

# **REGIONAL ECONOMIC INDICATORS: BUSINESS AND INNOVATION CLIMATE**

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## **INTRODUCTION**

This report is the first in a series to be released by the Center for Economic Development (Center) at Cleveland State University's Maxine Goodman Levin College of Urban Affairs as part of its regional economic indicators project. The project's objective is to provide a comprehensive benchmarking of Greater Cleveland's economy against other metropolitan areas across the nation. To achieve this objective, the Center is planning to analyze a broad set of economic indicators in several themes to construct a broad-based economic profile of the region. This will allow for an objective determination of areas in which Cleveland and northeast Ohio lead or lag regions that are considered comparable. This report focuses on economic indicators associated with business and innovation climate. Other themes to be released in the future include human capital; broad economic indicators (employment, income, and output); globalization; real estate; quality of life; and social indicators.

In each of these themes, the geographic unit examined is a metropolitan area. The research team chose not to compare northeast Ohio's metro areas to the largest areas in the country, but to develop a set of comparable areas based on several criteria. To be included, the area had to be similar in size to the Cleveland area in terms of population and/or labor force. The area had to also meet one of the following three criteria: similar industry structure, location in midwestern states, or being a high-growth region (in terms of labor force). Appendix D provides more details related to the selection criteria. Thirty-two metropolitan areas across the U.S. were identified as being comparable with Cleveland metro area. In addition, the three smaller metro areas in northeast Ohio (Akron, Canton, and Youngstown) that did not meet these criteria were included because they are part of the northeast Ohio region. As a result, they were not expected to rank highly in any of the indicators or the business and innovation climate index. In total, 36 metro areas are included in the description and ranking in this report.

The economic indicators that comprise the theme of business and innovative climate include Small Business Innovation Research (SBIR) and Small Business Technology Transfer STTR awards, venture capital, initial public offerings (IPOs), high-tech employment share, research and development funding, patents, business incubators, corporate headquarters, and business costs. These indicators provide different ways of capturing a region's propensity to conduct research, transfer basic research to development and

commercialization, innovate, promote entrepreneurship, and develop and sustain a technology-based economy.

This report includes four sections. Following the introduction, the second section describes the business and innovation climate index, which offers an aggregated measure used to benchmark northeast Ohio's metropolitan areas against comparable regions. The third section provides some observations on Northeast Ohio's strengths and weaknesses based on the index and individual indicators presented throughout the report. The final section discusses each of the nine economic indicators in detail.

## **BUSINESS AND INNOVATION CLIMATE INDEX**

The business and innovation climate index aggregates key microeconomic variables for each of the 36 comparable metropolitan areas into a single operational measure. This provides a simple way to benchmark the Cleveland area (and other northeast Ohio areas) against other regions. The index is comprised of eight indicators, each with one or more variables. First, a sub-index was calculated for each of the indicators, and then the indicators were combined to create the business and innovation climate index. Appendix C summarizes the steps used to construct the index. Table C-1 in the appendix provides a list of indicators and their variables.

The aggregated (overall) index and each of the sub-indices have a range from 1 (worst) to 10 (best). Although some variables had available data through 2003, many others did not. The common denominator year was 2001.<sup>1</sup> All indicators discussed later in this report are included in the index, except for business incubators. The primary reason is that no time frame is associated with the data.

Table 1 presents the index and rank for each of the 36 metropolitan areas. It also shows the rank for each of the eight indicators included in the index. Table C-2 in Appendix C estimates the actual scores for every sub-index in each of the metro areas. The top five comparable metro areas (in order of rank) are San Diego, Seattle, Minneapolis, Austin, and St. Louis. Minneapolis, third overall, is the highest ranked area in the Midwest.

The Cleveland metro area ranked 11<sup>th</sup> overall. Sub-indices contributing significantly to Cleveland's ranking are research and development (R&D), patents, and headquarters. Cleveland's number six ranking in the R&D sub-index is primarily due to the number and dollar value of National Institutes of Health (NIH) awards given to area universities, independent hospitals, medical schools, and research institutes. The number of patents awarded to Cleveland area inventors placed the region 8<sup>th</sup> in the patent sub-index. This ranking may be partially attributed to an outgrowth of the R&D activity. Cleveland was tied with Seattle for 2<sup>nd</sup> in the headquarter sub-index. One reason often cited for the large number of headquarters (which has decreased since 2001) is the area's industrial heritage dating back to the late 19<sup>th</sup> century.

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<sup>1</sup> Business costs data are the sole exception. It uses 2002 data since data for 2001 was not available.

As expected, because of their smaller size, other northeast Ohio metro areas did not rank as high as the Cleveland area. Moreover, Canton and Youngstown ranked the lowest, 35<sup>th</sup> and 36<sup>th</sup>, respectively. Akron did somewhat better at 29. These areas scored low because they did not meet the criteria for inclusion on the comparable metro area list. However, the Akron metro area showed some strength. Within the sub-indices, Akron ranked 17<sup>th</sup> among the 36 metro areas in patents. This is attributed to the polymer research and production that is present in the Akron region. It ranked 20<sup>th</sup> in SBIR/SBTT awards and tied for 21<sup>st</sup> place with several other areas in headquarters.

**Table 1. Business and Innovation Climate Index**

METROPOLITAN STATISTICAL AREA	AGGREGATED INDEX		SUB-INDICES RANKING							
	INDEX	RANK	SBIR	VC	IPO	EMP	R&D	PATENTS	HQs	COSTS
Akron, OH MSA	2.30	29	20	35	10	29	28	17	21	27
Austin-Round Rock, TX MSA	5.52	4	3	3	10	2	10	3	21	6
Buffalo-Cheektowaga-Tonawanda, NY MSA	2.27	30	19	27	10	21	17	19	32	33
Canton-Massillon, OH MSA	1.76	35	32	34	10	34	36	33	32	21
Charlotte-Gastonia-Concord, NC-SC MSA	3.53	13	24	16	5	25	31	22	4	7
Cincinnati-Middletown, OH-KY-IN MSA	3.78	10	9	14	10	17	13	7	4	18
Cleveland-Lorain-Elyria, OH MSA	3.73	11	11	13	10	19	6	8	2	30
Columbus, OH MSA	3.37	15	8	18	10	11	9	18	11	19
Denver-Aurora, CO MSA	4.32	6	2	5	10	3	11	11	11	23
Grand Rapids-Wyoming, MI MSA	1.96	34	33	36	10	31	34	25	21	32
Greensboro-High Point, NC MSA	2.62	28	30	24	10	32	29	34	21	3
Indianapolis, IN MSA	3.55	12	34	23	3	23	26	13	15	10
Jacksonville, FL MSA	2.24	31	29	33	10	22	33	35	30	14
Kansas City, MO-KS MSA	3.80	9	27	12	3	6	24	24	11	12
Las Vegas-Paradise, NV MSA	1.98	33	31	31	10	36	32	29	15	17
Louisville, KY-IN MSA	2.90	23	26	26	10	26	25	31	15	2
Memphis, TN-MS-AR MSA	3.10	19	35	21	5	28	21	29	15	5
Milwaukee-Waukesha-West Allis, WI MSA	3.25	17	23	25	10	15	16	10	4	24
Minneapolis-St. Paul-Bloomington, MN-WI MSA	6.28	3	4	4	5	4	5	1	1	29
Nashville-Davidson-Murfreesboro, TN MSA	3.02	21	21	9	10	24	7	26	21	8
Oklahoma City, OK MSA	3.11	18	25	29	10	18	19	28	15	1
Orlando, FL MSA	2.62	27	6	11	10	27	30	21	30	20
Phoenix-Mesa-Scottsdale, AZ MSA	3.52	14	7	8	10	8	27	6	14	24
Pittsburgh, PA MSA	3.95	7	12	6	10	9	4	9	9	30
Portland-Vancouver-Beaverton, OR-WA MSA	3.89	8	13	7	10	10	8	5	21	13
Providence-New Bedford-Fall River, RI-MA	2.94	22	17	22	10	20	15	14	21	15
Richmond, VA MSA	3.08	20	28	20	10	12	18	27	9	9
Riverside-San Bernardino-Ontario, CA MSA	2.17	32	16	32	5	35	22	16	32	35
Sacramento-Arden-Arcade-Roseville, CA MSA	2.70	25	15	15	10	7	12	15	32	34
San Antonio, TX MSA	3.31	16	22	19	10	30	14	23	8	4
San Diego-Carlsbad-San Marcos, CA MSA	7.45	1	1	1	1	5	1	2	15	36
Seattle-Tacoma-Bellevue, WA MSA	7.31	2	5	2	1	1	2	4	2	28
St. Louis, MO-IL MSA	4.36	5	18	10	5	14	3	12	4	16
Tampa-St. Petersburg-Clearwater, FL MSA	2.70	26	14	17	10	16	23	20	21	21
Virginia Beach-Norfolk-Newport News, VA-NC MSA	2.84	24	10	28	10	13	20	32	21	11
Youngstown, OH MSA	1.73	36	36	30	10	33	35	36	32	26

