | -6,806 |
| Tampa, FL | 6,787 | 10,630 | 3,843 | Rochester, NY | 10,218 | 2,890 | -7,328 |
| Atlanta, GA | 28,362 | 31,880 | 3,518 | Houston, TX | 10,759 | 2,860 | -7,899 |
| Indianapolis, IN | 3,876 | 7,310 | 3,434 | Philadelphia, PA | 21,305 | 13,400 | -7,905 |
| Ft. Lauderdale, FL | 4,844 | 8,238 | 3,394 | Hartford, CT | 10,311 | 2,210 | -8,101 |
| Nashville, TN | 3,900 | 6,370 | 2,470 | Baltimore, MD | 16,873 | 7,990 | -8,883 |
| Miami, FL | 6,565 | 6,609 | 44 | Norfolk, VA | 7,599 | -1,520 | -9,119 |
| Madison, WI | 7,705 | 7,500 | -205 | New York, NY | 54,299 | 44,920 | -9,379 |
| Orlando, FL | 10,737 | 10,520 | -217 | Raleigh-Durham, NC | 15,792 | 6,170 | -9,622 |
| Milwaukee, WI | 3,546 | 2,910 | -636 | Ottawa, ON | 6,609 | -3,600 | -10,209 |
| San Antonio, TX | 4,818 | 4,070 | -748 | Detroit, MI | 24,225 | 13,370 | -10,855 |
| Richmond, VA | 3,417 | 2,650 | -767 | Pittsburgh, PA | 20,360 | 7,800 | -12,560 |
| Dallas/Ft. Worth, TX | 23,944 | 22,960 | -984 | Chicago, IL | 30,471 | 15,790 | -14,681 |
| Cincinnati, OH | 7,155 | 4,410 | -2,745 | Phoenix, AZ | 24,404 | 9,310 | -15,094 |
| Sacramento, CA | 7,514 | 4,390 | -3,124 | Los Angeles, CA | 41,453 | 19,704 | -21,749 |
| Austin, TX | 11,381 | 8,080 | -3,301 | Boston, MA | 37,717 | 3,710 | -34,007 |
| Orange County, CA | 12,831 | 8,889 | -3,942 | Washington, D.C. | 49,060 | 5,520 | -43,540 |

Source: CBRE Research, U.S. Bureau of Labor Statistics, The National Center for Education Statistics (Metro), Canadian Universities, 2019.

* Tech degrees cover the most recent five-year period available (2012-2017) and tech jobs added cover the time period reflecting when most graduates would be counted in employment figures (2013-2018).

+57,600 Toronto, ON

+54,700 SF Bay Area, CA

BRAIN DRAIN OR GAIN?

+4,800 Kansas City, MO
+4,400 Jacksonville, FL
+3,800 Tampa, FL
+3,500 Atlanta, GA
+3,400 Indianapolis, IN
+3,400 Ft. Lauderdale, FL

+15,700 Seattle, WA
+12,200 Charlotte, NC
+11,200 Vancouver, BC

+7,200 Portland, OR
+6,500 Denver, CO

+40 Miami, FL

-640 Milwaukee, WI
-750 San Antonio, TX
-770 Richmond, VA
-980 Dallas/Ft. Worth, TX

-205 Madison, WI
-220 Orlando, FL

-4,000 Orange County, CA
-4,200 Cleveland, OH
-4,700 St. Louis, MO
-4,800 Montreal, QC

-2,700 Cincinnati, OH
-3,100 Sacramento, CA
-3,300 Austin, TX

-6,000 Long Island, NY
-6,200 Newark, NJ
-6,700 Columbus, OH
-6,800 Salt Lake City, UT

-5,300 Minneapolis, MN
-5,500 San Diego, CA

-8,900 Baltimore, MD
-9,100 Norfolk, VA
-9,400 New York, NY
-9,600 Raleigh-Durham, NC

-12,600 Pittsburgh, PA
-14,700 Chicago, IL
-15,100 Phoenix, AZ

-7,300 Rochester, NY
-7,900 Houston, TX
-8,000 Philadelphia, PA
-8,100 Hartford, CT

-10,200 Ottawa, ON
-10,900 Detroit, MI

-21,700 Los Angeles, CA

-34,000 Boston, MA

-43,500 Washington, D.C.

Another notable characteristic of tech talent markets is the presence and growth of millennials³ in the workforce. The younger part of this generation has matured with the internet-connected world and continues to advocate for an integrated and efficient working environment. Generally, this well-educated cohort prefers city living. This has revitalized many downtown neighborhoods and provided a distinct geography to measure the trend—cities.

As the largest demographic cohort, millennials' robust entry into and maturity within the labor pool contributes greatly to the growth of tech talent across all 50 markets (Figure 8). Six large tech markets have increased their millennial populations by more than 10% since 2012. Dallas/Ft. Worth grew the fastest at 14.7%. During the same period, three of the smaller tech markets increased their millennial populations by more than 10%, with Long Island growing fastest. Aided by the presence of higher educational institutions, Madison, Virginia Beach, Pittsburgh and Boston rank highest for millennials as a proportion of their total urban population, accounting for 24% or more (Figure 9).

Similar traits among markets cause many of them to appear equivalent, but top tech markets distinguish themselves from the rest with tech clusters and higher concentrations of tech talent. These clusters typically form around preeminent universities that tend to invest the most in innovation and provide a constant flow of new talent for local companies. Stanford University is an essential catalyst for tech clustering in the San Francisco Bay Area, as is Georgia Institute of Technology in Atlanta and the Massachusetts Institute of Technology in Boston.

Tech clusters can also form around leading companies that draw other, smaller companies to a region, in turn supporting entrepreneurs as they develop their innovations. Examples can be found in Seattle with large tech companies, in Charlotte with large financial services companies and in Atlanta with Fortune 500 companies. Tech companies use these clusters for synergy and competition, thereby accelerating the innovation process. These companies in the core high-tech industry are heavily concentrated, with about half of their workers doing tech-related jobs (Figure 10). Consequently, tech talent clusters are likely to form in markets with a strong concentration of high-tech companies.

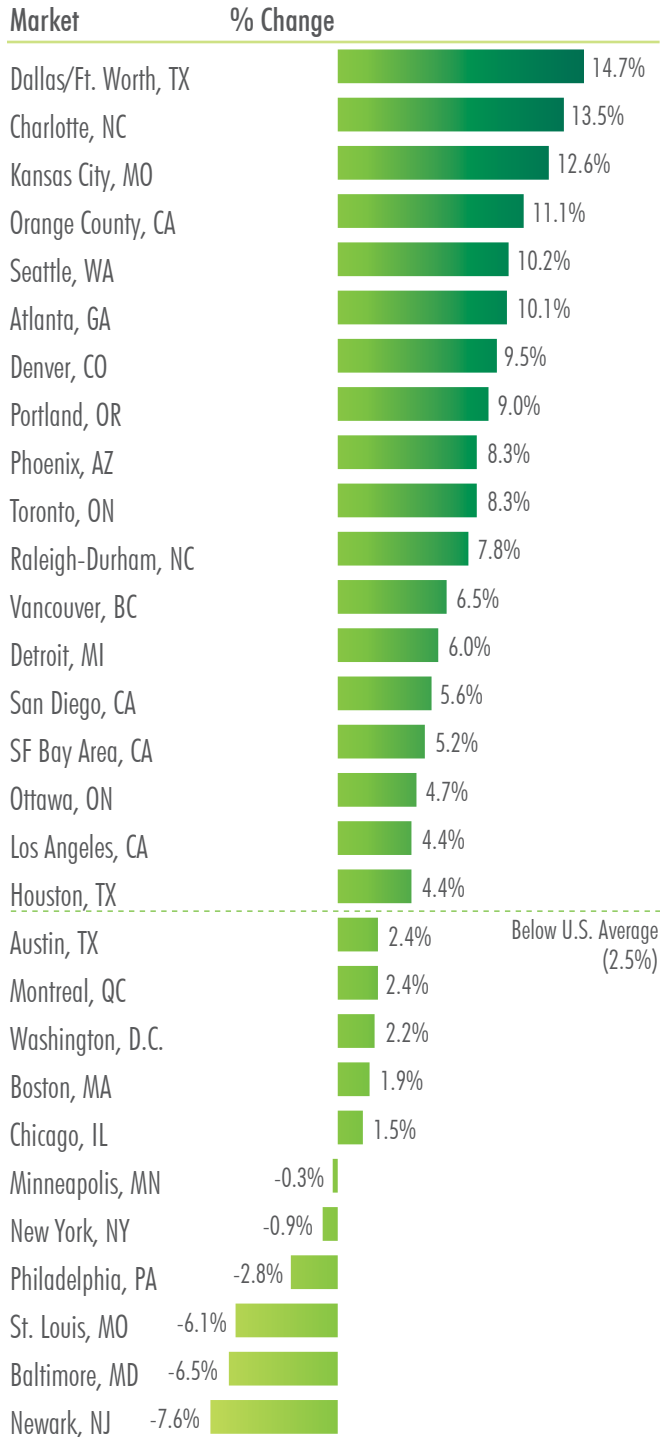
³ Analysis conducted in this report includes millennials aged 20-29 years.



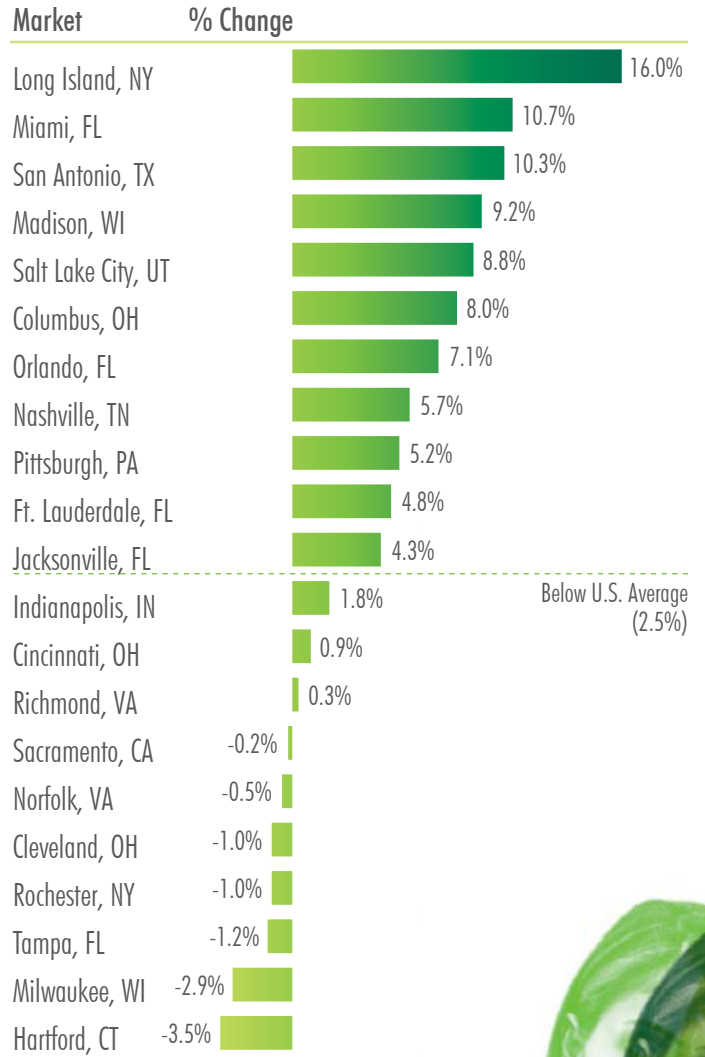


FIGURE 8: MILLENNIAL POPULATION CHANGE BY MARKET* (2012-2017)

Large Tech Talent Markets (>50,000 Labor Pool)



Small Tech Talent Markets (<50,000 Labor Pool)



Source: U.S. Census Bureau (City), Statistics Canada (Metro), 2019.
 *Millennials aged 20-29 years living in downtown areas.



FIGURE 9: TOP-10 MOST CONCENTRATED MILLENNIAL MARKETS* (2017)

U.S. Average = 13.8%

#01 MADISON, WI // 26.5%

#02 NORFOLK, VA // 25.3%

#03 PITTSBURGH, PA // 24.5%

#04 BOSTON, MA // 24.2%

#05 SALT LAKE CITY, UT // 22.7%

#06 ATLANTA, GA // 21.3%

#07 MINNEAPOLIS, MN // 21.1%

#08 RICHMOND, VA // 20.6%

#09 ROCHESTER, NY // 20.0%

#10 COLUMBUS, OH // 19.9%

Source: U.S. Census Bureau (City), 2019.
*Millennials aged 20-29 years living in downtown areas.



FIGURE 10: U.S. TECH TALENT LABOR CONCENTRATION BY INDUSTRY (2018)



49.7%
CORE HIGH-TECH*



Source: U.S. Bureau of Labor Statistics (National), April 2019.
*Includes computer software and services and computer product manufacturing.



WHICH ARE THE HIGHEST- AND LOWEST-COST MARKETS TO OPERATE IN?

The greatest cost for companies within tech talent markets is employee wages. These highly skilled and educated workers command a premium that can reach more than double the average non-tech salary. The San Francisco Bay Area ranked the highest for average tech talent worker salary at nearly \$130,000 per year, almost \$12,000 above the next highest market (Seattle). The average tech worker salary in 14 of the 50 top tech talent markets was above the U.S. tech talent worker average.