SBIR: Small Business Innovation Research/Small Business Technology Transfer awards

VC: Venture Capital

IPO: Initial Public Offering

EMP: High-Tech Employment Share

R&D: Research and Development

Patents: Utility Patents

HQs: Fortune 500 Corporate Headquarters

Costs: Cost of Doing Business

For a description of each sub-index and its associated variables, refer to the section titled "Business and Innovation Climate-Economic Indicators" and Appendix C.

Aggregated Index: Matching indices in Table 1 are due to rounding for presentation. The associated rank order is correct.

In 2001, no IPO activity was reported in 27 of the 36 comparable metro areas. The result is that 27 metro areas are ranked 10th.-Only 15 IPOs were issued across all 36 metro areas in 2001.

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University



## **SUMMARY OBSERVATIONS**

- Cleveland's overall ranking (11<sup>th</sup>) is relatively high among the 36 comparable regions. However, it is significantly below the top three – San Diego, Seattle, and Minneapolis. These metro areas reported an average business and innovation climate index of 7.01 compared to Cleveland's 3.73. In fact, the top three metro areas report significantly higher indices than the 4<sup>th</sup> and 5<sup>th</sup> ranked metro areas, Austin (5.52) and St. Louis (4.36).
- The sub-index that brings down Cleveland's ranking is business costs. In this sub-index, Cleveland ranked 30<sup>th</sup>. If business costs were not included as a sub-index, Cleveland would have ranked 9<sup>th</sup> among the 36 comparable regions.
- Research and development is one of the Cleveland metro area's strengths. The latest data show that local institutions and businesses ranked 5<sup>th</sup> among the 36 comparable regions in attracting NIH funding, 10<sup>th</sup> in university-related R&D expenditures, and 7<sup>th</sup> in the number of SBIR/STTR awards. These monies do not include NASA Glenn's research budget. The importance of University Circle and the Mid-Town areas of Cleveland cannot be over-estimated, as hospitals, universities, and businesses located there received more than 95 percent of the NIH funding that flowed into the local area. The natural progression of R&D work is the receipt of patents. Cleveland again did very well, ranking 8<sup>th</sup> in patents issued from 1994 through 2003.
- The indicators suggest that institutions and businesses in Cleveland are more successful in R&D than in commercializing results. This is confirmed by measures related to venture capital (VC), initial public offerings (IPOs), and high-tech employment. The Cleveland metro area ranked 21<sup>st</sup> in attracting venture capital. The top five metro areas had over 16 times, on average, the amount of VC funding invested in their startup companies as did companies in Cleveland. There was no IPO activity in the Cleveland metro area between 2000 and 2003, and the Cleveland area had a low ranking of 26 in high-tech employment share. In fact, the Cleveland area reported a decrease in the share of high-tech employment each year from 2000 through 2003.

- Concentrated efforts by Case Western Reserve University, Cleveland State University, The University of Akron, the NASA Glenn Research Center, and intermediaries such as NorTech, JumpStart, BioEnterprise, and the Ohio Aerospace Institute in the area of technology commercialization should increase venture capital invested in Cleveland and slow the area's high-tech brain drain.

## **BUSINESS AND INNOVATION CLIMATE – ECONOMIC INDICATORS**

This section describes each of the nine economic indicators. It explains what the indicator measures, why it is used, and shows how Northeast Ohio metro areas rank compared to other metro areas in the Great Lakes region as well as to the top and bottom ranked areas. Detailed tables of all 36 metro areas are included in appendix B.

### **SBIR & STTR AWARDS**

The Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs are federal government initiatives designed to stimulate technological innovation and provide opportunities for small businesses. Their purpose is to support private-sector R&D through set-aside funding earmarked for promising technologies that are not yet commercially viable.

The SBIR program provides competitive grants in two phases to entrepreneurs seeking to conduct proof-of-concept research for technical merit (Phase I) and feasibility and prototype development (Phase II). SBIR program solicitations are issued by 11 federal agencies.<sup>2</sup> The STTR program is a similar but smaller initiative aimed at partnerships between small businesses and nonprofit research institutions (including universities) to advance technology transfer. Five federal agencies reserve a portion of their R&D budgets for STTR grants.

SBIR and STTR awards are seen as a measure of entrepreneurship and technological innovation. Both programs are important sources of financing for entrepreneurs. For many start-up companies, they constitute the initial revenue stream and can make the difference between “go” and “no-go” decisions. Program participants can leverage the credibility associated with the award and the experimental data developed through their research to attract strategic partners and outside capital.

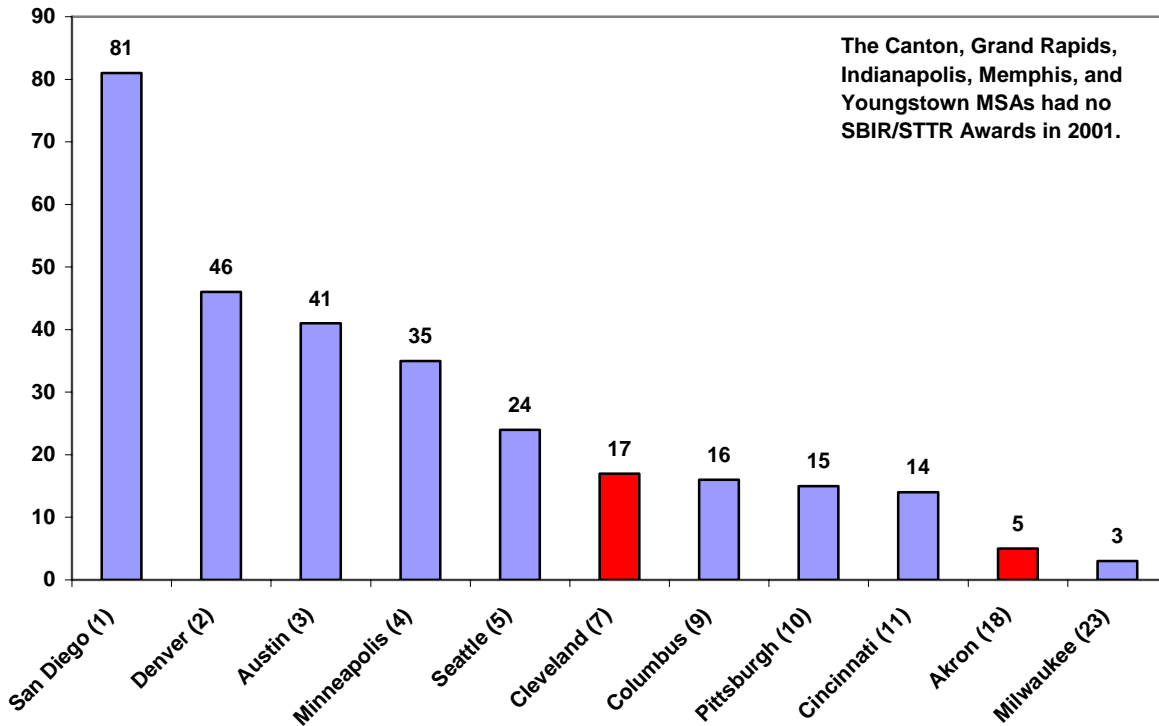
Among the 36 comparable metropolitan areas, Cleveland ranked in the top third in both number and dollar value of SBIR/STTR awards in 2000 and 2001. The highest-ranking metro areas included Austin, Denver, Minneapolis, San Diego, and Seattle. In 2001, Cleveland ranked 7<sup>th</sup> and Akron ranked 18<sup>th</sup> in number of awards. However, when looking at total award value, Cleveland’s ranking fell to 11<sup>th</sup> and Akron dropped to 19<sup>th</sup>. The overall variation in award rankings across all metro areas between 2000 and 2001 was small. Figure 1 shows a comparison of total SBIR/STTR awards in selected MSAs in 2001. The profile in Figure 1 also

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<sup>2</sup> Participating agencies include the Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Transportation, the Environmental Protection Agency, NASA, and the National Science Foundation.

accurately reflects the award activity in 2000. Table B-1 in Appendix B lists the number of awards, the number of companies receiving awards, and total award value for all metropolitan areas in 2000 and 2001.