The second-highest cost for most companies is office rent. Companies continue to pursue the benefits of tech clustering and often place a higher value on specific submarkets and even specific streets where tech talent wants to work. This has led to some competition for office space and caused rental rates in these areas to increase. Average office rents are the highest in Manhattan,

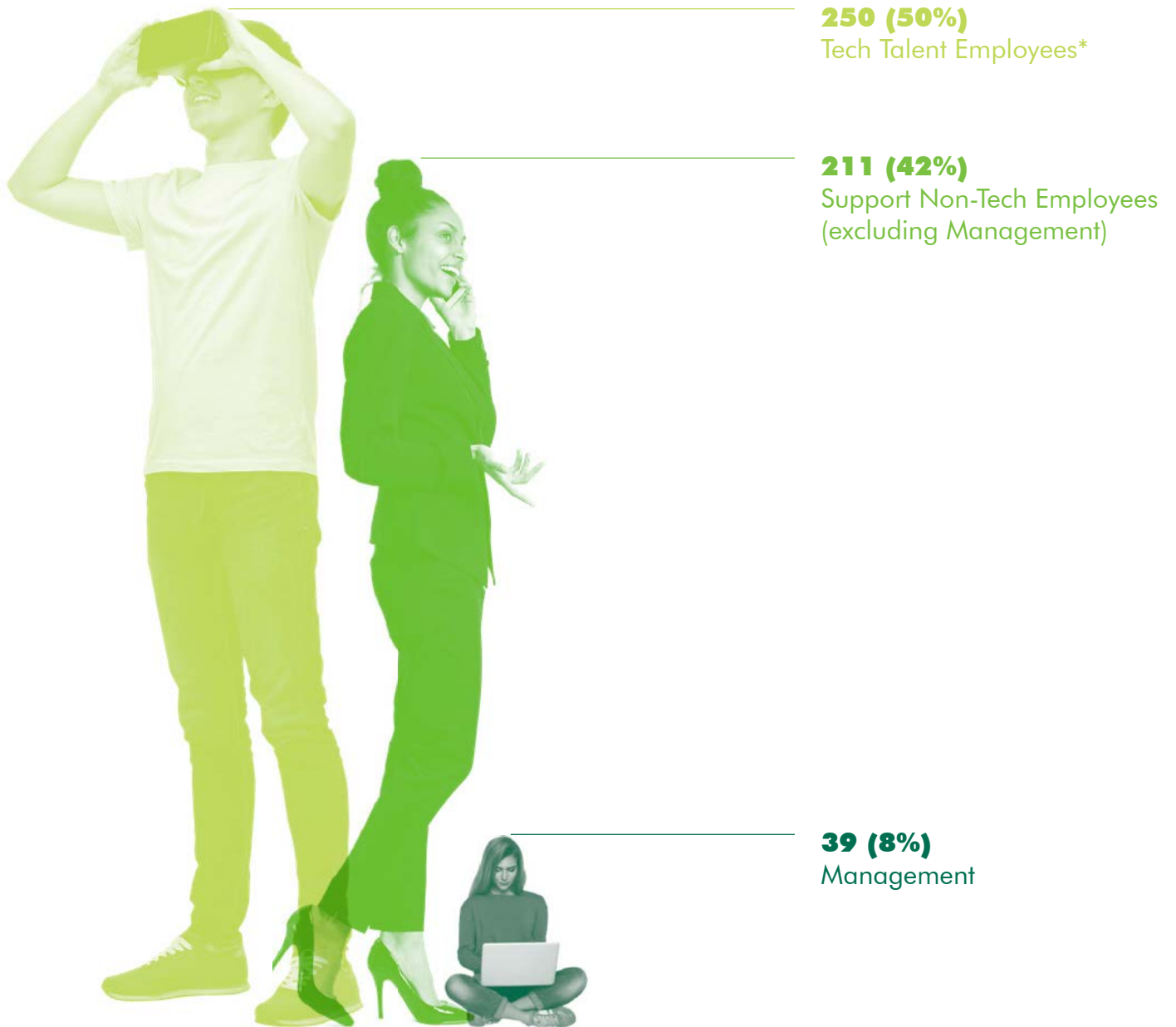
followed by the San Francisco Bay Area, Los Angeles and Washington, D.C. Among the top-10 most expensive office markets, Miami was the only small tech market with an average asking rate above \$35 per sq. ft.

Combining wage and real estate costs provides insight into what a tech company might pay to operate in any of the top-50 tech talent markets. For this comparison, U.S. occupational averages were analyzed to determine the makeup of a typical 500-person tech company needing 75,000 sq. ft. of office space. This breakdown provides interesting insight into each market's relative costs (Figure 12).

Local market wages were applied to the various occupations to determine total annual wage costs by market, and local market rents were used to estimate the annual cost of renting a 75,000-sq.-ft. office to house 500 employees. The San Francisco Bay Area topped the list with the highest estimated annual cost at more than \$59.4 million, followed distantly by the other major tech markets of New York, Washington, D.C. and Seattle. These high-cost markets continue to attract employers seeking to push the boundaries of innovation, as well as the tech talent that makes it possible.

FIGURE 11: AVERAGE U.S. TECH COMPANY OCCUPATION POOLS

Typical 500-Person Tech Company



Source: U.S. Bureau of Labor Statistics (National), April 2019.
* Tech Talent includes the following occupation categories: software developers and programmers; computer support, database and systems; technology and engineering related; and computer information system managers

FIGURE 12: ESTIMATED ONE-YEAR COSTS BY MARKET: WAGE AND RENT OBLIGATION FOR SAMPLE TECH FIRM

Sample Tech Firm Estimates: 500 Employees, 75,000 Sq. Ft.

| Market | Rent Cost (Avg Rent x 75,000 SF) | Tech Talent Wages (Avg. Wage x 250 People) | Support Non-Tech Wages (Avg. Wage x 211 People) | Management Wages (Avg. Wage x 39 People) | Total |
|----------------------|-------------------------------------|---|--|---|---------------------|
| SF Bay Area, CA | \$4,851,000 | \$32,429,425 | \$14,353,705 | \$7,771,843 | \$59,405,973 |
| New York, NY | \$5,915,250 | \$28,375,097 | \$13,151,001 | \$7,820,415 | \$55,261,762 |
| Washington, D.C. | \$3,166,500 | \$28,183,721 | \$13,575,235 | \$6,765,330 | \$51,690,786 |
| Seattle, WA | \$2,814,750 | \$29,451,440 | \$12,230,354 | \$6,423,300 | \$50,919,844 |
| Newark, NJ | \$1,981,500 | \$27,692,887 | \$12,058,259 | \$7,320,863 | \$49,053,509 |
| Boston, MA | \$2,952,000 | \$26,658,544 | \$12,721,812 | \$6,250,140 | \$48,582,496 |
| Los Angeles, CA | \$3,204,000 | \$26,001,305 | \$11,123,758 | \$6,649,565 | \$46,978,628 |
| Denver, CO | \$2,128,500 | \$25,718,124 | \$12,489,780 | \$6,524,443 | \$46,860,847 |
| San Diego, CA | \$2,706,750 | \$26,511,866 | \$10,820,842 | \$6,144,060 | \$46,183,518 |
| Orange County, CA | \$2,664,000 | \$25,469,089 | \$11,651,032 | \$6,349,035 | \$46,133,156 |
| Baltimore, MD | \$1,699,500 | \$26,365,812 | \$10,974,470 | \$5,993,910 | \$45,033,692 |
| Austin, TX | \$2,821,500 | \$23,465,113 | \$11,241,181 | \$6,061,380 | \$43,589,174 |
| Philadelphia, PA | \$2,168,250 | \$24,176,384 | \$10,919,080 | \$6,253,260 | \$43,516,974 |
| Houston, TX | \$2,196,000 | \$23,978,877 | \$10,774,997 | \$6,239,220 | \$43,189,095 |
| Long Island, NY | \$2,051,250 | \$23,694,939 | \$10,817,932 | \$6,555,041 | \$43,119,163 |
| Dallas/Ft. Worth, TX | \$1,875,750 | \$24,502,184 | \$10,469,339 | \$6,231,030 | \$43,078,303 |
| Hartford, CT | \$1,494,000 | \$24,661,210 | \$11,217,537 | \$5,525,520 | \$42,898,267 |
| Minneapolis, MN | \$2,106,000 | \$23,625,505 | \$11,123,886 | \$5,791,110 | \$42,646,500 |
| Raleigh-Durham, NC | \$2,117,250 | \$23,926,853 | \$10,836,431 | \$5,744,207 | \$42,624,741 |
| Charlotte, NC | \$2,136,750 | \$23,987,982 | \$10,410,283 | \$5,548,530 | \$42,083,545 |
| Sacramento, CA | \$1,773,000 | \$24,180,240 | \$10,185,499 | \$5,843,370 | \$41,982,110 |
| Atlanta, GA | \$2,079,000 | \$24,012,422 | \$10,065,403 | \$5,738,850 | \$41,895,675 |
| Columbus, OH | \$1,476,750 | \$24,009,568 | \$10,293,328 | \$5,833,620 | \$41,613,266 |
| Richmond, VA | \$1,503,750 | \$23,346,415 | \$10,525,609 | \$6,062,550 | \$41,438,324 |
| Portland, OR | \$2,325,750 | \$22,933,740 | \$10,630,253 | \$5,250,570 | \$41,140,313 |
| Chicago, IL | \$2,355,000 | \$21,539,813 | \$10,646,072 | \$5,695,950 | \$40,236,835 |
| Ft. Lauderdale, FL | \$2,548,500 | \$22,294,629 | \$9,618,271 | \$5,378,030 | \$39,839,429 |
| Miami, FL | \$2,982,000 | \$22,029,428 | \$9,290,580 | \$4,915,757 | \$39,217,766 |
| Phoenix, AZ | \$2,001,000 | \$22,085,469 | \$9,518,653 | \$5,463,120 | \$39,068,242 |
| St. Louis, MO | \$1,500,000 | \$22,041,650 | \$9,942,416 | \$5,307,900 | \$38,791,966 |
| Detroit, MI | \$1,413,000 | \$21,715,989 | \$10,236,195 | \$5,423,730 | \$38,788,913 |
| Norfolk, VA | \$1,394,250 | \$21,745,834 | \$9,258,030 | \$5,872,230 | \$38,270,343 |
| San Antonio, TX | \$1,692,000 | \$21,938,079 | \$9,037,643 | \$5,588,700 | \$38,256,422 |
| Cincinnati, OH | \$1,452,750 | \$21,481,175 | \$10,085,596 | \$5,142,540 | \$38,162,061 |
| Tampa, FL | \$1,732,500 | \$21,570,709 | \$9,145,115 | \$5,446,350 | \$37,894,675 |
| Indianapolis, IN | \$1,536,750 | \$20,957,705 | \$10,167,367 | \$5,217,030 | \$37,878,851 |
| Nashville, TN | \$2,047,500 | \$20,796,047 | \$10,027,213 | \$4,898,790 | \$37,769,551 |
| Orlando, FL | \$1,795,500 | \$21,428,084 | \$9,116,082 | \$5,126,940 | \$37,466,606 |
| Madison, WI | \$1,578,750 | \$21,042,287 | \$9,920,662 | \$4,917,510 | \$37,459,209 |
| Salt Lake City, UT | \$1,758,750 | \$21,764,920 | \$9,164,490 | \$4,764,480 | \$37,452,641 |
| Milwaukee, WI | \$1,405,500 | \$20,693,718 | \$9,972,937 | \$4,988,100 | \$37,060,256 |
| Cleveland, OH | \$1,422,000 | \$20,041,356 | \$10,165,270 | \$5,260,320 | \$36,888,946 |
| Kansas City, MO | \$1,473,000 | \$20,486,732 | \$9,873,928 | \$4,929,600 | \$36,763,259 |
| Pittsburgh, PA | \$1,713,000 | \$19,954,319 | \$9,452,515 | \$5,605,080 | \$36,724,914 |
| Rochester, NY | \$1,462,500 | \$19,952,211 | \$9,635,084 | \$5,556,330 | \$36,606,126 |
| Jacksonville, FL | \$1,497,750 | \$20,091,188 | \$8,877,118 | \$4,930,380 | \$35,396,436 |
| Ottawa, ON* | \$1,857,490 | \$16,930,015 | \$10,163,436 | \$3,355,114 | \$32,306,055 |
| Toronto, ON* | \$2,086,131 | \$15,788,407 | \$9,316,772 | \$3,371,392 | \$30,562,702 |
| Vancouver, BC* | \$2,504,631 | \$15,456,045 | \$8,960,470 | \$2,868,031 | \$29,789,176 |
| Montreal, QC* | \$1,822,760 | \$14,593,204 | \$8,986,815 | \$3,188,579 | \$28,591,358 |

*data in US\$: Source: U.S. Bureau of Labor Statistics, April 2019, Statistics Canada, April 2019, CBRE Research (Metro), Q1 2019.

HOW IS TECH TALENT QUALITY VS COST MEASURED?

Assessing the quality of a labor market is challenging because there are no standard metrics to measure. Since labor is the largest expense for most firms seeking tech talent, the quality of that tech talent is becoming one of their most important considerations. Figure 13 plots a quality assessment for software developers against their average salary by market to illustrate this trade-off across the top-50 tech talent markets.

Labor quality was measured by the number and concentration of software engineers with three or more years of experience and who graduated from one of the top-25 computer science programs in North America, including the top-three in Canada, as determined by U.S. News & World Report. The highest-cost markets (San Francisco Bay Area and Seattle) also have the highest concentration of quality tech talent. Nevertheless, good, high and very high concentrations of quality tech



talent are available in moderate- and low-cost markets, providing a range of options. Due in part to the strong U.S. dollar, Toronto, Vancouver, Montreal and Ottawa provide the best value when it comes to cost and quality, followed by Indianapolis, Pittsburgh, Madison and Detroit.

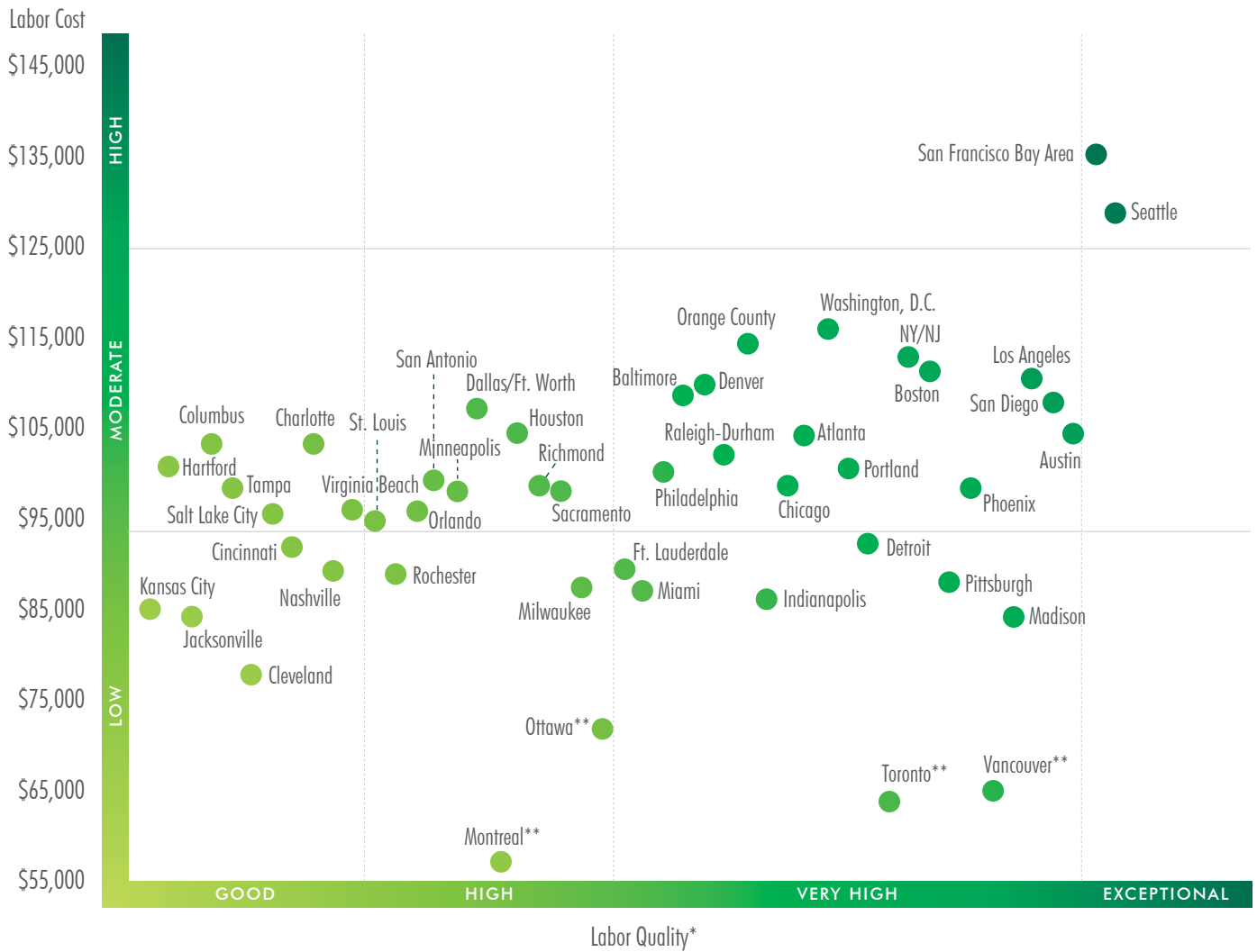
The skills of the available labor pool do not appear to align with available jobs, causing a structural barrier to growth for companies across North America and slowing job creation. Jobs that require specific skills, such as software development and machine learning, remain

in high demand, while the pool of available talent to fill them is limited. Only 37% of all tech talent workers are employed in the high-tech software/services industry (Figure 1), meaning tech companies must compete with other industries that employ the remaining 63% of tech workers. In addition, the unemployment rate for college-educated workers dipped to 1.9% in 2019. This has resulted in growing labor costs and increased competition to attract and retain talent. The most competitive markets are the San Francisco Bay Area, Seattle, Denver and Austin, while more balanced markets can be found in the U.S. Midwest and East and in Canada.