Figure 1. Number of SBIR/STTR Awards in Selected MSAs, 2001



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions. The value above the bar indicates the number of SBIR/STTR awards given to companies in their respective metro area.

Data source: SBIRWorld

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## **VENTURE CAPITAL**

Venture capital (VC) is money invested in new and unproven businesses that helps stimulate growth at the critical early stages of a growing company's development. Many of these new firms require large amounts of external financing for an extended period before they can tap traditional debt or equity markets. The majority of venture investments are follow-on funding that investors place in business sectors where they expect rapid growth.<sup>3</sup>

Venture capitalists have a history of funding new technologies that are risky investments, but are expected to achieve above-average returns. They become involved as board members and management advisors, suggesting strategic partnerships and helping to refine business plans. Venture capitalists look for high rates of return over a five-year period with an exit strategy of cashing out after a firm becomes publicly traded through an initial public offering or a merger or acquisition by an established firm.

VC activity is an excellent way to gauge investors' confidence in the new ideas and entrepreneurial infrastructure of a region. Those regions with high concentrations of venture capital are seen as having a better entrepreneurial climate.

Venture capital investing dropped precipitously across all comparable regions following the dot.com collapse that began in late 2000. Between 2000 and 2003, VC activity fell collectively in the 36 metro areas from 1,681 deals valued at \$19.3 billion to 719 deals valued at \$4.2 billion. The top five comparable metro areas during this time period were Austin, Denver, Minneapolis, San Diego, and Seattle. In the Cleveland metro area, 27 deals valued at \$316 million were reported in 2000, decreasing to just 16 deals valued at \$33 million in 2003. Out of the 36 metro areas, Cleveland was ranked as high as 15<sup>th</sup> in total VC investment (2000) to as low as 21<sup>st</sup> in 2003.

Most observers believe that venture capitalists are more attracted to Pittsburgh-based start-ups than those in Cleveland. Data reported by Thomson Financial confirms this thinking. Between 2000 and 2003, venture capitalists invested \$1.9 billion (199 deals) in the Pittsburgh metro area compared to \$477 million (82 deals) in Cleveland. In fact, Pittsburgh ranked number five in total investment in 2003. This suggests that Pittsburgh-based companies are more innovative in their thinking than their counterparts in Cleveland. According to David Morgenthaler, Morgenthaler Ventures, "VC follows innovations, it does not create them."<sup>4</sup>

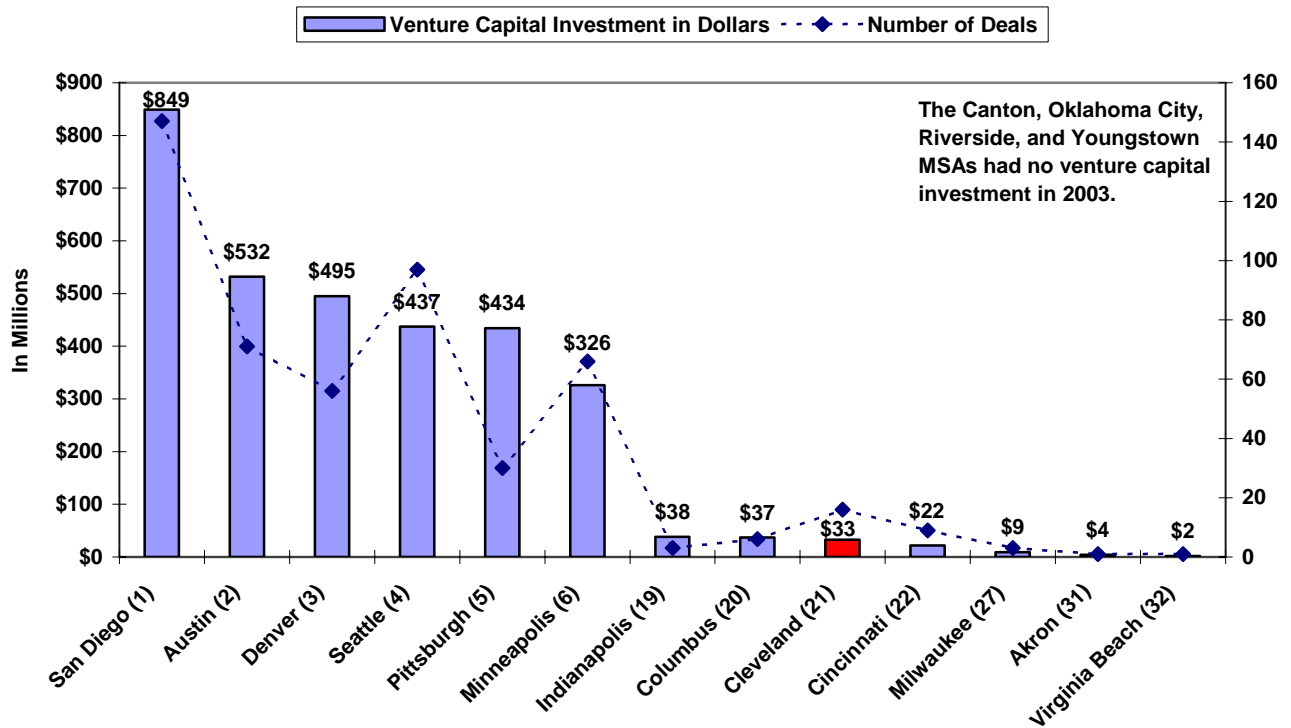
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<sup>3</sup> Follow-on funding refers to monies the entrepreneur taps into after exhausting his/her own financial resources and those of angel investors.

<sup>4</sup> David T. Morgenthaler's speech to Cuyahoga County Commissioners Blue Ribbon Economic Development Task Force, July 27, 2004.

Figure 2 shows a comparison of total VC investment and number of deals in selected MSAs in 2003. Table B-2 in Appendix B shows VC activity for all metropolitan areas between 2000 and 2003.

Figure 2. Venture Capital Investment and Number of Deals in Selected MSAs, 2003



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the two lowest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions.

The value above the bar indicates venture capital investment in companies in their respective metro area.

Data source: Thomson Financial Venture Economics

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

## **INITIAL PUBLIC OFFERING**

An initial public offering (IPO) is the sale or distribution of a company's stock to the public for the first time. It indicates strong growth in the company and allows that firm to access public capital markets that provide leverage and accelerate growth. IPOs are also a route to liquidity for entrepreneurs and early investors, such as venture capitalists. The proceeds of going public are typically reinvested in new ideas and opportunities within the firm. IPOs are an important measure of regional innovative climate because they indicate the degree to which an economy is producing companies that investors regard as durable, that is, having long-term and significant growth potential.

A limited amount of activity was reported in the IPO market across all 36 comparable metro areas for the four-year period ending in 2003. The most active year was 2000 with 47 IPOs. A steep decline was seen in 2001 when only 15 IPOs were issued. According to IPO Monitor, 2001 had the weakest deal flow in over 20 years. Reasons cited include the September 11 attack and the fact that investors were no longer interested in putting their money in highly speculative transactions. Investors required a sound business model as opposed to merely an idea or concept. The IPO market picked up slightly by 2003 when 20 companies floated their stock.

There were no IPOs in the Cleveland metro area between 2000 and 2003. In fact, across the entire northeast Ohio region, only one IPO was issued during the four-year period, that by an Akron metro area-based company.<sup>5</sup> Metro areas reporting the highest number of IPOs included Denver, Minneapolis, San Diego, and Seattle.

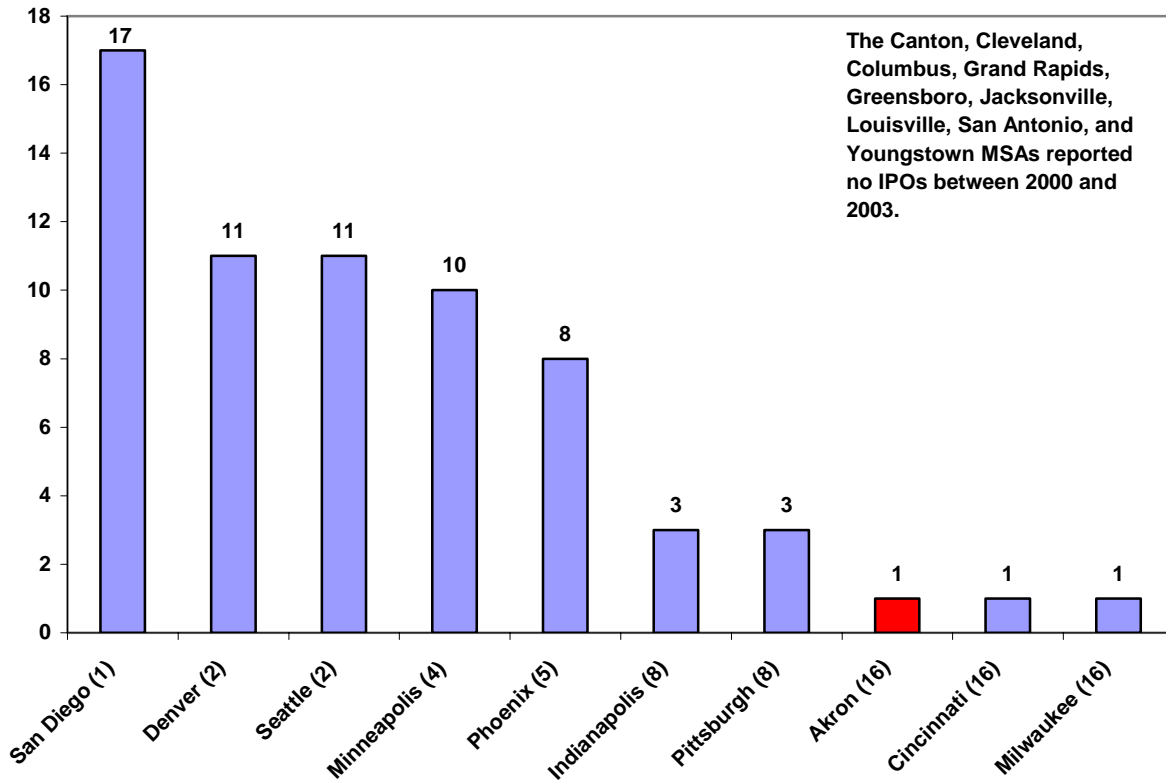
Companies issuing IPOs were evenly split among the technology, healthcare, services, and "other" sectors. Technology companies were primarily involved with semiconductors and software. Healthcare included medical devices, biomed, and biotech products. Among service providers were companies involved in communications, food processing, financial products, and education. "Other" sectors included energy, capital goods, utilities, consumer cyclical, basic materials, and transportation.

Figure 3 shows a comparison of the total number of IPOs issued by companies in selected MSAs from 2000 through 2003. Table B-3 in Appendix B provides a summary of IPO activity by sector for all metropolitan areas between 2000 and 2003.

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<sup>5</sup> The International Steel Group (ISG) became a publicly held company on December 12, 2003. After acquiring the steelmaking assets of the bankrupt LTV Corporation, ISG moved the corporate headquarters from downtown Cleveland to Richfield in northern Summit County.

Figure 3. Number of IPOs Issued in Selected MSAs, 2000 – 2003



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions. The value above the bar indicates the number of IPOs issued by companies in their respective metro area.

Data source: IPO Monitor

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

## HIGH-TECH EMPLOYMENT

High-tech workers are essential to the creation of economic value. They do more than simply apply technical know-how to firm-specific objectives. Rather, they channel new information to generate new knowledge. By applying analytical skills to complex problems, high-tech workers contribute to the creation of new concepts and processes. Knowledge generation can take the form of incremental innovation in processes as well as radical innovation that propels a business into new products and endeavors.

Which occupations constitute the high-tech workforce? One guiding principal in answering this question states that high-tech workers typically utilize new technologies in performing their work such that the results change the ways in which people live and work. Daniel Hecker's identification of high-tech occupations is gaining broad-based support.<sup>6</sup> It includes engineers, life and physical scientists, mathematical specialists, engineering and science technicians, computer specialists, and engineering, scientific, and computer managers. These occupation categories served as the basis for data gathering reported here.

The Cleveland metro area reported a decrease in high-tech employment in each year from 2000 through 2003. In 2000, Cleveland reported a 3.7 percent share decreasing to a 3.3 percent share by 2003. In contrast, Akron's high-tech employment share held steady at just under three percent from 2000 through 2001. It then increased to 3.5 percent in 2002 and 2003.

The top five metro areas in high-tech employment (Seattle, Austin, Denver, San Diego, and Minneapolis) also reported decreases in the share of high-tech workers in 2001 and 2002. However, by 2003, these regions reported a small upturn in high-tech employment. Cleveland's share of high-tech employment (3.3 percent) was less than half that reported in Austin (7.5 percent) in 2003.

Figure 4 shows a comparison of high-tech employment share in selected MSAs in 2003. Table B-4 in Appendix B shows high-tech employment share for all metropolitan areas between 2000 and 2003.<sup>7</sup>

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<sup>6</sup> Hecker, Daniel. "High Technology Employment: A Broader View," *Monthly Labor Review*. June 1999, pp. 19-28.

<sup>7</sup> Figure 4 and Table B-4 only include occupations included in Hecker's definition.