FIGURE 13: TECH TALENT QUALITY VS. COST ANALYSIS

Average Annual Salary for Software Engineer (US\$)

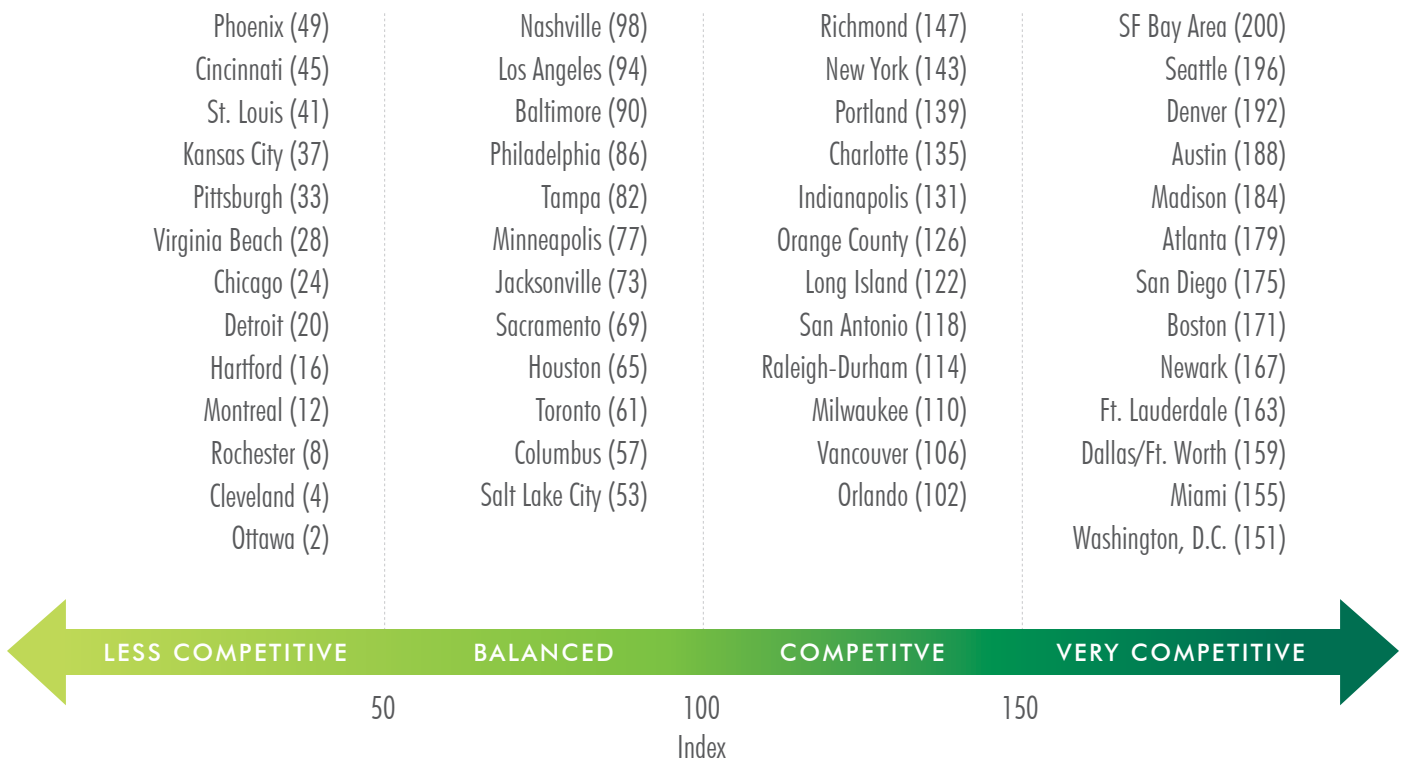


Source: U.S. Bureau of Labor Statistics, April 2019, Statistics Canada, April 2019, U.S. News & World Report, CBRE Labor Analytics, CBRE Research, 2019.

*Concentration of software engineers/developers with 3+ years of experience that have earned degrees from the Top 25 Computer Information Science programs in North America and Top 3 in Canada as rated by U.S. News, 2019.

**Data in US\$.

FIGURE 14: TECH LABOR MARKET COMPETITIVENESS



Source: U.S. Bureau of Labor Statistics, Statistics Canada, IPEDS, CBRE Location Analytics, CBRE Econometric Advisors, CBRE Research, 2019.


HOW DOES TECH TALENT IMPACT COMMERCIAL REAL ESTATE?

Tech talent growth, primarily within the high-tech industry, has totaled 693,000 jobs in the past five years and been the top driver of office leasing activity in the U.S. during that time. The high-tech industry's share of major leasing activity⁴ nationwide increased to 20% in Q1 2019 from 11% in 2011—the largest single share of any industry. Many tech talent markets, especially those with high concentrations or clusters of tech companies, have seen rising rents and declining vacancies as a result. Significant demand for office space in top markets that have added tens of thousands of workers during the past five years raised rents to their highest levels and pushed down vacancy rates to their lowest levels.

Rent growth is most prominent in the large tech markets, with office rents in Orange County 50% higher than they were five years ago. But the decrease in vacancy rates is present across both large and small tech markets. Vacancy rates in Madison, Vancouver, Charlotte and the San Francisco Bay Area are the lowest of the top-50 tech talent markets, and some larger markets like Toronto, Ottawa and New York are not far behind (Figure 15).

The in-migration of talent to these tech markets also has a sizeable impact on residential real estate. Although Manhattan remains the most-expensive market in which to rent an apartment, 32 of the top-50 tech talent markets





have a cost of living above the U.S. national average, according to Moody's Analytics (Figure 16). Comparing the annual average apartment rent with the annual average tech-worker salary, tech salaries generally can cover the cost of living in even the most-expensive markets (Figure 17), based on the affordability standard of 30% of income to housing.

The extended structural shift of technological innovation on the economic cycle could cushion markets during a downturn. Considering the underlying fundamentals of these top tech talent markets, we conclude that both occupiers and investors can pursue profitable real estate strategies.

⁴ Includes top-25 largest transactions by sq. ft. each quarter for the 54 markets tracked by CBRE Research.

FIGURE 15: OFFICE ASKING RENT BY MARKET (Q1 2019)

| Market | Annual Gross Direct Asking Rent Per SF | Vacancy Rate |
|----------------------|--|--------------|
| New York, NY | \$78.87 | 7.9% |
| SF Bay Area, CA | \$68.88 | 6.1% |
| Los Angeles, CA | \$41.28 | 14.4% |
| Washington, D.C. | \$42.22 | 16.9% |
| Miami, FL | \$39.76 | 11.3% |
| Boston, MA | \$39.36 | 13.0% |
| Austin, TX | \$37.62 | 9.3% |
| Seattle, WA | \$37.53 | 9.4% |
| San Diego, CA | \$36.09 | 9.9% |
| Orange County, CA | \$35.52 | 9.4% |
| Ft. Lauderdale, FL | \$33.98 | 9.9% |
| Vancouver, BC* | \$33.40 | 4.7% |
| Chicago, IL | \$31.40 | 15.5% |
| Portland, OR | \$31.01 | 11.6% |
| Houston, TX | \$29.28 | 18.9% |
| Philadelphia, PA | \$28.91 | 13.8% |
| Charlotte, NC | \$28.49 | 5.9% |
| Denver, CO | \$28.38 | 13.3% |
| Raleigh-Durham, NC | \$28.23 | 12.7% |
| Minneapolis, MN | \$28.08 | 18.3% |
| Toronto, ON* | \$27.82 | 7.1% |
| Atlanta, GA | \$27.72 | 17.1% |
| Long Island, NY | \$27.35 | 10.2% |
| Nashville, TN | \$27.30 | 10.3% |
| Phoenix, AZ | \$26.68 | 15.0% |
| Newark, NJ | \$26.42 | 18.0% |
| Dallas/Ft. Worth, TX | \$25.01 | 20.7% |
| Ottawa, ON* | \$24.77 | 7.5% |
| Montreal, QC* | \$24.30 | 12.2% |
| Orlando, FL | \$23.94 | 8.8% |
| Sacramento, CA | \$23.64 | 10.7% |
| Salt Lake City, UT | \$23.45 | 10.9% |
| Tampa, FL | \$23.10 | 9.8% |
| Pittsburgh, PA | \$22.84 | 14.7% |
| Baltimore, MD | \$22.66 | 14.7% |
| San Antonio, TX | \$22.56 | 14.0% |
| Madison, WI | \$21.05 | 4.6% |
| Indianapolis, IN | \$20.49 | 16.8% |
| Richmond, VA | \$20.05 | 10.1% |
| St. Louis, MO | \$20.00 | 11.4% |
| Jacksonville, FL | \$19.97 | 14.8% |
| Hartford, CT | \$19.92 | 17.9% |
| Columbus, OH | \$19.69 | 15.1% |
| Kansas City, MO | \$19.64 | 13.3% |
| Rochester, NY | \$19.50 | 15.7% |
| Cincinnati, OH | \$19.37 | 18.9% |
| Cleveland, OH | \$18.96 | 17.5% |
| Detroit, MI | \$18.84 | 14.6% |
| Milwaukee, WI | \$18.74 | 14.9% |
| Norfolk, VA | \$18.59 | 12.8% |

Source: CBRE Research (Office Market), Q1 2019.
*Data in US\$; Note: New York represents Manhattan only.

FIGURE 16: APARTMENT ASKING RENT BY MARKET (Q1 2019)

| Market | Average Monthly Apartment Rent | Cost of Living (U.S. = 100%) |
|----------------------|--------------------------------|------------------------------|
| New York, NY | \$4,120 | 120% |
| SF Bay Area, CA | \$2,856 | 163% |
| Long Island, NY | \$2,243 | 126% |
| Los Angeles, CA | \$2,239 | 129% |
| Boston, MA | \$2,164 | 120% |
| Orange County, CA | \$2,082 | 147% |
| San Diego, CA | \$1,954 | 128% |
| Washington, D.C. | \$1,754 | 117% |
| Newark, NJ | \$1,716 | 118% |
| Seattle, WA | \$1,694 | 137% |
| Miami, FL | \$1,630 | 114% |
| Ft. Lauderdale, FL | \$1,587 | 113% |
| Chicago, IL | \$1,505 | 99% |
| Denver, CO | \$1,489 | 113% |
| Sacramento, CA | \$1,429 | 110% |
| Philadelphia, PA | \$1,370 | 96% |
| Portland, OR | \$1,364 | 113% |
| Hartford, CT | \$1,326 | 105% |
| Baltimore, MD | \$1,319 | 106% |
| Minneapolis, MN | \$1,306 | 102% |
| Austin, TX | \$1,257 | 115% |
| Orlando, FL | \$1,239 | 104% |
| Atlanta, GA | \$1,223 | 102% |
| Nashville, TN | \$1,203 | 108% |
| Tampa, FL | \$1,192 | 103% |
| Madison, WI | \$1,150 | 101% |
| Dallas/Ft. Worth, TX | \$1,135 | 108% |
| Salt Lake City, UT | \$1,129 | 109% |
| Pittsburgh, PA | \$1,127 | 93% |
| Raleigh-Durham, NC | \$1,117 | 100% |
| Charlotte, NC | \$1,116 | 98% |
| Milwaukee, WI | \$1,113 | 99% |
| Houston, TX | \$1,105 | 108% |
| Phoenix, AZ | \$1,104 | 107% |
| Richmond, VA | \$1,073 | 100% |
| Toronto, ON* | \$1,069 | 118% |
| Norfolk, VA | \$1,064 | 97% |
| Vancouver, BC* | \$1,052 | 109% |
| Jacksonville, FL | \$1,042 | 101% |
| Rochester, NY | \$992 | 89% |
| Detroit, MI | \$989 | 95% |
| San Antonio, TX | \$985 | 103% |
| Cincinnati, OH | \$951 | 91% |
| Kansas City, MO | \$950 | 97% |
| Columbus, OH | \$949 | 94% |
| Ottawa, ON* | \$906 | 90% |
| St. Louis, MO | \$899 | 94% |
| Cleveland, OH | \$891 | 88% |
| Indianapolis, IN | \$884 | 95% |
| Montreal, QC* | \$614 | 83% |

Source: CBRE Econometric Advisors (City), Axiometrics, CMHC, Moody's Analytics, Q1 2019.
*Data in US\$; Note: New York represents Manhattan only.

FIGURE 17: TECH WAGE TO APARTMENT RENT RATIO

| Market | Annualized Apartment Rent (2019) | Average Annual Tech Wage (2018) | Rent-to-Tech Wage Ratio |
|----------------------|----------------------------------|---------------------------------|-------------------------|
| New York, NY | \$49,445 | \$113,500 | 43.6% |
| Long Island, NY | \$26,911 | \$94,780 | 28.4% |
| SF Bay Area, CA | \$34,272 | \$129,718 | 26.4% |
| Los Angeles, CA | \$26,871 | \$104,005 | 25.8% |
| Orange County, CA | \$24,990 | \$101,876 | 24.5% |
| Boston, MA | \$25,964 | \$106,634 | 24.3% |
| Miami, FL | \$19,557 | \$88,118 | 22.2% |
| San Diego, CA | \$23,443 | \$106,047 | 22.1% |
| Ft. Lauderdale, FL | \$19,039 | \$89,179 | 21.3% |
| Chicago, IL | \$18,057 | \$86,159 | 21.0% |
| Vancouver, BC* | \$12,623 | \$61,824 | 20.4% |
| Toronto, ON* | \$12,827 | \$63,154 | 20.3% |
| Washington, D.C. | \$21,046 | \$112,735 | 18.7% |
| Newark, NJ | \$20,597 | \$110,772 | 18.6% |
| Portland, OR | \$16,372 | \$91,735 | 17.8% |
| Sacramento, CA | \$17,153 | \$96,721 | 17.7% |
| Denver, CO | \$17,862 | \$102,872 | 17.4% |
| Nashville, TN | \$14,437 | \$83,184 | 17.4% |
| Orlando, FL | \$14,868 | \$85,712 | 17.3% |
| Seattle, WA | \$20,324 | \$117,806 | 17.3% |
| Philadelphia, PA | \$16,438 | \$96,706 | 17.0% |
| Pittsburgh, PA | \$13,522 | \$79,817 | 16.9% |
| Minneapolis, MN | \$15,667 | \$94,502 | 16.6% |
| Tampa, FL | \$14,300 | \$86,283 | 16.6% |
| Madison, WI | \$13,800 | \$84,169 | 16.4% |
| Milwaukee, WI | \$13,356 | \$82,775 | 16.1% |
| Hartford, CT | \$15,916 | \$98,645 | 16.1% |
| Austin, TX | \$15,081 | \$93,860 | 16.1% |
| Ottawa, ON* | \$10,873 | \$67,720 | 16.1% |
| Salt Lake City, UT | \$13,554 | \$87,060 | 15.6% |
| Jacksonville, FL | \$12,509 | \$80,365 | 15.6% |
| Atlanta, GA | \$14,671 | \$96,050 | 15.3% |
| Baltimore, MD | \$15,828 | \$105,463 | 15.0% |
| Phoenix, AZ | \$13,242 | \$88,342 | 15.0% |
| Rochester, NY | \$11,904 | \$79,809 | 14.9% |
| Norfolk, VA | \$12,772 | \$86,983 | 14.7% |
| Raleigh-Durham, NC | \$13,410 | \$95,707 | 14.0% |
| Charlotte, NC | \$13,398 | \$95,952 | 14.0% |
| Kansas City, MO | \$11,400 | \$81,947 | 13.9% |
| Dallas/Ft. Worth, TX | \$13,618 | \$98,009 | 13.9% |
| Houston, TX | \$13,257 | \$95,916 | 13.8% |
| Richmond, VA | \$12,876 | \$93,386 | 13.8% |
| Detroit, MI | \$11,868 | \$86,864 | 13.7% |
| San Antonio, TX | \$11,816 | \$87,752 | 13.5% |
| Cleveland, OH | \$10,695 | \$80,165 | 13.3% |
| Cincinnati, OH | \$11,407 | \$85,925 | 13.3% |
| Indianapolis, IN | \$10,606 | \$83,831 | 12.7% |
| Montreal, QC* | \$7,372 | \$58,373 | 12.6% |
| St. Louis, MO | \$10,791 | \$88,167 | 12.2% |
| Columbus, OH | \$11,392 | \$96,038 | 11.9% |

Source: U.S. Bureau of Labor Statistics, Statistics Canada, CBRE Econometric Advisors, Axiometrics, CMHC, Q1 2019.

*Data in US\$; Note: New York represents Manhattan only.

WHAT DEFINES A TECH TALENT MARKET?



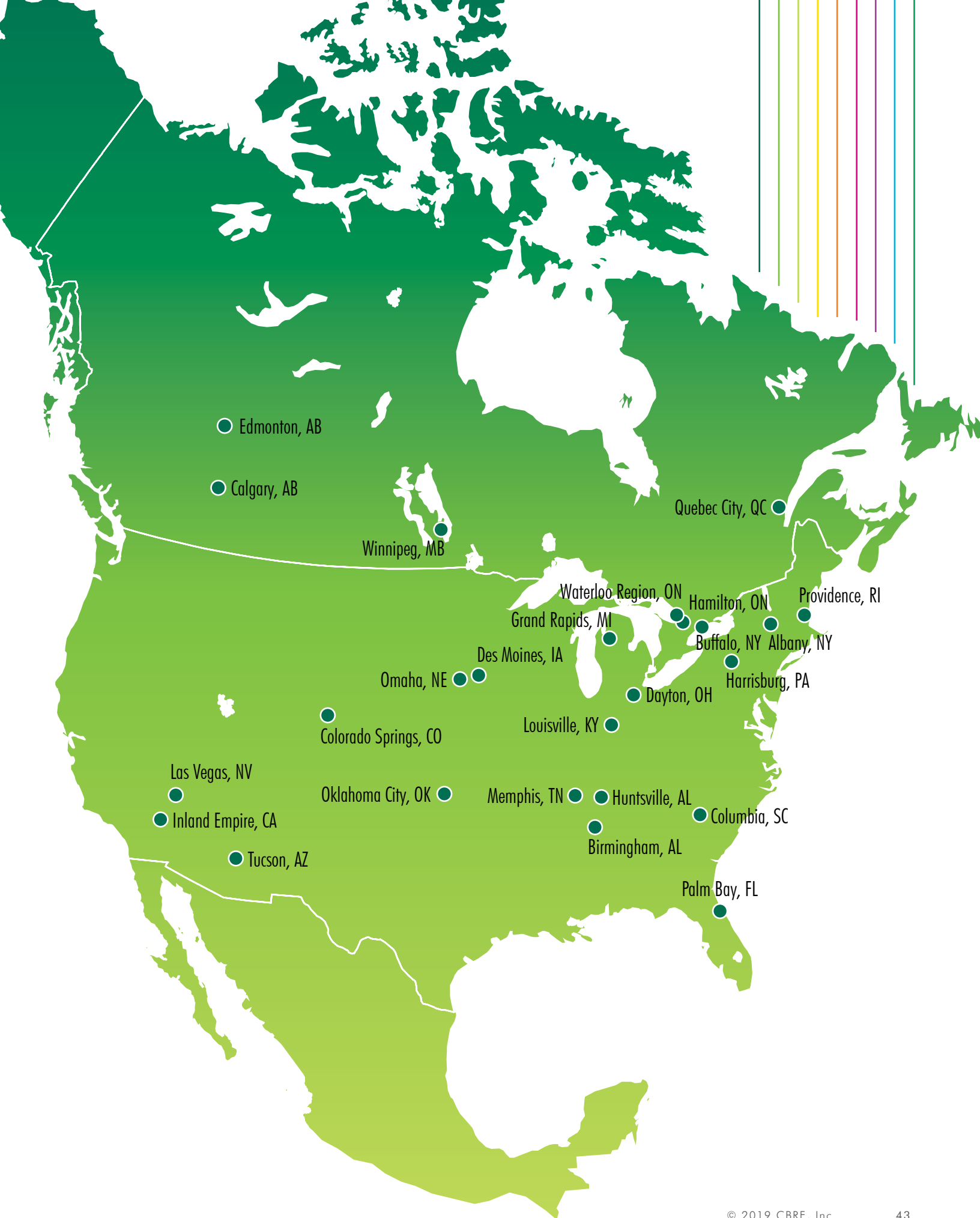
Fostering talent development in lesser-known and under-developed markets could offer additional talent pools to employers seeking to expand their geographical

reach and uncover opportunities. These smaller markets represent potential and are concentrated in Canada and the U.S. Midwest and South.

FIGURE 18: THE NEXT 25 MARKETS

| Market | Total Tech Growth (5 Years) | Total Tech Employment (2018) | Total Tech Wages (2018) | Total Tech Wage Growth (5 Years) |
|----------------------|-----------------------------|------------------------------|-------------------------|----------------------------------|
| Tucson, AZ | 90% | 15,700 | \$90,528 | 29% |
| Hamilton, ON* | 52% | 18,100 | \$63,634 | 5% |
| Waterloo Region, ON* | 40% | 20,500 | \$66,123 | 24% |
| Las Vegas, NV | 35% | 18,410 | \$83,766 | 9% |
| Des Moines, IA | 31% | 17,280 | \$82,423 | 14% |
| Louisville, KY | 30% | 19,050 | \$79,530 | 14% |
| Columbia, SC | 27% | 12,040 | \$75,427 | 10% |
| Inland Empire, CA | 26% | 19,550 | \$87,312 | 13% |
| Edmonton, AB* | 26% | 28,400 | \$66,492 | 10% |
| Grand Rapids, MI | 17% | 12,750 | \$72,390 | 2% |
| Omaha, NE | 15% | 21,920 | \$83,574 | 9% |
| Buffalo, NY | 14% | 16,030 | \$80,836 | 16% |
| Palm Bay, FL | 14% | 12,870 | \$93,313 | 14% |
| Colorado Springs, CO | 14% | 17,290 | \$98,950 | 15% |
| Oklahoma City, OK | 10% | 19,340 | \$80,510 | 15% |
| Harrisburg, PA | 9% | 12,800 | \$85,229 | 14% |
| Dayton, OH | 8% | 16,420 | \$88,807 | 14% |
| Providence, RI | 8% | 18,090 | \$94,744 | 12% |
| Albany, NY | 8% | 18,560 | \$85,533 | 11% |
| Huntsville, AL | 6% | 20,860 | \$97,049 | 11% |
| Memphis, TN | 4% | 12,210 | \$75,216 | 2% |
| Quebec City, QC* | 4% | 27,700 | \$53,987 | 6% |
| Winnipeg, MB* | 3% | 15,500 | \$58,305 | 17% |
| Calgary, AB* | -7% | 38,500 | \$76,060 | 14% |
| Birmingham, AL | -7% | 15,040 | \$84,707 | 12% |

Source: U.S. Bureau of Labor Statistics, Statistics Canada, CBRE Research, 2019.
*Data in US\$.



Edmonton, AB

Calgary, AB

Winnipeg, MB

Quebec City, QC

Providence, RI

Grand Rapids, MI

Waterloo Region, ON

Hamilton, ON

Buffalo, NY

Albany, NY

Harrisburg, PA

Des Moines, IA

Dayton, OH

Omaha, NE

Louisville, KY

Colorado Springs, CO

Las Vegas, NV

Inland Empire, CA

Tucson, AZ

Oklahoma City, OK

Memphis, TN

Huntsville, AL

Columbia, SC

Birmingham, AL

Palm Bay, FL

APPENDIX

APPENDIX A: LOCAL MARKET PROFILES

APPENDIX B: FULL REPORT DATA SUMMARY

What is tech talent?

Which are the top-ranked tech-talent markets?

What are tech-talent momentum markets?

What defines a tech talent market?

Tech talent has unique concentrations across markets

Which are the highest- and lowest-cost markets to operate in?

How does tech talent impact commercial real estate?

A2

B1

B2

B3

B4

B6

B10

B14

B17



FULL REPORT DATA SUMMARY





WHAT IS TECH TALENT?

TABLE 1: TECH TALENT LABOR BY INDUSTRY (2018)*

Tech Talent occupations in each industry as a % of U.S. Tech Talent

| <u>Industry</u> | <u>% of Total Tech Talent Labor</u> |
|---|-------------------------------------|
| Core High-Tech* | 37.2% |
| Professional, Scientific & Technical Services (Excluding High-Tech) | 10.5% |
| Other | 8.6% |
| FIRE | 8.3% |
| Management of Companies & Enterprises | 6.2% |
| Government | 6.0% |
| Information (Excluding High-Tech) | 5.8% |
| Transportation, Warehousing & Wholesale | 4.9% |
| Manufacturing (Excluding High-Tech) | 4.8% |
| Education | 4.8% |
| Health Care | 2.9% |

Source: U.S. Bureau of Labor Statistics (National), April 2019.

*Includes computer software and services and computer product manufacturing

WHICH ARE THE TOP-RANKED TECH TALENT MARKETS?

TABLE 2: TECH TALENT SCORECARD RANKING

| Rank | Market | Score | Rank | Market | Score |
|------|----------------------|-------|------|---------------------|-------|
| 1 | SF Bay Area, CA | 84.79 | 26 | Orange County, CA | 47.70 |
| 2 | Seattle, WA | 73.82 | 27 | Columbus, OH | 44.92 |
| 3 | Toronto, ON | 69.88 | 28 | Newark, NJ | 44.82 |
| 4 | Washington, D.C. | 69.83 | 29 | Tampa, FL | 44.70 |
| 5 | New York, NY | 65.12 | 30 | Charlotte, NC | 44.51 |
| 6 | Austin, TX | 62.10 | 31 | Pittsburgh, PA | 43.98 |
| 7 | Boston, MA | 60.26 | 32 | Kansas City, MO | 42.44 |
| 8 | Denver, CO | 59.43 | 33 | Orlando, FL | 40.34 |
| 9 | Atlanta, GA | 58.08 | 34 | Houston, TX | 39.51 |
| 10 | Raleigh-Durham, NC | 57.68 | 35 | St. Louis, MO | 35.34 |
| 11 | Dallas/Ft. Worth, TX | 57.63 | 36 | Indianapolis, IN | 34.46 |
| 12 | Vancouver, BC | 56.25 | 37 | Cleveland, OH | 32.84 |
| 13 | Montreal, QC | 55.54 | 38 | Sacramento, CA | 32.52 |
| 14 | Baltimore, MD | 55.28 | 39 | Hartford, CT | 32.42 |
| 15 | Salt Lake City, UT | 52.99 | 40 | Cincinnati, OH | 31.93 |
| 16 | Portland, OR | 52.65 | 41 | Rochester, NY | 31.87 |
| 17 | Minneapolis, MN | 52.05 | 42 | Long Island, NY | 31.47 |
| 18 | San Diego, CA | 51.33 | 43 | Fort Lauderdale, FL | 30.97 |
| 19 | Ottawa, ON | 51.10 | 44 | Milwaukee, WI | 29.26 |
| 20 | Phoenix, AZ | 50.57 | 45 | Nashville, TN | 27.74 |
| 21 | Chicago, IL | 48.87 | 46 | Jacksonville, FL | 26.85 |
| 22 | Philadelphia, PA | 48.86 | 47 | San Antonio, TX | 24.49 |
| 23 | Los Angeles, CA | 48.82 | 48 | Miami, FL | 22.16 |
| 24 | Detroit, MI | 48.04 | 49 | Richmond, VA | 21.93 |
| 25 | Madison, WI | 47.96 | 50 | Norfolk, VA | 21.33 |

Source: CBRE Research; CBRE Econometric Advisors; U.S. Bureau of Labor Statistics; Statistics Canada; CMHC; Moody's Analytics; The National Center of Education Statistics; National Science Foundation; Axiometrics, 2019.

WHAT ARE TECH TALENT MOMENTUM MARKETS?