Figure 4. High-Tech Employment Share in Selected MSAs, 2003

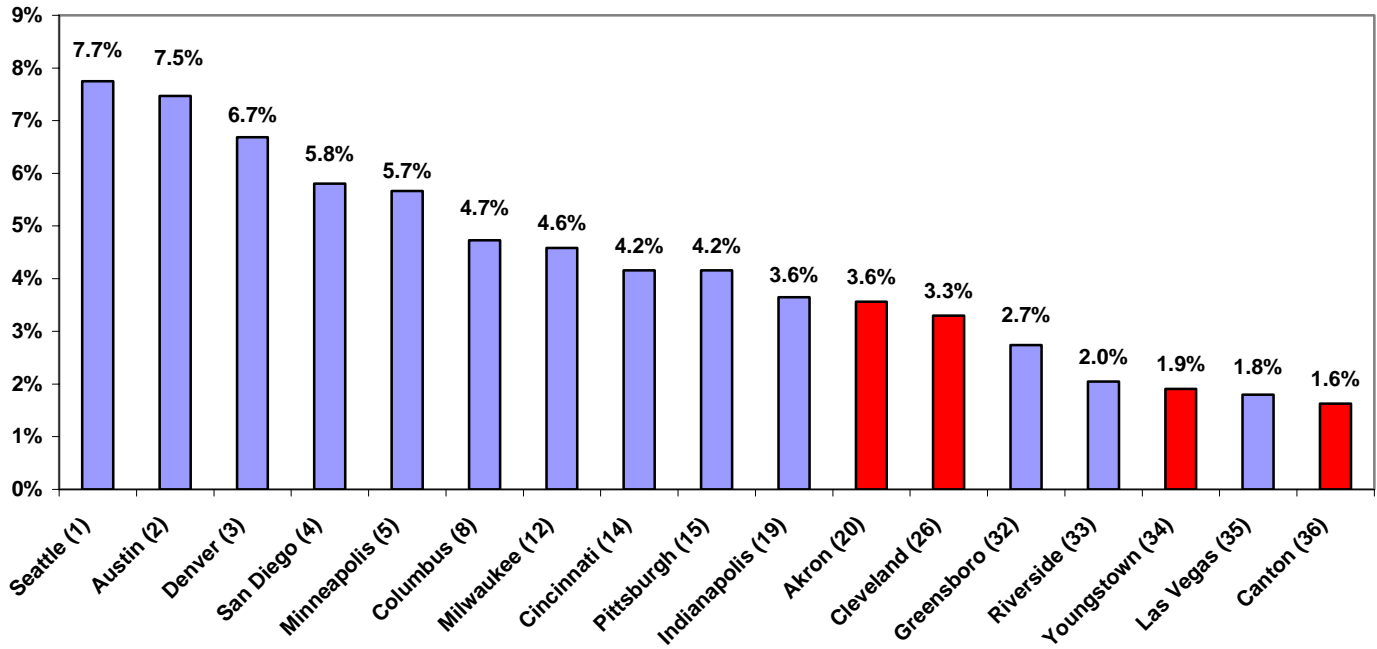
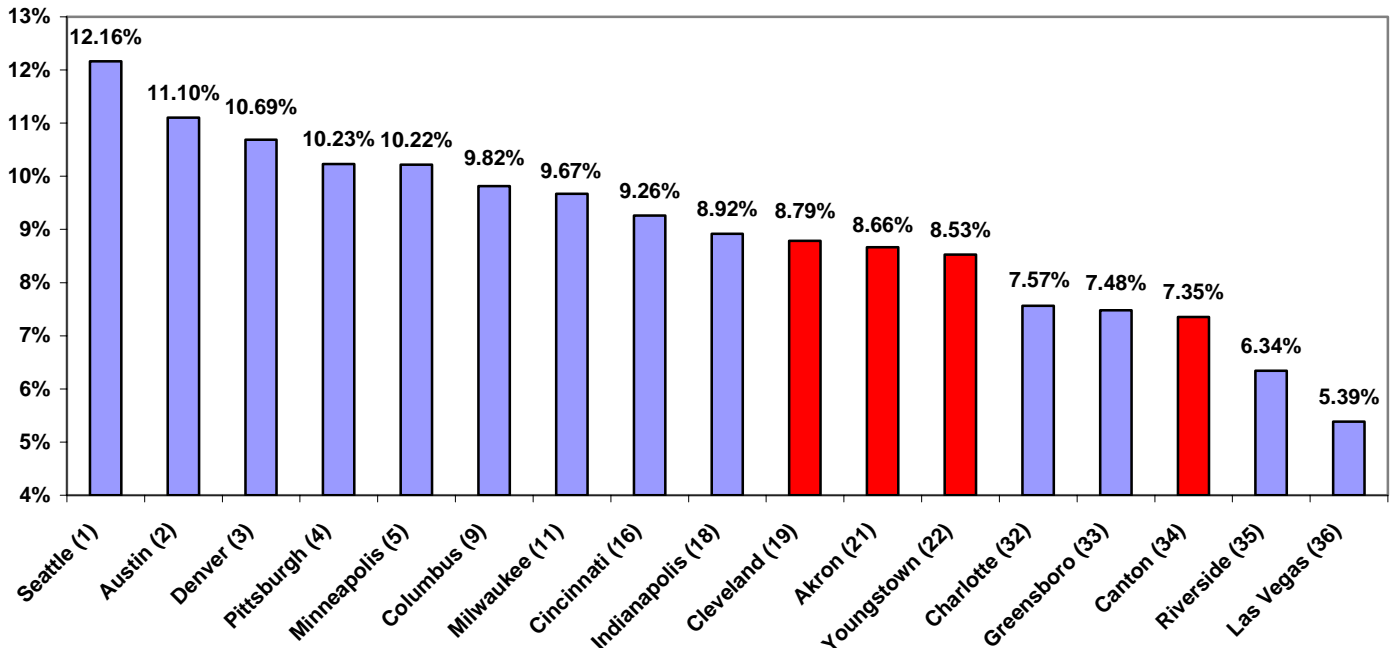


Figure 5. High-Tech Employment Share, Including Healthcare Occupations, in Selected MSAs, 2003



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the five lowest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions.

The value above the bar indicates the percent share of high-tech employees in their respective metro area.

Data source: U.S. Department of Labor, Bureau of Labor Statistics

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

Healthcare professionals such as doctors and nurses were not included in Hecker's list of high-tech occupations. Although these and other healthcare-related professions are defined as knowledge-intensive, similar to other the high-tech occupations, there is disagreement among analysts as to whether or not their work falls within the guiding principal described earlier that helps define high-tech occupations.

By including healthcare-related occupations as high-tech, 50 percent of the comparable metro areas reported a significant change in their high-tech employment share ranking.<sup>8</sup> Cleveland's ranking rose from 26th to 19th in 2003. This may be attributable, in part, to research being conducted by doctors and medical technicians at the Cleveland Clinic and University Hospitals. In contrast, Akron's ranking dropped from 20th to 21st. Of the top 10 metro areas (when using Hecker's definition), only two reported a significant rank change: San Diego dropped from 4th (excluding healthcare occupations) to 13th (including healthcare occupations) and Portland dropped from 7th (excluding healthcare occupations) to 15th (including healthcare occupations). Figure 5 shows a comparison of high-tech employment share (including healthcare occupations) in selected MSAs in 2003. Table B-5 in Appendix B shows high-tech employment share (including healthcare occupations) for all metropolitan areas in 2003.

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<sup>8</sup>A significant change in rank is defined here as either rising or falling more than three positions.

## **RESEARCH AND DEVELOPMENT FUNDING**

Research and development (R&D) funding is a key driver of economic growth in metropolitan areas. One of the results of R&D is product innovation, which adds to the knowledge base of industry and the marketplace as a whole. Metropolitan areas that have academic institutions performing large amounts of R&D are more able to attract and grow technology-based companies. The R&D infrastructure of a region is critical to building a technology-based economy with newly emerging industry clusters and sustaining the vibrancy of existing clusters.

Two sources of R&D funding are reported in this study: 1) awards presented by the National Institutes of Health (NIH) to colleges and universities, independent hospitals, medical schools, and research institutes, and 2) university-related R&D expenditures from all sources as reported in the Survey of Research and Development Expenditures at Universities and Colleges conducted by the National Science Foundation (NSF). Data collected by the NSF includes NIH grants awarded to universities. Data for private-sector R&D initiatives is not available on the metropolitan level.

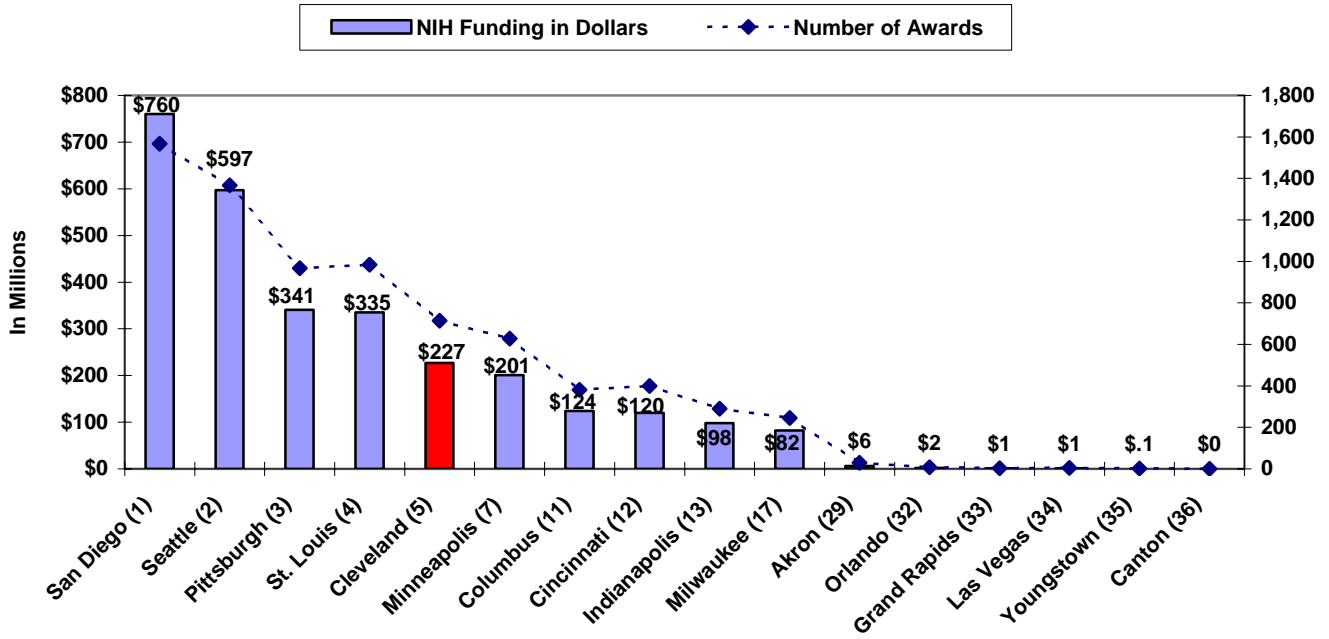
In NIH funding, Cleveland ranked fifth out of 36 metro areas in 2001 (latest year of available data). However, the \$227 million awarded to Cleveland area institutions was over \$100 million less than that received by institutions in Pittsburgh and St. Louis, which ranked 3<sup>rd</sup> and 4<sup>th</sup> respectively. Cleveland also ranked fifth in the number of NIH awards at 714. In comparison, the top-ranked metro area, San Diego, received 1,567 awards in 2001. However, NIH funding is one measure in which Cleveland ranked higher than Minneapolis. Figure 6 shows a comparison of NIH funding and number of awards in selected MSAs in 2001. Table B-6 in Appendix B provides a summary of NIH funding for all metropolitan areas in 2001.