TABLE 3: TECH TALENT LABOR CONCENTRATION (2018)

| Market | Tech Talent Jobs as % of Total Jobs | Market | Tech Talent Jobs as % of Total Jobs |
|----------------------|-------------------------------------|--------------------|-------------------------------------|
| SF Bay Area, CA | 10.0% | Detroit, MI | 4.4% |
| Ottawa, ON | 9.9% | Rochester, NY | 4.3% |
| Toronto, ON | 8.3% | Phoenix, AZ | 4.1% |
| Washington, D.C. | 8.1% | Sacramento, CA | 4.0% |
| Seattle, WA | 7.9% | Pittsburgh, PA | 4.0% |
| Austin, TX | 7.0% | St. Louis, MO | 4.0% |
| Montreal, QC | 6.8% | Richmond, VA | 4.0% |
| Raleigh-Durham, NC | 6.5% | New York, NY | 3.9% |
| Denver, CO | 6.5% | Philadelphia, PA | 3.8% |
| Vancouver, BC | 6.4% | Tampa, FL | 3.7% |
| Madison, WI | 6.0% | Milwaukee, WI | 3.7% |
| Boston, MA | 5.8% | Indianapolis, IN | 3.6% |
| Baltimore, MD | 5.5% | Chicago, IL | 3.6% |
| Atlanta, GA | 5.3% | Cincinnati, OH | 3.5% |
| Kansas City, MO | 5.0% | Norfolk, VA | 3.5% |
| Portland, OR | 5.0% | Cleveland, OH | 3.4% |
| San Diego, CA | 5.0% | Orlando, FL | 3.3% |
| Salt Lake City, UT | 5.0% | Houston, TX | 3.2% |
| Minneapolis, MN | 4.7% | Jacksonville, FL | 3.1% |
| Dallas/Ft. Worth, TX | 4.7% | Ft. Lauderdale, FL | 3.1% |
| Columbus, OH | 4.6% | Los Angeles, CA | 3.1% |
| Charlotte, NC | 4.6% | Nashville, TN | 3.0% |
| Newark, NJ | 4.5% | San Antonio, TX | 3.0% |
| Orange County, CA | 4.4% | Long Island, NY | 2.5% |
| Hartford, CT | 4.4% | Miami, FL | 2.2% |

Source: U.S. Bureau of Labor Statistics (Metro) April 2019, Statistics Canada (Metro), 2019.

TABLE 4: TECH TALENT LABOR POOLS BY MARKET (2018)

| Labor Pool Size | Market | Tech Talent Total |
|--|--|-------------------|
| Large Tech Talent Markets (>50,000 Labor Pool) | SF Bay Area, CA | 353,760 |
| | New York, NY | 264,373 |
| | Washington, D.C. | 253,660 |
| | Toronto, ON | 228,500 |
| | Dallas/Ft. Worth, TX | 169,290 |
| | Chicago, IL | 166,620 |
| | Boston, MA | 160,070 |
| | Seattle, WA | 156,770 |
| | Atlanta, GA | 141,580 |
| | Los Angeles, CA | 139,774 |
| | Montreal, QC | 130,200 |
| | Philadelphia, PA | 109,670 |
| | Denver, CO | 107,170 |
| | Houston, TX | 95,640 |
| | Minneapolis, MN | 92,830 |
| | Detroit, MI | 86,090 |
| | Phoenix, AZ | 85,060 |
| | Baltimore, MD | 75,150 |
| | Vancouver, BC | 74,700 |
| | San Diego, CA | 73,170 |
| | Orange County, CA | 72,699 |
| | Austin, TX | 72,360 |
| | Ottawa, ON | 64,500 |
| | Raleigh-Durham, NC | 61,040 |
| | Portland, OR | 59,580 |
| | Charlotte, NC | 55,430 |
| | St. Louis, MO | 54,020 |
| | Kansas City, MO | 53,360 |
| | Newark, NJ | 53,168 |
| | Small Tech Talent Markets (<50,000 Labor Pool) | Tampa, FL |
| Columbus, OH | | 48,600 |
| Salt Lake City, UT | | 47,760 |
| Pittsburgh, PA | | 45,440 |
| Orlando, FL | | 41,240 |
| Sacramento, CA | | 39,110 |
| Cincinnati, OH | | 37,820 |
| Indianapolis, IN | | 37,650 |
| Cleveland, OH | | 35,700 |
| Long Island, NY | | 33,271 |
| Milwaukee, WI | | 31,620 |
| San Antonio, TX | | 30,170 |
| Nashville, TN | | 29,120 |
| Norfolk, VA | | 26,120 |
| Ft. Lauderdale, FL | | 25,838 |
| Hartford, CT | | 25,770 |
| Richmond, VA | | 25,560 |
| Miami, FL | | 25,289 |
| Madison, WI | | 23,470 |
| Rochester, NY | | 22,180 |
| Jacksonville, FL | 21,490 | |

Source: U.S. Bureau of Labor Statistics (Metro) April 2019, Statistics Canada (Metro), 2019.

TABLE 5: TECH LABOR POOL GROWTH RATES (2013-2018)

| Labor Pool Size | Market | % Change | By Volume |
|--|--|-------------|-----------|
| Large Tech Talent Markets (>50,000 Labor Pool) | Toronto, ON | 54.0% | 80,100 |
| | Charlotte, NC | 48.4% | 18,070 |
| | Vancouver, BC | 42.6% | 22,300 |
| | Portland, OR | 35.3% | 15,540 |
| | SF Bay Area, CA | 33.4% | 88,500 |
| | Denver, CO | 30.9% | 25,290 |
| | Atlanta, GA | 29.1% | 31,880 |
| | Kansas City, MO | 25.6% | 10,870 |
| | Seattle, WA | 24.3% | 30,680 |
| | New York, NY | 20.5% | 44,920 |
| | Detroit, MI | 18.4% | 13,370 |
| | Los Angeles, CA | 16.4% | 19,704 |
| | Dallas/Ft. Worth, TX | 15.7% | 22,960 |
| | San Diego, CA | 15.5% | 9,820 |
| | Montreal, QC | 14.6% | 16,600 |
| | Orange County, CA | 13.9% | 8,889 |
| | Philadelphia, PA | 13.9% | 13,400 |
| | Minneapolis, MN | 13.2% | 10,860 |
| | Austin, TX | 12.6% | 8,080 |
| | Small Tech Talent Markets (<50,000 Labor Pool) | Phoenix, AZ | 12.3% |
| Baltimore, MD | | 11.9% | 7,990 |
| Raleigh-Durham, NC | | 11.2% | 6,170 |
| Chicago, IL | | 10.5% | 15,790 |
| Newark, NJ | | 9.7% | 4,696 |
| St. Louis, MO | | 6.5% | 3,320 |
| Houston, TX | | 3.1% | 2,860 |
| Boston, MA | | 2.4% | 3,710 |
| Washington, D.C. | | 2.2% | 5,520 |
| Ottawa, ON | | -5.3% | -3,600 |
| Madison, WI | | 47.0% | 7,500 |
| Ft. Lauderdale, FL | | 46.8% | 8,238 |
| Jacksonville, FL | | 40.7% | 6,220 |
| Salt Lake City, UT | | 38.6% | 13,290 |
| Miami, FL | | 35.4% | 6,609 |
| Orlando, FL | | 34.2% | 10,520 |
| Nashville, TN | | 28.0% | 6,370 |
| Tampa, FL | | 27.6% | 10,630 |
| Indianapolis, IN | | 24.1% | 7,310 |
| Pittsburgh, PA | | 20.7% | 7,800 |
| Long Island, NY | 19.9% | 5,521 | |
| Cleveland, OH | 17.2% | 5,230 | |
| San Antonio, TX | 15.6% | 4,070 | |
| Rochester, NY | 15.0% | 2,890 | |
| Cincinnati, OH | 13.2% | 4,410 | |
| Sacramento, CA | 12.6% | 4,390 | |
| Richmond, VA | 11.6% | 2,650 | |
| Milwaukee, WI | 10.1% | 2,910 | |
| Hartford, CT | 9.4% | 2,210 | |
| Columbus, OH | 8.1% | 3,660 | |
| Norfolk, VA | -5.5% | -1,520 | |

Source: U.S. Bureau of Labor Statistics (Metro) April 2019, Statistics Canada (Metro), 2019.

WHAT DEFINES A TECH TALENT MARKET?

TABLE 6: TOP-10 MARKETS FOR EDUCATIONAL ATTAINMENT

25+ Years Old, Bachelor’s Degree or Higher

| Market | Educational Attainment Rate |
|--------------------|-----------------------------|
| Seattle, WA | 62.6% |
| Washington, D.C. | 57.3% |
| Madison, WI | 57.0% |
| Long Island, NY | 52.7% |
| Denver, CO | 52.3% |
| Austin, TX | 51.0% |
| Minneapolis, MN | 50.8% |
| Raleigh-Durham, NC | 50.3% |
| Portland, OR | 49.9% |
| SF Bay Area, CA | 49.3% |

Source: U.S. Census Bureau (City), 2019.

TABLE 7: TOP-10 MARKETS FOR TECH DEGREE COMPLETIONS (2017)

| Market | Tech Degree Completions (2017) | Growth (2012-2017) |
|----------------------|--------------------------------|--------------------|
| New York, NY | 13,337 | 48.0% |
| Washington, D.C. | 11,278 | 31.1% |
| Los Angeles, CA | 9,621 | 37.7% |
| Boston, MA | 9,429 | 61.0% |
| SF Bay Area, CA | 8,225 | 46.3% |
| Chicago, IL | 7,375 | 36.9% |
| Atlanta, GA | 7,050 | 47.5% |
| Dallas/Ft. Worth, TX | 6,503 | 98.5% |
| Detroit, MI | 5,726 | 32.0% |
| Toronto, ON | 5,397 | 37.8% |

Source: The National Center for Education Statistics (Region), Canadian Universities, July 2019.
Note: Bachelor’s Degree or Higher.

TABLE 8: WHERE ARE TECH TALENT WORKERS COMING FROM AND WHERE ARE THEY HEADED?

| Market | Tech Degrees (2012-2017)* | Tech Jobs Added (2013-2018)* | Brain Gain/Drain |
|----------------------|---------------------------|------------------------------|------------------|
| Toronto, ON | 22,466 | 80,100 | 57,634 |
| SF Bay Area, CA | 33,809 | 88,500 | 54,691 |
| Seattle, WA | 15,213 | 30,680 | 15,467 |
| Charlotte, NC | 5,885 | 18,070 | 12,185 |
| Vancouver, BC | 11,140 | 22,300 | 11,160 |
| Portland, OR | 8,375 | 15,540 | 7,165 |
| Denver, CO | 18,793 | 25,290 | 6,497 |
| Kansas City, MO | 6,040 | 10,870 | 4,830 |
| Jacksonville, FL | 1,851 | 6,220 | 4,369 |
| Tampa, FL | 6,787 | 10,630 | 3,843 |
| Atlanta, GA | 28,362 | 31,880 | 3,518 |
| Indianapolis, IN | 3,876 | 7,310 | 3,434 |
| Ft. Lauderdale, FL | 4,844 | 8,238 | 3,394 |
| Nashville, TN | 3,900 | 6,370 | 2,470 |
| Miami, FL | 6,565 | 6,609 | 44 |
| Madison, WI | 7,705 | 7,500 | -205 |
| Orlando, FL | 10,737 | 10,520 | -217 |
| Milwaukee, WI | 3,546 | 2,910 | -636 |
| San Antonio, TX | 4,818 | 4,070 | -748 |
| Richmond, VA | 3,417 | 2,650 | -767 |
| Dallas/Ft. Worth, TX | 23,944 | 22,960 | -984 |
| Cincinnati, OH | 7,155 | 4,410 | -2,745 |
| Sacramento, CA | 7,514 | 4,390 | -3,124 |
| Austin, TX | 11,381 | 8,080 | -3,301 |
| Orange County, CA | 12,831 | 8,889 | -3,942 |
| Cleveland, OH | 9,427 | 5,230 | -4,197 |
| St. Louis, MO | 8,065 | 3,320 | -4,745 |
| Montreal, QC | 21,403 | 16,600 | -4,803 |
| Minneapolis, MN | 16,185 | 10,860 | -5,325 |
| San Diego, CA | 15,300 | 9,820 | -5,480 |
| Long Island, NY | 11,493 | 5,521 | -5,972 |
| Newark, NJ | 10,849 | 4,696 | -6,153 |
| Columbus, OH | 10,399 | 3,660 | -6,739 |
| Salt Lake City, UT | 20,096 | 13,290 | -6,806 |
| Rochester, NY | 10,218 | 2,890 | -7,328 |
| Houston, TX | 10,759 | 2,860 | -7,899 |
| Philadelphia, PA | 21,305 | 13,400 | -7,905 |
| Hartford, CT | 10,311 | 2,210 | -8,101 |
| Baltimore, MD | 16,873 | 7,990 | -8,883 |
| Norfolk, VA | 7,599 | -1,520 | -9,119 |
| New York, NY | 54,299 | 44,920 | -9,379 |
| Raleigh-Durham, NC | 15,792 | 6,170 | -9,622 |
| Ottawa, ON | 6,609 | -3,600 | -10,209 |
| Detroit, MI | 24,225 | 13,370 | -10,855 |
| Pittsburgh, PA | 20,360 | 7,800 | -12,560 |
| Chicago, IL | 30,471 | 15,790 | -14,681 |
| Phoenix, AZ | 24,404 | 9,310 | -15,094 |
| Los Angeles, CA | 41,453 | 19,704 | -21,749 |
| Boston, MA | 37,717 | 3,710 | -34,007 |
| Washington, D.C. | 49,060 | 5,520 | -43,540 |

Source: CBRE Research, U.S. Bureau of Labor Statistics, The National Center for Education Statistics (Metro), Canadian Universities, 2019.

*Tech degrees cover the most recent five-year period available (2012-2017) and tech jobs added cover the time period reflecting when most graduates would be counted in employment figures (2013-2018).

TABLE 9: TOP-10 MOST CONCENTRATED MILLENNIAL MARKETS* (2017)

| Market | Population Concentration of Millennials |
|----------------------|---|
| UNITED STATES | 13.8% |
| Madison, WI | 26.5% |
| Norfolk, VA | 25.3% |
| Pittsburgh, PA | 24.5% |
| Boston, MA | 24.2% |
| Salt Lake City, UT | 22.7% |
| Atlanta, GA | 21.3% |
| Minneapolis, MN | 21.1% |
| Richmond, VA | 20.6% |
| Rochester, NY | 20.0% |
| Columbus, OH | 19.9% |

Source: U.S. Census Bureau (City), 2019.
*Millennials aged 20-29 years living in downtown areas.

TABLE 11: TOP- & BOTTOM-10 MARKETS BY GENDER DIVERSITY IN TECH OCCUPATIONS (2017)

| Market | | % Male | % Female |
|------------------|--------------------------------|--------|----------|
| Long Island, NY | ▼ TOP 10 (most diverse) | 71.7 | 28.3 |
| New York, NY | | 71.7 | 28.3 |
| Newark, NJ | | 71.7 | 28.3 |
| Philadelphia, PA | | 71.5 | 28.5 |
| Boston, MA | | 70.3 | 29.7 |
| Richmond, VA | | 70.2 | 29.8 |
| Nashville, TN | | 69.8 | 30.2 |
| Baltimore, MD | | 69.7 | 30.3 |
| Washington, D.C. | | 69.0 | 31.0 |
| Sacramento, CA | | 68.3 | 31.7 |
| Vancouver, BC | ▼ BOTTOM 10 (least diverse) | 81.7 | 18.3 |
| Montreal, QC | | 78.7 | 21.3 |
| Phoenix, AZ | | 78.6 | 21.4 |
| Austin, TX | | 77.9 | 22.1 |
| Ottawa, ON | | 77.7 | 22.3 |
| Cleveland, OH | | 77.3 | 22.7 |
| Indianapolis, IN | | 77.3 | 22.7 |
| Seattle, WA | | 76.8 | 23.2 |
| Cincinnati, OH | | 76.5 | 23.5 |
| Houston, TX | | 76.5 | 23.5 |

Source: U.S. Census Bureau (City), Statistics Canada, 2019.

TABLE 10: MILLENNIAL POPULATION CHANGE BY MARKET* (2012-2017)

U.S. Average = 2.5%

| Labor Pool Size | Market | % Change |
|---|----------------------|----------|
| Large Tech Talent Markets (>50,000 Labor Pool) | Dallas/Ft. Worth, TX | 14.7% |
| | Charlotte, NC | 13.5% |
| | Kansas City, MO | 12.6% |
| | Orange County, CA | 11.1% |
| | Seattle, WA | 10.2% |
| | Atlanta, GA | 10.1% |
| | Denver, CO | 9.5% |
| | Portland, OR | 9.0% |
| | Phoenix, AZ | 8.3% |
| | Toronto, ON | 8.3% |
| | Raleigh-Durham, NC | 7.8% |
| | Vancouver, BC | 6.5% |
| | Detroit, MI | 6.0% |
| | San Diego, CA | 5.6% |
| | SF Bay Area, CA | 5.2% |
| | Ottawa, ON | 4.7% |
| | Los Angeles, CA | 4.4% |
| | Houston, TX | 4.4% |
| | Austin, TX | 2.4% |
| | Montreal, QC | 2.4% |
| | Washington, D.C. | 2.2% |
| | Boston, MA | 1.9% |
| | Chicago, IL | 1.5% |
| | Minneapolis, MN | -0.3% |
| | New York, NY | -0.9% |
| | Philadelphia, PA | -2.8% |
| | St. Louis, MO | -6.1% |
| | Baltimore, MD | -6.5% |
| Newark, NJ | -7.6% | |
| Small Tech Talent Markets (<50,000 Labor Pool) | Long Island, NY | 16.0% |
| | Miami, FL | 10.7% |
| | San Antonio, TX | 10.3% |
| | Madison, WI | 9.2% |
| | Salt Lake City, UT | 8.8% |
| | Columbus, OH | 8.0% |
| | Orlando, FL | 7.1% |
| | Nashville, TN | 5.7% |
| | Pittsburgh, PA | 5.2% |
| | Ft. Lauderdale, FL | 4.8% |
| | Jacksonville, FL | 4.3% |
| | Indianapolis, IN | 1.8% |
| | Cincinnati, OH | 0.9% |
| | Richmond, VA | 0.3% |
| | Sacramento, CA | -0.2% |
| | Norfolk, VA | -0.5% |
| | Cleveland, OH | -1.0% |
| | Rochester, NY | -1.0% |
| Tampa, FL | -1.2% | |
| Milwaukee, WI | -2.9% | |
| Hartford, CT | -3.5% | |

Source: U.S. Census Bureau (City), Statistics Canada (Metro), 2019.
*Millennials aged 20-29 years living in downtown areas.

TABLE 12: U.S. TECH TALENT LABOR CONCENTRATION BY INDUSTRY (2018)

Tech Talent Occupations as a % of All Occupations in Each Industry

| Industry | % of Total Tech Talent Labor |
|---|------------------------------|
| Core High-Tech* | 49.7% |
| Information (Excluding High-Tech) | 14.3% |
| Management of Companies & Enterprises | 13.4% |
| Professional, Scientific & Technical Services (Excluding High-Tech) | 7.7% |
| FIRE | 5.3% |
| Total U.S. Employment | 3.6% |
| Government | 3.2% |
| Manufacturing (Excluding High-Tech) | 2.1% |
| Transportation, Warehousing & Wholesale | 2.1% |
| Education | 1.9% |
| Other | 0.8% |
| Health Care | 0.7% |

Source: U.S. Bureau of Labor Statistics (National), April 2019.

*Includes computer software and services and computer product manufacturing

TECH TALENT HAS UNIQUE CONCENTRATIONS ACROSS MARKETS

TABLE 13: TECH TALENT BY TYPE: SOFTWARE DEVELOPERS & PROGRAMMERS

Ranked by % of tech talent

| Market | Software Developers & Programmers | % of Tech Talent | Market | Software Developers & Programmers | % of Tech Talent |
|----------------------|-----------------------------------|------------------|--------------------|-----------------------------------|------------------|
| Seattle, WA | 79,780 | 50.9% | Atlanta, GA | 44,720 | 31.6% |
| SF Bay Area, CA | 156,670 | 44.3% | Kansas City, MO | 16,760 | 31.4% |
| Madison, WI | 9,620 | 41.0% | Minneapolis, MN | 29,040 | 31.3% |
| Raleigh-Durham, NC | 23,710 | 38.8% | Jacksonville, FL | 6,700 | 31.2% |
| Boston, MA | 61,670 | 38.5% | Tampa, FL | 15,290 | 31.1% |
| Salt Lake City, UT | 18,110 | 37.9% | Ft. Lauderdale, FL | 7,968 | 30.8% |
| New York, NY | 99,384 | 37.6% | Pittsburgh, PA | 13,890 | 30.6% |
| Detroit, MI | 32,110 | 37.3% | Washington, D.C. | 75,850 | 29.9% |
| Austin, TX | 25,990 | 35.9% | St. Louis, MO | 16,120 | 29.8% |
| Denver, CO | 37,490 | 35.0% | Milwaukee, WI | 9,400 | 29.7% |
| San Diego, CA | 25,240 | 34.5% | Rochester, NY | 6,530 | 29.4% |
| Newark, NJ | 18,332 | 34.5% | Phoenix, AZ | 24,980 | 29.4% |
| Dallas/Ft. Worth, TX | 58,340 | 34.5% | Toronto, ON | 67,000 | 29.3% |
| Vancouver, BC | 25,200 | 33.7% | Charlotte, NC | 16,030 | 28.9% |
| Orlando, FL | 13,860 | 33.6% | Cincinnati, OH | 10,870 | 28.7% |
| Orange County, CA | 24,377 | 33.5% | Cleveland, OH | 10,130 | 28.4% |
| Sacramento, CA | 13,110 | 33.5% | Long Island, NY | 9,375 | 28.2% |
| Chicago, IL | 55,430 | 33.3% | Houston, TX | 26,590 | 27.8% |
| Columbus, OH | 15,880 | 32.7% | Nashville, TN | 7,970 | 27.4% |
| Indianapolis, IN | 12,280 | 32.6% | Baltimore, MD | 20,290 | 27.0% |
| Richmond, VA | 8,330 | 32.6% | Miami, FL | 6,809 | 26.9% |
| Portland, OR | 19,350 | 32.5% | Montreal, QC | 34,100 | 26.2% |
| Los Angeles, CA | 45,293 | 32.4% | Ottawa, ON | 15,600 | 24.2% |
| Philadelphia, PA | 35,470 | 32.3% | San Antonio, TX | 6,910 | 22.9% |
| Hartford, CT | 8,300 | 32.2% | Norfolk, VA | 5,790 | 22.2% |

Source: U.S. Bureau of Labor Statistics, Statistics Canada, April 2019.

Note: Software Developers & Programmers include: computer programmers; software application developers, software systems software developers, and web developers

TABLE 14: TECH TALENT BY TYPE: COMPUTER SUPPORT, DATABASE & SYSTEMS

Ranked by % of tech talent

| Market | Computer Support, Database & Systems | % of Tech Talent | Market | Computer Support, Database & Systems | % of Tech Talent |
|--------------------|--------------------------------------|------------------|----------------------|--------------------------------------|------------------|
| San Antonio, TX | 18,930 | 62.7% | Dallas/Ft. Worth, TX | 86,620 | 51.2% |
| Miami, FL | 14,783 | 58.5% | Pittsburgh, PA | 23,150 | 50.9% |
| Cleveland, OH | 20,140 | 56.4% | Orlando, FL | 20,850 | 50.6% |
| St. Louis, MO | 30,470 | 56.4% | Madison, WI | 11,780 | 50.2% |
| Washington, D.C. | 142,550 | 56.2% | Long Island, NY | 16,519 | 49.6% |
| Tampa, FL | 27,510 | 56.0% | Raleigh-Durham, NC | 29,790 | 48.8% |
| Nashville, TN | 16,250 | 55.8% | Denver, CO | 51,740 | 48.3% |
| Jacksonville, FL | 11,930 | 55.5% | New York, NY | 123,286 | 46.6% |
| Baltimore, MD | 41,710 | 55.5% | Los Angeles, CA | 65,028 | 46.5% |
| Ft. Lauderdale, FL | 14,299 | 55.3% | Austin, TX | 33,660 | 46.5% |
| Cincinnati, OH | 20,920 | 55.3% | Hartford, CT | 11,940 | 46.3% |
| Richmond, VA | 14,110 | 55.2% | Salt Lake City, UT | 22,070 | 46.2% |
| Charlotte, NC | 30,500 | 55.0% | Newark, NJ | 24,317 | 45.7% |
| Phoenix, AZ | 46,530 | 54.7% | Sacramento, CA | 17,810 | 45.5% |
| Columbus, OH | 26,390 | 54.3% | Detroit, MI | 37,310 | 43.3% |
| Norfolk, VA | 13,990 | 53.6% | Orange County, CA | 31,083 | 42.8% |
| Milwaukee, WI | 16,870 | 53.4% | Toronto, ON | 93,100 | 40.7% |
| Houston, TX | 50,970 | 53.3% | Ottawa, ON | 25,800 | 40.0% |
| Indianapolis, IN | 20,040 | 53.2% | Boston, MA | 63,670 | 39.8% |
| Minneapolis, MN | 49,070 | 52.9% | Portland, OR | 22,780 | 38.2% |
| Atlanta, GA | 74,750 | 52.8% | San Diego, CA | 26,620 | 36.4% |
| Kansas City, MO | 27,960 | 52.4% | Montreal, QC | 47,300 | 36.3% |
| Philadelphia, PA | 56,890 | 51.9% | Seattle, WA | 55,780 | 35.6% |
| Chicago, IL | 85,630 | 51.4% | SF Bay Area, CA | 124,440 | 35.2% |
| Rochester, NY | 11,360 | 51.2% | Vancouver, BC | 25,600 | 34.3% |

Source: U.S. Bureau of Labor Statistics, Statistics Canada, April 2019.

Note: Computer Support, Database & Systems include: computer and information research scientists, computer systems analysts, information security analysts, database administrators, network and computer systems administrators, computer network architects, computer user support specialists, computer network support specialists, and all other computer occupations.

TABLE 15: TECH TALENT BY TYPE: COMPUTER & INFORMATION SYSTEMS MANAGERS

Ranked by % of tech talent

| Market | Computer & Information Systems Managers | % of Tech Talent | Market | Computer & Information Systems Managers | % of Tech Talent |
|--------------------|---|------------------|----------------------|---|------------------|
| Hartford, CT | 3,590 | 13.9% | Orlando, FL | 3,070 | 7.4% |
| Ottawa, ON | 7,300 | 11.3% | Miami, FL | 1,869 | 7.4% |
| Toronto, ON | 23,600 | 10.3% | Cleveland, OH | 2,610 | 7.3% |
| Boston, MA | 16,530 | 10.3% | San Diego, CA | 5,310 | 7.3% |
| Charlotte, NC | 5,440 | 9.8% | Washington, D.C. | 18,220 | 7.2% |
| Salt Lake City, UT | 4,680 | 9.8% | Pittsburgh, PA | 3,250 | 7.2% |
| Newark, NJ | 5,113 | 9.6% | Ft. Lauderdale, FL | 1,847 | 7.1% |
| New York, NY | 24,722 | 9.4% | Sacramento, CA | 2,790 | 7.1% |
| Chicago, IL | 15,320 | 9.2% | Phoenix, AZ | 5,980 | 7.0% |
| SF Bay Area, CA | 31,470 | 8.9% | Tampa, FL | 3,430 | 7.0% |
| Minneapolis, MN | 8,110 | 8.7% | Baltimore, MD | 5,130 | 6.8% |
| Los Angeles, CA | 12,032 | 8.6% | Jacksonville, FL | 1,460 | 6.8% |
| Atlanta, GA | 12,010 | 8.5% | Vancouver, BC | 4,900 | 6.6% |
| Cincinnati, OH | 3,200 | 8.5% | Houston, TX | 6,130 | 6.4% |
| Nashville, TN | 2,460 | 8.4% | Detroit, MI | 5,510 | 6.4% |
| Orange County, CA | 5,970 | 8.2% | Kansas City, MO | 3,380 | 6.3% |
| Milwaukee, WI | 2,530 | 8.0% | Richmond, VA | 1,510 | 5.9% |
| Raleigh-Durham, NC | 4,750 | 7.8% | Denver, CO | 6,320 | 5.9% |
| Montreal, QC | 10,100 | 7.8% | St. Louis, MO | 3,130 | 5.8% |
| Columbus, OH | 3,730 | 7.7% | Rochester, NY | 1,280 | 5.8% |
| Portland, OR | 4,570 | 7.7% | Madison, WI | 1,330 | 5.7% |
| Long Island, NY | 2,541 | 7.6% | Dallas/Ft. Worth, TX | 9,010 | 5.3% |
| Indianapolis, IN | 2,870 | 7.6% | Austin, TX | 3,330 | 4.6% |
| Philadelphia, PA | 8,200 | 7.5% | Norfolk, VA | 1,190 | 4.6% |
| Seattle, WA | 11,700 | 7.5% | San Antonio, TX | 1,330 | 4.4% |

Source: U.S. Bureau of Labor Statistics, Statistics Canada, April 2019.