The Cleveland metro area ranked 10<sup>th</sup> in overall university-related R&D expenditures in FY 2001 with \$212 million in spending by four institutions.<sup>9</sup> This is an increase of more than three percent over FY 2000. University-related R&D spending in the top five metro areas (San Diego, Seattle, Austin, Pittsburgh, and Minneapolis) averaged \$537 million in 2001, an increase of 11 percent over 2000. As expected, little change was observed in metro area rankings between 2000 and 2001. Figure 7 shows a comparison of university R&D expenditures in selected MSAs for 2001. Table B-7 in Appendix B provides a summary of university R&D expenditures for all metropolitan areas for 2000 and 2001.

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<sup>9</sup> Colleges and universities in the Cleveland metro area reporting R&D expenditures include Case Western Reserve University, Cleveland State University, John Carroll University, and Oberlin College.

Figure 6. NIH Funding and Number of Awards in Selected MSAs, 2001



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the five lowest ranking, and others in the Great Lakes region.

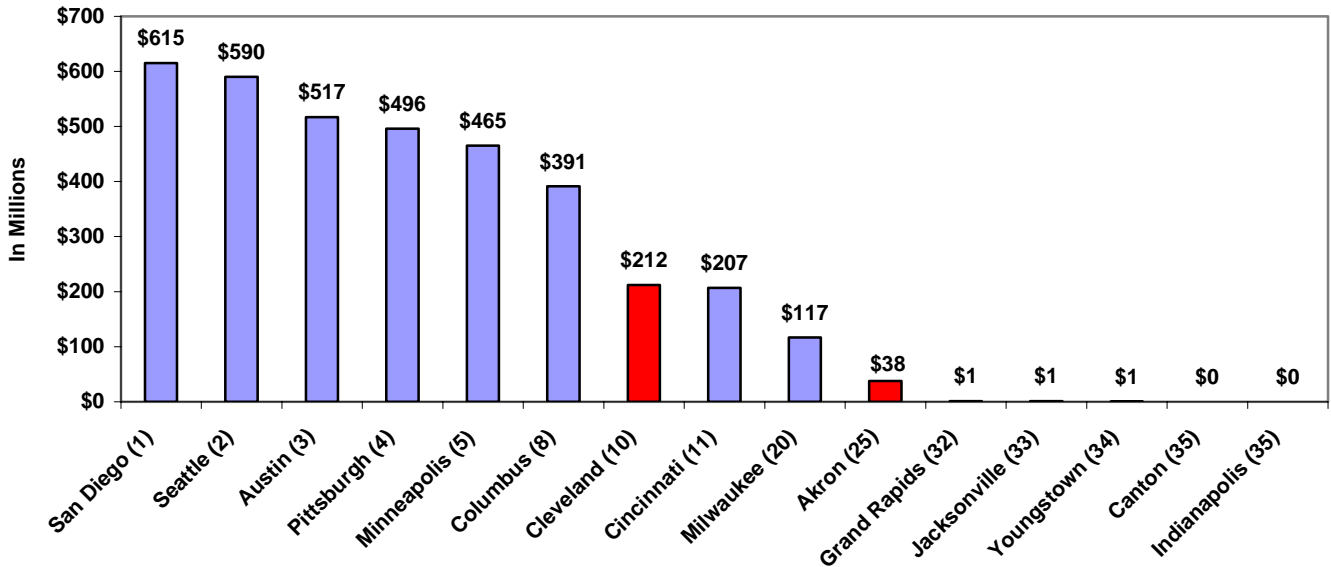
The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions.

The value above the bar indicates NIH funding given to institutions in their respective metro area.

Data source: National Institutes of Health

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University.

Figure 7. University R&D Expenditures in Selected MSAs, 2001



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the five lowest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions. Since universities in the bottom two metro areas did not report R&D-related expenditures, they are each ranked 35<sup>th</sup>.

The value above the bar indicates university-related R&D expenditures in their respective metro area.

Data source: National Science Foundation

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

## **PATENTS**

The majority of patents granted by the U.S. Patent and Trademark Office (USPTO) are utility patents.<sup>10</sup> A patent recognizes the viability of a research discovery and sets the stage for possible commercialization. The number of patents issued serves as a proxy for the level of research and innovation in a metropolitan area. A large number of patents indicates the potential for significant product innovation activity and a highly entrepreneurial environment. The capacity of firms to develop new products determines their competitive advantage and ability to pay higher wages.

The Cleveland metro area ranked 8<sup>th</sup> in the number of utility patents granted over three time periods: 2003, the four-year period from 2000 through 2003, and the 10-year period from 1994 through 2003. Akron ranked 17<sup>th</sup> with 523 patents granted in 2003. Rankings of the top 12 metro areas remained the same during the three time periods. Looking at two trend periods (2000 through 2003 and 1994 through 2003), the top five metro areas reported approximately twice the number of patents granted as Cleveland.<sup>11</sup> However, by 2003, Cleveland began falling further behind the comparable metro areas. In 2003, the top five metro areas were each awarded, on average, 2.5 times the number of patents as those granted in the Cleveland area (2,250 compared to 890). Figure 8 shows a comparison of utility patents granted in selected MSAs in 2003 and during the 1994-2003 time period. Table B-8 in Appendix B provides a summary of patent activity for all metropolitan areas for the time periods discussed above.

In 1996, the Northeast Ohio Clusters project identified six manufacturing-related industry clusters in the combined Cleveland and Akron metropolitan areas.<sup>12</sup> They include metalworking; plastics and chemicals; motor vehicles; biomed; instruments, controls, and electronics (ICE); and information technology (IT). Cleveland's patent ranking in each of the

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<sup>10</sup> A utility patent is granted to anyone who invents or discovers any new, useful, and non-obvious process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof.