TABLE 16: TECH TALENT BY TYPE: TECHNOLOGY ENGINEERING-RELATED

Ranked by % of tech talent

| Market | Technology Engineering-Related | % of Tech Talent | Market | Technology Engineering-Related | % of Tech Talent |
|----------------------|--------------------------------|------------------|--------------------|--------------------------------|------------------|
| Montreal, QC | 38,700 | 30% | Phoenix, AZ | 7,570 | 9% |
| Vancouver, BC | 19,000 | 25% | Orlando, FL | 3,460 | 8% |
| Ottawa, ON | 15,800 | 24% | Nashville, TN | 2,440 | 8% |
| San Diego, CA | 16,000 | 22% | Philadelphia, PA | 9,110 | 8% |
| Portland, OR | 12,880 | 22% | St. Louis, MO | 4,300 | 8% |
| Norfolk, VA | 5,150 | 20% | Cleveland, OH | 2,820 | 8% |
| Toronto, ON | 44,800 | 20% | Hartford, CT | 1,940 | 8% |
| Orange County, CA | 11,270 | 16% | Cincinnati, OH | 2,830 | 7% |
| Long Island, NY | 4,836 | 15% | Miami, FL | 1,828 | 7% |
| Sacramento, CA | 5,400 | 14% | Atlanta, GA | 10,100 | 7% |
| Rochester, NY | 3,010 | 14% | Minneapolis, MN | 6,610 | 7% |
| Detroit, MI | 11,160 | 13% | Washington, D.C. | 17,040 | 7% |
| Austin, TX | 9,380 | 13% | Ft. Lauderdale, FL | 1,725 | 7% |
| Houston, TX | 11,950 | 12% | Indianapolis, IN | 2,460 | 7% |
| Los Angeles, CA | 17,420 | 12% | Jacksonville, FL | 1,400 | 7% |
| SF Bay Area, CA | 41,180 | 12% | New York, NY | 16,982 | 6% |
| Boston, MA | 18,200 | 11% | Richmond, VA | 1,610 | 6% |
| Pittsburgh, PA | 5,150 | 11% | Charlotte, NC | 3,460 | 6% |
| Denver, CO | 11,620 | 11% | Chicago, IL | 10,240 | 6% |
| Baltimore, MD | 8,020 | 11% | Salt Lake City, UT | 2,900 | 6% |
| Newark, NJ | 5,406 | 10% | Seattle, WA | 9,510 | 6% |
| San Antonio, TX | 3,000 | 10% | Tampa, FL | 2,890 | 6% |
| Kansas City, MO | 5,260 | 10% | Columbus, OH | 2,600 | 5% |
| Dallas/Ft. Worth, TX | 15,320 | 9% | Raleigh-Durham, NC | 2,790 | 5% |
| Milwaukee, WI | 2,820 | 9% | Madison, WI | 740 | 3% |

Source: U.S. Bureau of Labor Statistics, Statistics Canada, April 2019.

Note: Technology Engineering-Related includes: computer programmers; computer hardware engineers, electrical engineers, electronics engineers except computer, electrical and electronics drafters, electrical and electronics engineering technicians, and electro-mechanical technicians.

WHICH ARE THE HIGHEST- AND LOWEST-COST MARKETS TO OPERATE IN?

TABLE 17: TECH TALENT WAGES BY MARKET (2018)

U.S. Average = 100%

| Market | Average Tech Talent Wage | Wage Relative to U.S. Average | Talent Wage 5 Yr. Growth | Market | Average Tech Talent Wage | Wage Relative to U.S. Average | Talent Wage 5 Yr. Growth |
|----------------------|--------------------------|-------------------------------|--------------------------|--------------------|--------------------------|-------------------------------|--------------------------|
| SF Bay Area, CA | \$129,718 | 135% | 14% | Ft. Lauderdale, FL | \$89,179 | 93% | 24% |
| Seattle, WA | \$117,806 | 122% | 13% | Phoenix, AZ | \$88,342 | 92% | 8% |
| New York, NY | \$113,500 | 118% | 14% | St. Louis, MO | \$88,167 | 91% | 10% |
| Washington, D.C. | \$112,735 | 117% | 9% | Miami, FL | \$88,118 | 91% | 13% |
| Newark, NJ | \$110,772 | 115% | 9% | San Antonio, TX | \$87,752 | 91% | 14% |
| Boston, MA | \$106,634 | 111% | 11% | Salt Lake City, UT | \$87,060 | 90% | 15% |
| San Diego, CA | \$106,047 | 110% | 15% | Norfolk, VA | \$86,983 | 90% | #N/A |
| Baltimore, MD | \$105,463 | 109% | 10% | Detroit, MI | \$86,864 | 90% | 13% |
| Los Angeles, CA | \$104,005 | 108% | 12% | Tampa, FL | \$86,283 | 90% | 12% |
| Denver, CO | \$102,872 | 107% | 14% | Chicago, IL | \$86,159 | 89% | 5% |
| Orange County, CA | \$101,876 | 106% | 9% | Cincinnati, OH | \$85,925 | 89% | 10% |
| Hartford, CT | \$98,645 | 102% | 12% | Orlando, FL | \$85,712 | 89% | 18% |
| Dallas/Ft. Worth, TX | \$98,009 | 102% | 17% | Madison, WI | \$84,169 | 87% | 15% |
| Sacramento, CA | \$96,721 | 100% | 12% | Indianapolis, IN | \$83,831 | 87% | 11% |
| Philadelphia, PA | \$96,706 | 100% | 11% | Nashville, TN | \$83,184 | 86% | 14% |
| Atlanta, GA | \$96,050 | 100% | 14% | Milwaukee, WI | \$82,775 | 86% | 8% |
| Columbus, OH | \$96,038 | 100% | 20% | Kansas City, MO | \$81,947 | 85% | 6% |
| Charlotte, NC | \$95,952 | 100% | 9% | Jacksonville, FL | \$80,365 | 83% | 8% |
| Houston, TX | \$95,916 | 100% | 6% | Cleveland, OH | \$80,165 | 83% | 10% |
| Raleigh-Durham, NC | \$95,707 | 99% | 9% | Pittsburgh, PA | \$79,817 | 83% | 8% |
| Long Island, NY | \$94,780 | 98% | 7% | Rochester, NY | \$79,809 | 83% | 10% |
| Minneapolis, MN | \$94,502 | 98% | 12% | Ottawa, ON* | \$67,720 | 70% | 7% |
| Austin, TX | \$93,860 | 97% | 11% | Toronto, ON* | \$63,154 | 66% | 10% |
| Richmond, VA | \$93,386 | 97% | 11% | Vancouver, BC* | \$61,824 | 64% | 10% |
| Portland, OR | \$91,735 | 95% | 12% | Montreal, QC* | \$58,373 | 61% | 11% |

Source: U.S. Bureau of Labor Statistics (Metro), Statistics Canada (Metro), April 2019.
*Data in US\$

TABLE 18: AVERAGE U.S. TECH COMPANY OCCUPATION POOLS
 500 Employees

| Occupation Pools | Employees | % of Total Labor |
|---|-----------|------------------|
| Tech Talent Employees* | 250 | 50% |
| Support Non-Tech Employees (excluding Management) | 211 | 42% |
| Management | 39 | 8% |

Source: U.S. Bureau of Labor Statistics (National), April 2019.

*Tech Talent includes the following occupation categories: software developers and programmers; computer support, database and systems; technology and engineering related; and computer information system managers.

TABLE 19: ESTIMATED ONE-YEAR COSTS BY MARKET: WAGE AND RENT OBLIGATION FOR SAMPLE TECH FIRM

Sample Tech Firm Estimates: 500 Employees, 75,000 Sq. Ft.

| Market | Rent Cost (Avg Rent x 75,000 SF) | Tech Talent Wages (Avg. Wage x 250 People) | Support Non-Tech Wages (Avg. Wage x 211 People) | Management Wages (Avg. Wage x 39 People) | Total |
|----------------------|-------------------------------------|---|--|---|---------------------|
| SF Bay Area, CA | \$4,851,000 | \$32,429,425 | \$14,353,705 | \$7,771,843 | \$59,405,973 |
| New York, NY | \$5,915,250 | \$28,375,097 | \$13,151,001 | \$7,820,415 | \$55,261,762 |
| Washington, D.C. | \$3,166,500 | \$28,183,721 | \$13,575,235 | \$6,765,330 | \$51,690,786 |
| Seattle, WA | \$2,814,750 | \$29,451,440 | \$12,230,354 | \$6,423,300 | \$50,919,844 |
| Newark, NJ | \$1,981,500 | \$27,692,887 | \$12,058,259 | \$7,320,863 | \$49,053,509 |
| Boston, MA | \$2,952,000 | \$26,658,544 | \$12,721,812 | \$6,250,140 | \$48,582,496 |
| Los Angeles, CA | \$3,204,000 | \$26,001,305 | \$11,123,758 | \$6,649,565 | \$46,978,628 |
| Denver, CO | \$2,128,500 | \$25,718,124 | \$12,489,780 | \$6,524,443 | \$46,860,847 |
| San Diego, CA | \$2,706,750 | \$26,511,866 | \$10,820,842 | \$6,144,060 | \$46,183,518 |
| Orange County, CA | \$2,664,000 | \$25,469,089 | \$11,651,032 | \$6,349,035 | \$46,133,156 |
| Baltimore, MD | \$1,699,500 | \$26,365,812 | \$10,974,470 | \$5,993,910 | \$45,033,692 |
| Austin, TX | \$2,821,500 | \$23,465,113 | \$11,241,181 | \$6,061,380 | \$43,589,174 |
| Philadelphia, PA | \$2,168,250 | \$24,176,384 | \$10,919,080 | \$6,253,260 | \$43,516,974 |
| Houston, TX | \$2,196,000 | \$23,978,877 | \$10,774,997 | \$6,239,220 | \$43,189,095 |
| Long Island, NY | \$2,051,250 | \$23,694,939 | \$10,817,932 | \$6,555,041 | \$43,119,163 |
| Dallas/Ft. Worth, TX | \$1,875,750 | \$24,502,184 | \$10,469,339 | \$6,231,030 | \$43,078,303 |
| Hartford, CT | \$1,494,000 | \$24,661,210 | \$11,217,537 | \$5,525,520 | \$42,898,267 |
| Minneapolis, MN | \$2,106,000 | \$23,625,505 | \$11,123,886 | \$5,791,110 | \$42,646,500 |
| Raleigh-Durham, NC | \$2,117,250 | \$23,926,853 | \$10,836,431 | \$5,744,207 | \$42,624,741 |
| Charlotte, NC | \$2,136,750 | \$23,987,982 | \$10,410,283 | \$5,548,530 | \$42,083,545 |
| Sacramento, CA | \$1,773,000 | \$24,180,240 | \$10,185,499 | \$5,843,370 | \$41,982,110 |
| Atlanta, GA | \$2,079,000 | \$24,012,422 | \$10,065,403 | \$5,738,850 | \$41,895,675 |
| Columbus, OH | \$1,476,750 | \$24,009,568 | \$10,293,328 | \$5,833,620 | \$41,613,266 |
| Richmond, VA | \$1,503,750 | \$23,346,415 | \$10,525,609 | \$6,062,550 | \$41,438,324 |
| Portland, OR | \$2,325,750 | \$22,933,740 | \$10,630,253 | \$5,250,570 | \$41,140,313 |
| Chicago, IL | \$2,355,000 | \$21,539,813 | \$10,646,072 | \$5,695,950 | \$40,236,835 |
| Ft. Lauderdale, FL | \$2,548,500 | \$22,294,629 | \$9,618,271 | \$5,378,030 | \$39,839,429 |
| Miami, FL | \$2,982,000 | \$22,029,428 | \$9,290,580 | \$4,915,757 | \$39,217,766 |
| Phoenix, AZ | \$2,001,000 | \$22,085,469 | \$9,518,653 | \$5,463,120 | \$39,068,242 |
| St. Louis, MO | \$1,500,000 | \$22,041,650 | \$9,942,416 | \$5,307,900 | \$38,791,966 |
| Detroit, MI | \$1,413,000 | \$21,715,989 | \$10,236,195 | \$5,423,730 | \$38,788,913 |
| Norfolk, VA | \$1,394,250 | \$21,745,834 | \$9,258,030 | \$5,872,230 | \$38,270,343 |
| San Antonio, TX | \$1,692,000 | \$21,938,079 | \$9,037,643 | \$5,588,700 | \$38,256,422 |
| Cincinnati, OH | \$1,452,750 | \$21,481,175 | \$10,085,596 | \$5,142,540 | \$38,162,061 |
| Tampa, FL | \$1,732,500 | \$21,570,709 | \$9,145,115 | \$5,446,350 | \$37,894,675 |
| Indianapolis, IN | \$1,536,750 | \$20,957,705 | \$10,167,367 | \$5,217,030 | \$37,878,851 |
| Nashville, TN | \$2,047,500 | \$20,796,047 | \$10,027,213 | \$4,898,790 | \$37,769,551 |
| Orlando, FL | \$1,795,500 | \$21,428,084 | \$9,116,082 | \$5,126,940 | \$37,466,606 |
| Madison, WI | \$1,578,750 | \$21,042,287 | \$9,920,662 | \$4,917,510 | \$37,459,209 |
| Salt Lake City, UT | \$1,758,750 | \$21,764,920 | \$9,164,490 | \$4,764,480 | \$37,452,641 |
| Milwaukee, WI | \$1,405,500 | \$20,693,718 | \$9,972,937 | \$4,988,100 | \$37,060,256 |
| Cleveland, OH | \$1,422,000 | \$20,041,356 | \$10,165,270 | \$5,260,320 | \$36,888,946 |
| Kansas City, MO | \$1,473,000 | \$20,486,732 | \$9,873,928 | \$4,929,600 | \$36,763,259 |
| Pittsburgh, PA | \$1,713,000 | \$19,954,319 | \$9,452,515 | \$5,605,080 | \$36,724,914 |
| Rochester, NY | \$1,462,500 | \$19,952,211 | \$9,635,084 | \$5,556,330 | \$36,606,126 |
| Jacksonville, FL | \$1,497,750 | \$20,091,188 | \$8,877,118 | \$4,930,380 | \$35,396,436 |
| Ottawa, ON* | \$1,857,490 | \$16,930,015 | \$10,163,436 | \$3,355,114 | \$32,306,055 |
| Toronto, ON* | \$2,086,131 | \$15,788,407 | \$9,316,772 | \$3,371,392 | \$30,562,702 |
| Vancouver, BC* | \$2,504,631 | \$15,456,045 | \$8,960,470 | \$2,868,031 | \$29,789,176 |
| Montreal, QC* | \$1,822,760 | \$14,593,204 | \$8,986,815 | \$3,188,579 | \$28,591,358 |

*Data in US\$: Source: U.S. Bureau of Labor Statistics, April 2019, Statistics Canada, April 2019, CBRE Research (Metro), Q1 2019.

HOW DOES TECH TALENT IMPACT COMMERCIAL REAL ESTATE?