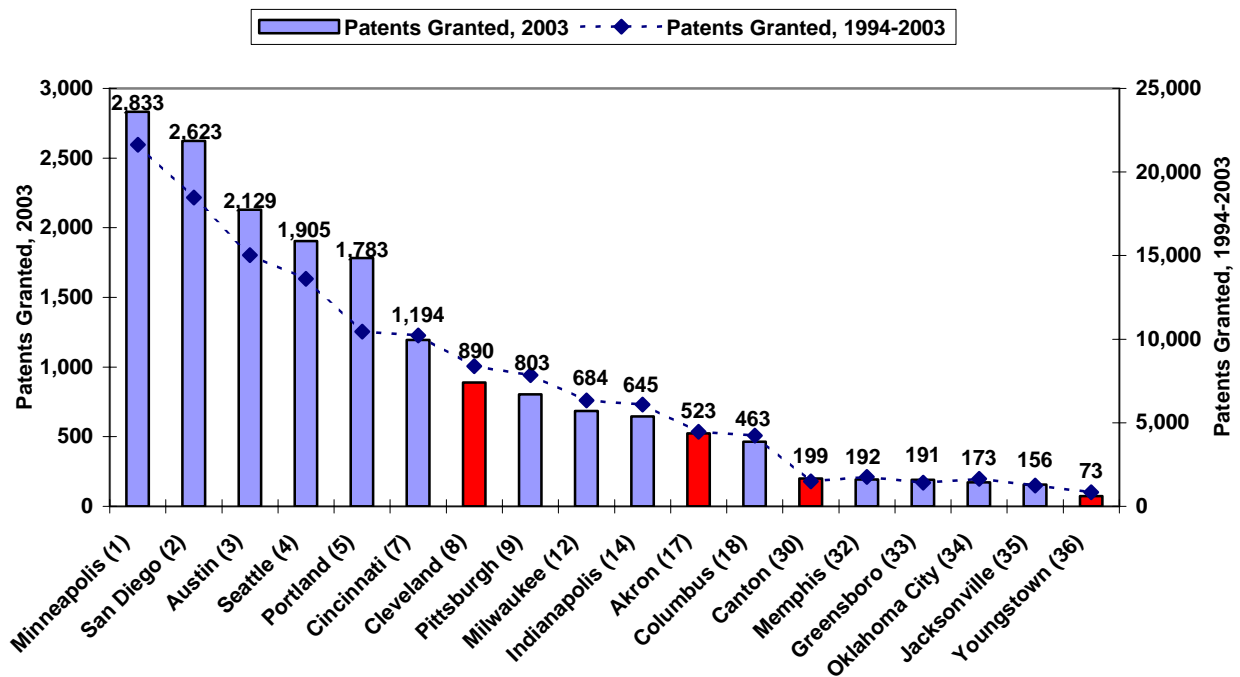
<sup>11</sup> From 1994 through 2003, the top five metro areas averaged 16,100 patents each compared to 8,400 in Cleveland. From 2000 through 2003, the top five metro areas averaged 8,100 patents each compared to 3,800 in Cleveland.

<sup>12</sup> Industry clusters are important to an economy because they reinforce the competitive position of member industries. When customer and supplier firms locate near one another, they are better able to coordinate the supply chain. More importantly, they can share technical knowledge and workforce skill development that increase performance for all firms in the cluster. Competing firms within an industry are also important because they stimulate innovations such as product improvements, new product development, technology applications, and process improvements that can significantly impact the competitive position of the cluster as a whole. It is the collective nature of the clusters that provides the strategic advantage. In fact, many similar companies are able to differentiate themselves by finding unique market niches that other companies do not fill. Competitiveness through collaboration helps small firms grow, resulting in tangible economic development outcomes for neighborhoods in a local economy.

clusters supports the belief that a significant amount of product innovation activity is occurring within the region in each of these industries. Following is Cleveland's rank (in parentheses) among the 36 comparable regions in the number of patents granted in the cluster industries from 2000 through 2003: metalworking (3), plastics and chemicals (5), motor vehicles (8), biomed (13), ICE (8), and IT (16). Table B-9 in Appendix B provides a summary of utility patents granted by cluster industry for all metropolitan areas.

When looking at the combined Cleveland-Akron metropolitan areas, the number of patents granted in each cluster as a percentage of the cluster total across all 36 comparable regions is especially noteworthy in the metalworking, plastic and chemicals, and motor vehicle industries. The Cleveland-Akron share of all patents in the following categories reveals the significance of these clusters to northeast Ohio: metalworking (10%), plastics and chemicals (13.2%), motor vehicles (11.9%), biomed (2.9%), ICE (5%), and IT (2.1%).

**Figure 8. Utility Patents Granted in Selected MSAs, 2003 and 1994 through 2003**



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the five lowest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions. The value above the bar indicates the number of utility patents granted to inventors in their respective metro area in 2003.

Data source: CHI Research Inc

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

## **BUSINESS INCUBATORS**

Business incubators provide start-up companies with various resources such as physical facilities, office/manufacturing equipment, business assistance services, and management consulting in order to stimulate growth and development during the companies' critical formative stages. The concept of business incubation has been successfully applied across the United States and around the world. Business incubation can offer better returns on investment for successful business creation and job and revenue growth with measurable direct and indirect economic impact.

Greater Cleveland ranked 5<sup>th</sup> (tied with Cincinnati) with seven business incubators located in the metropolitan area. The top four regions (number of incubators in parentheses) were Minneapolis (14), St. Louis (12), Milwaukee (11), and Pittsburgh (10). The number of incubators is a less important indicator of entrepreneurial activity within a region because of the large turnover in incubator facilities. For example, at the height of the dot.com boom, three incubators opened and closed their doors within a 12-month period in Cleveland's downtown. A far more significant indicator of entrepreneurship would be the number (or percentage) of businesses successfully launched from incubators that are still in operation after one year. However, these statistics are unavailable.

Table B-10 in Appendix B lists the number of incubators in each of the 36 comparable regions. The data provided in Table B-10 does not reflect a specific year. The National Business Incubator Association (provider of the data) maintains an incubator database that is updated upon receipt of new information. Therefore the data in Table B-10 may not accurately reflect the number of incubators in a specific metro area.

## CORPORATE HEADQUARTERS

The presence of corporate headquarters (HQ) in a metropolitan area is important to the local economy. The HQ building is home to highly paid executives and staff personnel who add significantly to the local tax base. In addition, the headquarters city is often the base of operations for the firm's high-tech components including engineering and R&D. The existence of corporate headquarters contributes to the stability of regional professional employment, especially in the areas of law, financial services, engineering, and information technology. Finally, large corporations tend to be involved in civic activities and philanthropy.

Headquarter counts in this report are taken exclusively from the *Fortune 500* list. Due to data availability issues, privately held companies and those listed in the bottom half of the *Fortune 1000* are excluded from the analysis. The result being that a somewhat limited picture of headquarters activity across the 36 metro areas is presented in this report.

The Cleveland metro area ranked very high among the comparable regions. In 2000, Cleveland was ranked third (tied with St. Louis) with nine HQs. In 2001, Cleveland reported the second highest number of HQs (tied with Seattle) at nine.<sup>13</sup> However, by 2002, Cleveland's rank dropped to number four (tied with Charlotte and Milwaukee) with eight corporate headquarters.<sup>14</sup> In 2003, Cleveland still retained six Fortune 500 headquarters, but its ranking dropped to number eight.<sup>15</sup> Akron reported two corporate headquarters in 2000 and 2001 and three in 2002 and 2003.<sup>16</sup>

Among the 36 metro areas, Minneapolis is dominant. It reported significantly more Fortune 500 HQs than any other metro area between 2000 and 2003. Of the 500 largest publicly held companies (by revenue) in the United States, only 28 percent are headquartered in metro areas considered in this report. Figure 9 shows a comparison of corporate headquarters located in selected MSAs for 2003. Table B-11 in Appendix B provides a summary of headquarter counts for all metropolitan areas between 2000 and 2003.