TABLE 20: OFFICE ASKING RENT BY MARKET (Q1 2019)

| Market | Annual Gross Direct Asking Rent | Office Rent 5 Year Growth | Market | Annual Gross Direct Asking Rent | Office Rent 5 Year Growth |
|--------------------|---------------------------------|---------------------------|----------------------|---------------------------------|---------------------------|
| New York, NY | \$78.87 | 20% | Newark, NJ | \$26.42 | 5% |
| SF Bay Area, CA | \$68.88 | 40% | Dallas/Ft. Worth, TX | \$25.01 | 25% |
| Los Angeles, CA | \$41.28 | 38% | Ottawa, ON* | \$24.77 | -1% |
| Washington, D.C. | \$42.22 | 14% | Montreal, QC* | \$24.30 | 5% |
| Miami, FL | \$39.76 | 29% | Orlando, FL | \$23.94 | 21% |
| Boston, MA | \$39.36 | 23% | Sacramento, CA | \$23.64 | 19% |
| Austin, TX | \$37.62 | 32% | Salt Lake City, UT | \$23.45 | 22% |
| Seattle, WA | \$37.53 | 36% | Tampa, FL | \$23.10 | 16% |
| San Diego, CA | \$36.09 | 27% | Pittsburgh, PA | \$22.84 | 14% |
| Orange County, CA | \$35.52 | 50% | Baltimore, MD | \$22.66 | 0% |
| Ft. Lauderdale, FL | \$33.98 | 29% | San Antonio, TX | \$22.56 | 13% |
| Vancouver, BC* | \$33.40 | 22% | Madison, WI | \$21.05 | 24% |
| Chicago, IL | \$31.40 | 15% | Indianapolis, IN | \$20.49 | 20% |
| Portland, OR | \$31.01 | 44% | Richmond, VA | \$20.05 | 6% |
| Houston, TX | \$29.28 | 17% | St. Louis, MO | \$20.00 | 9% |
| Philadelphia, PA | \$28.91 | 13% | Jacksonville, FL | \$19.97 | 15% |
| Charlotte, NC | \$28.49 | 40% | Hartford, CT | \$19.92 | 0% |
| Denver, CO | \$28.38 | 27% | Columbus, OH | \$19.69 | 11% |
| Raleigh-Durham, NC | \$28.23 | 24% | Kansas City, MO | \$19.64 | 19% |
| Minneapolis, MN | \$28.08 | 19% | Rochester, NY | \$19.50 | 0% |
| Toronto, ON* | \$27.82 | 4% | Cincinnati, OH | \$19.37 | 3% |
| Atlanta, GA | \$27.72 | 36% | Cleveland, OH | \$18.96 | 9% |
| Long Island, NY | \$27.35 | 4% | Detroit, MI | \$18.84 | 10% |
| Nashville, TN | \$27.30 | 41% | Milwaukee, WI | \$18.74 | 10% |
| Phoenix, AZ | \$26.68 | 28% | Norfolk, VA | \$18.59 | 5% |

Source: CBRE Research (Office Market), Q1 2019.
Note: New York represents Manhattan only. *Data in US\$

TABLE 21: OFFICE VACANCY RATE BY MARKET (Q1 2019)

| Market | Vacancy Rate | 5 Years Ago (Q1 2014) | Market | Vacancy Rate | 5 Years Ago (Q1 2014) |
|--------------------|--------------|-----------------------|----------------------|--------------|-----------------------|
| Madison, WI | 4.6% | 10.9% | Boston, MA | 13.0% | 13.8% |
| Vancouver, BC | 4.7% | 9.4% | Kansas City, MO | 13.3% | 16.6% |
| Charlotte, NC | 5.9% | 13.3% | Denver, CO | 13.3% | 13.9% |
| SF Bay Area, CA | 6.9% | 10.2% | Philadelphia, PA | 13.8% | 17.9% |
| Toronto, ON | 7.1% | 9.6% | San Antonio, TX | 14.0% | 17.6% |
| Ottawa, ON | 7.5% | 8.9% | Los Angeles, CA | 14.4% | 16.8% |
| New York, NY | 7.9% | 8.2% | Detroit, MI | 14.6% | 22.2% |
| Orlando, FL | 8.8% | 19.2% | Pittsburgh, PA | 14.7% | 9.9% |
| Austin, TX | 9.3% | 11.7% | Baltimore, MD | 14.7% | 15.1% |
| Orange County, CA | 9.4% | 12.7% | Jacksonville, FL | 14.8% | 20.3% |
| Seattle, WA | 9.4% | 14.9% | Milwaukee, WI | 14.9% | 15.3% |
| Tampa, FL | 9.8% | 15.1% | Phoenix, AZ | 15.0% | 22.1% |
| San Diego, CA | 9.9% | 13.9% | Columbus, OH | 15.1% | 15.4% |
| Ft. Lauderdale, FL | 9.9% | 16.4% | Chicago, IL | 15.5% | 16.5% |
| Richmond, VA | 10.1% | 15.1% | Rochester, NY | 15.7% | 16.2% |
| Long Island, NY | 10.2% | 14.8% | Indianapolis, IN | 16.8% | 18.2% |
| Nashville, TN | 10.3% | 10.7% | Washington, D.C. | 16.9% | 14.8% |
| Sacramento, CA | 10.7% | 19.6% | Atlanta, GA | 17.1% | 20.1% |
| Salt Lake City, UT | 10.9% | 15.7% | Cleveland, OH | 17.5% | 18.9% |
| Miami, FL | 11.3% | 16.6% | Hartford, CT | 17.9% | 16.9% |
| St. Louis, MO | 11.4% | 15.3% | Newark, NJ | 18.0% | 20.1% |
| Portland, OR | 11.6% | 12.8% | Minneapolis, MN | 18.3% | 17.3% |
| Montreal, QC | 12.2% | 11.7% | Houston, TX | 18.9% | 11.9% |
| Raleigh-Durham, NC | 12.7% | 15.7% | Cincinnati, OH | 18.9% | 21.5% |
| Norfolk, VA | 12.8% | 15.5% | Dallas/Ft. Worth, TX | 20.7% | 17.9% |

Source: CBRE Research (Office Market), Q1 2019.
 Note: New York represents Manhattan only.

TABLE 22: APARTMENT ASKING RENT BY MARKET (Q1 2019)

| Market | Average Monthly Apartment Rent | Apartment Rent 5 Year Growth | Market | Average Monthly Apartment Rent | Apartment Rent 5 Year Growth |
|--------------------|--------------------------------|------------------------------|----------------------|--------------------------------|------------------------------|
| New York, NY | \$4,120 | 7% | Madison, WI | \$1,150 | 12% |
| SF Bay Area, CA | \$2,856 | 25% | Dallas/Ft. Worth, TX | \$1,135 | 22% |
| Long Island, NY | \$2,243 | 18% | Salt Lake City, UT | \$1,129 | 25% |
| Los Angeles, CA | \$2,239 | 25% | Pittsburgh, PA | \$1,127 | 6% |
| Boston, MA | \$2,164 | 18% | Raleigh-Durham, NC | \$1,117 | 20% |
| Orange County, CA | \$2,082 | 21% | Charlotte, NC | \$1,116 | 21% |
| San Diego, CA | \$1,954 | 27% | Milwaukee, WI | \$1,113 | 5% |
| Washington, D.C. | \$1,754 | 8% | Houston, TX | \$1,105 | 8% |
| Newark, NJ | \$1,716 | 14% | Phoenix, AZ | \$1,104 | 34% |
| Seattle, WA | \$1,694 | 28% | Richmond, VA | \$1,073 | 18% |
| Miami, FL | \$1,630 | 15% | Toronto, ON* | \$1,069 | 30% |
| Ft. Lauderdale, FL | \$1,587 | 19% | Norfolk, VA | \$1,064 | 8% |
| Chicago, IL | \$1,505 | 12% | Vancouver, BC* | \$1,052 | 21% |
| Denver, CO | \$1,489 | 27% | Jacksonville, FL | \$1,042 | 23% |
| Sacramento, CA | \$1,429 | 44% | Rochester, NY | \$992 | 17% |
| Philadelphia, PA | \$1,370 | 14% | Detroit, MI | \$989 | 19% |
| Portland, OR | \$1,364 | 28% | San Antonio, TX | \$985 | 13% |
| Hartford, CT | \$1,326 | 11% | Cincinnati, OH | \$951 | 16% |
| Baltimore, MD | \$1,319 | 10% | Kansas City, MO | \$950 | 14% |
| Minneapolis, MN | \$1,306 | 18% | Columbus, OH | \$949 | 18% |
| Austin, TX | \$1,257 | 15% | Ottawa, ON* | \$906 | 16% |
| Orlando, FL | \$1,239 | 29% | St. Louis, MO | \$899 | 10% |
| Atlanta, GA | \$1,223 | 30% | Cleveland, OH | \$891 | 12% |
| Nashville, TN | \$1,203 | 19% | Indianapolis, IN | \$884 | 14% |
| Tampa, FL | \$1,192 | 25% | Montreal, QC* | \$614 | 12% |

Source: CBRE Econometric Advisors (City), Axiometrics, CMHC, Q1 2019.
 Note: New York represents Manhattan only. *Data in US\$

TABLE 23: COST OF LIVING RELATIVE TO U.S. AVERAGE

U.S. Average = 100%

| <u>Market</u> | <u>Cost of Living</u> | <u>Market</u> | <u>Cost of Living</u> | <u>Market</u> | <u>Cost of Living</u> |
|--------------------|-----------------------|----------------------|-----------------------|------------------|-----------------------|
| SF Bay Area, CA | 163% | Salt Lake City, UT | 109% | Chicago, IL | 99% |
| Orange County, CA | 147% | Vancouver, BC | 109% | Milwaukee, WI | 99% |
| Seattle, WA | 137% | Nashville, TN | 108% | Charlotte, NC | 98% |
| Los Angeles, CA | 129% | Houston, TX | 108% | Norfolk, VA | 97% |
| San Diego, CA | 128% | Dallas/Ft. Worth, TX | 108% | Kansas City, MO | 97% |
| Long Island, NY | 126% | Phoenix, AZ | 107% | Philadelphia, PA | 96% |
| New York, NY | 120% | Baltimore, MD | 106% | Detroit, MI | 95% |
| Boston, MA | 120% | Hartford, CT | 105% | Indianapolis, IN | 95% |
| Toronto, ON | 118% | Orlando, FL | 104% | Columbus, OH | 94% |
| Newark, NJ | 118% | Tampa, FL | 103% | St. Louis, MO | 94% |
| Washington, D.C. | 117% | San Antonio, TX | 103% | Pittsburgh, PA | 93% |
| Austin, TX | 115% | Minneapolis, MN | 102% | Cincinnati, OH | 91% |
| Miami, FL | 114% | Atlanta, GA | 102% | Ottawa, ON | 90% |
| Ft. Lauderdale, FL | 113% | Madison, WI | 101% | Rochester, NY | 89% |
| Denver, CO | 113% | Jacksonville, FL | 101% | Cleveland, OH | 88% |
| Portland, OR | 113% | Richmond, VA | 100% | Montreal, QC | 83% |
| Sacramento, CA | 110% | Raleigh-Durham, NC | 100% | | |

Source: Moody's Analytics, Numbeo, Q1 2019.

TABLE 24: TECH WAGE TO APARTMENT RENT RATIO

| Market | 2019 Annualized Apartment Rent | 2018 Average Annual Tech Wage | Rent-to-Tech Wage Ratio |
|----------------------|--------------------------------|-------------------------------|-------------------------|
| New York, NY | \$49,445 | \$113,500 | 43.6% |
| Long Island, NY | \$26,911 | \$94,780 | 28.4% |
| SF Bay Area, CA | \$34,272 | \$129,718 | 26.4% |
| Los Angeles, CA | \$26,871 | \$104,005 | 25.8% |
| Orange County, CA | \$24,990 | \$101,876 | 24.5% |
| Boston, MA | \$25,964 | \$106,634 | 24.3% |
| Miami, FL | \$19,557 | \$88,118 | 22.2% |
| San Diego, CA | \$23,443 | \$106,047 | 22.1% |
| Ft. Lauderdale, FL | \$19,039 | \$89,179 | 21.3% |
| Chicago, IL | \$18,057 | \$86,159 | 21.0% |
| Vancouver, BC* | \$12,623 | \$61,824 | 20.4% |
| Toronto, ON* | \$12,827 | \$63,154 | 20.3% |
| Washington, D.C. | \$21,046 | \$112,735 | 18.7% |
| Newark, NJ | \$20,597 | \$110,772 | 18.6% |
| Portland, OR | \$16,372 | \$91,735 | 17.8% |
| Sacramento, CA | \$17,153 | \$96,721 | 17.7% |
| Denver, CO | \$17,862 | \$102,872 | 17.4% |
| Nashville, TN | \$14,437 | \$83,184 | 17.4% |
| Orlando, FL | \$14,868 | \$85,712 | 17.3% |
| Seattle, WA | \$20,324 | \$117,806 | 17.3% |
| Philadelphia, PA | \$16,438 | \$96,706 | 17.0% |
| Pittsburgh, PA | \$13,522 | \$79,817 | 16.9% |
| Minneapolis, MN | \$15,667 | \$94,502 | 16.6% |
| Tampa, FL | \$14,300 | \$86,283 | 16.6% |
| Madison, WI | \$13,800 | \$84,169 | 16.4% |
| Milwaukee, WI | \$13,356 | \$82,775 | 16.1% |
| Hartford, CT | \$15,916 | \$98,645 | 16.1% |
| Austin, TX | \$15,081 | \$93,860 | 16.1% |
| Ottawa, ON* | \$10,873 | \$67,720 | 16.1% |
| Salt Lake City, UT | \$13,554 | \$87,060 | 15.6% |
| Jacksonville, FL | \$12,509 | \$80,365 | 15.6% |
| Atlanta, GA | \$14,671 | \$96,050 | 15.3% |
| Baltimore, MD | \$15,828 | \$105,463 | 15.0% |
| Phoenix, AZ | \$13,242 | \$88,342 | 15.0% |
| Rochester, NY | \$11,904 | \$79,809 | 14.9% |
| Norfolk, VA | \$12,772 | \$86,983 | 14.7% |
| Raleigh-Durham, NC | \$13,410 | \$95,707 | 14.0% |
| Charlotte, NC | \$13,398 | \$95,952 | 14.0% |
| Kansas City, MO | \$11,400 | \$81,947 | 13.9% |
| Dallas/Ft. Worth, TX | \$13,618 | \$98,009 | 13.9% |
| Houston, TX | \$13,257 | \$95,916 | 13.8% |
| Richmond, VA | \$12,876 | \$93,386 | 13.8% |
| Detroit, MI | \$11,868 | \$86,864 | 13.7% |
| San Antonio, TX | \$11,816 | \$87,752 | 13.5% |
| Cleveland, OH | \$10,695 | \$80,165 | 13.3% |
| Cincinnati, OH | \$11,407 | \$85,925 | 13.3% |
| Indianapolis, IN | \$10,606 | \$83,831 | 12.7% |
| Montreal, QC* | \$7,372 | \$58,373 | 12.6% |
| St. Louis, MO | \$10,791 | \$88,167 | 12.2% |
| Columbus, OH | \$11,392 | \$96,038 | 11.9% |

Source: U.S. Bureau of Labor Statistics, April 2019, Statistics Canada, May 2019, CBRE Econometric Advisors, Axiometrics, CMHC, Q1 2019.

Note: New York represents Manhattan only. *Data in US\$



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