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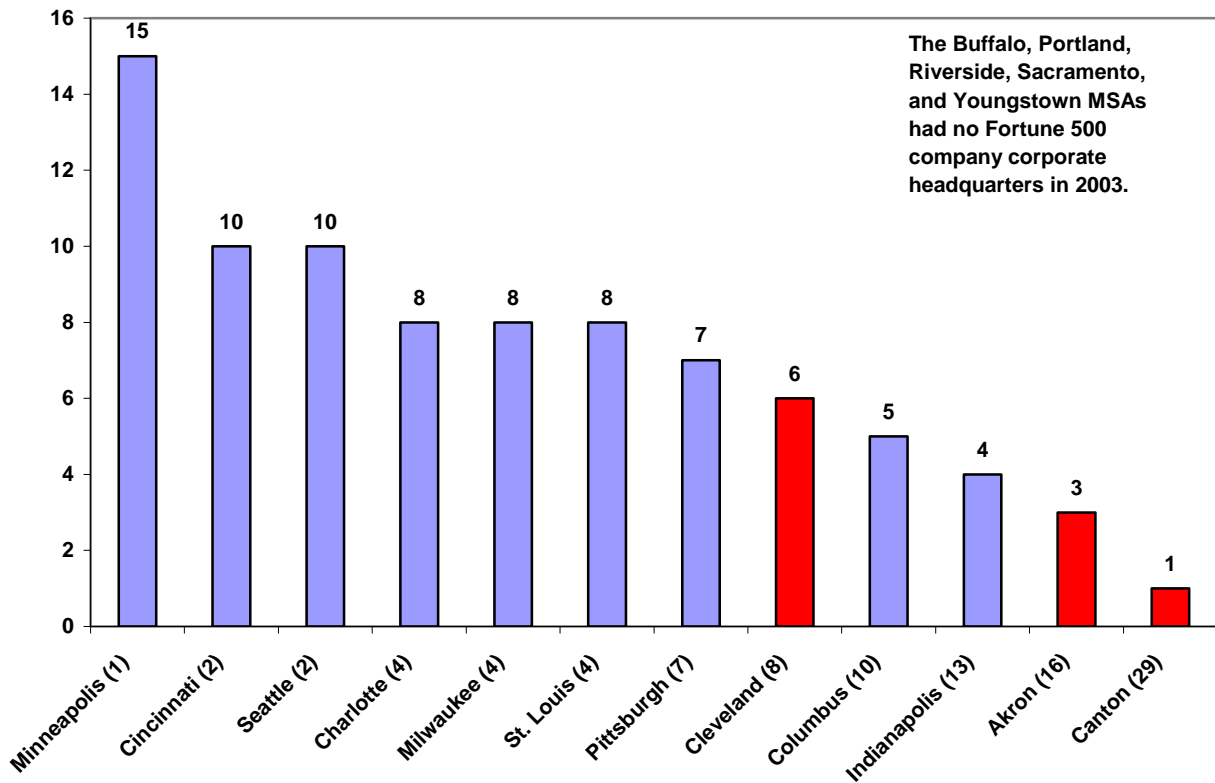
<sup>13</sup>Cleveland area headquarters in 2001: Eaton Corp., KeyCorp, LTV Steel, National City Corp., Office Max, Parker Hannifin, Progressive Insurance, Sherwin-Williams, and TRW.

<sup>14</sup>Cleveland area headquarters in 2002: Eaton Corp., KeyCorp, National City Corp., Office Max, Parker Hannifin, OM Group, Progressive Insurance, and Sherwin-Williams.

<sup>15</sup>Cleveland area headquarters in 2003: Eaton Corp., KeyCorp, National City Corp., Parker Hannifin, Progressive Insurance, and Sherwin-Williams.

<sup>16</sup>Akron area headquarters in 2003: First Energy, Goodyear, and International Steel Group.

Figure 9. Number of Fortune 500 Corporate Headquarters in Selected MSAs, 2003



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the lowest ranking, and others in the Great Lakers region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions. The value above the bar indicates the number of Fortune 500 corporate headquarters located in their respective metro area.

Data source: *Fortune* magazine

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

## BUSINESS COSTS

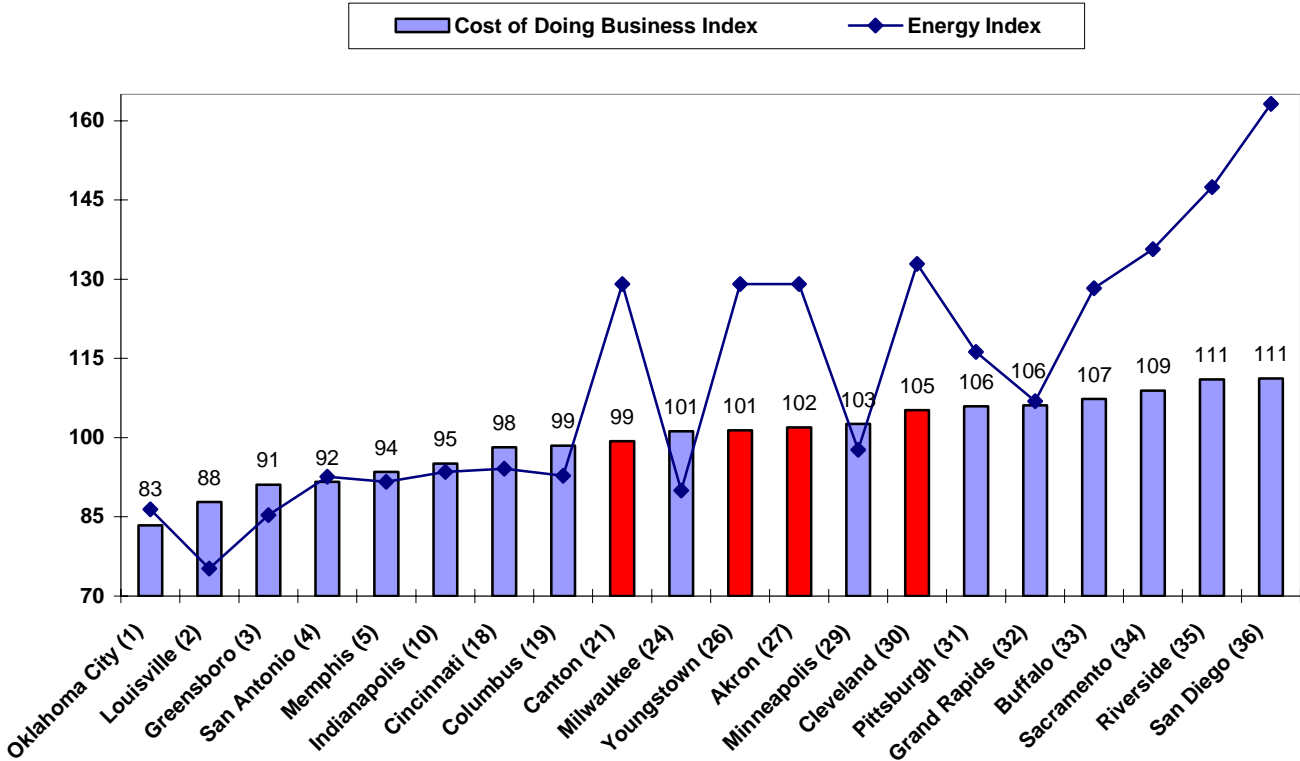
This report utilizes the *North American Business Cost Review* (NABCR), produced by Economy.com, as the basis for comparing the 36 metropolitan areas. NABCR's total business cost index is derived from four components: labor, energy, state and local taxes, and office rent. The U.S. index equals 100 for total cost and each of the four components. For a specific metropolitan area, if any of its indices is greater than 100, then the total cost, or component cost, is greater than the U.S. average. If an index is less than 100, then the total cost, or component cost, is less than the U.S. average. As an example, the office rent index for the Cleveland metropolitan area is 87.9. This means that office rent in the Cleveland area is about 12 percent less than the U.S. average.

This indicator is an important measure of a regional business climate because companies in a lower business cost region are more competitive than companies in a higher business cost region if everything else is equal between the two regions. The data reveals that the Cleveland metro area (and the entire northeast Ohio (NEO) region) is a high cost place to do business. Cleveland ranks 30<sup>th</sup> (index = 105.2) in total business cost; only six other comparable metro areas report higher business costs than Cleveland. The highest cost metropolitan areas are all in California: San Diego, Riverside, and Sacramento. In NEO, Akron ranks 27<sup>th</sup>, Youngstown ranks 26<sup>th</sup>, and Canton ranks 21<sup>st</sup>.

The primary reason for the high rankings is the cost of energy. Cleveland's energy index equals 132.9. The other metro areas in NEO report an energy index of 129.1. These are in contrast to the lowest energy cost metro areas: Portland, OR (75.0); Louisville, KY (75.2); Virginia Beach, VA (80.0); Richmond, VA (80.0); and Denver, CO (81.5).

In addition to energy, taxes contribute significantly to the high cost of doing business. Following are the tax indices for NEO: Cleveland (111.9), Akron (110.7), Canton (106.2), and Youngstown (106.3). Figure 10 shows a comparison of the total business cost index and the energy index in selected MSAs for 2002. Table B-12 in Appendix B provides a listing of the total business cost index as well as labor, energy, taxes, and office rent sub-indices for all metropolitan areas in 2002.

Figure 10. Total Cost of Doing Business Index and Energy Index in Selected MSAs, 2002



**Notes:**

Metro areas represented include those located in the state of Ohio, the five highest ranking, the five lowest ranking, and others in the Great Lakes region.

The number in parentheses adjacent to the metro area name indicates its ranking among the 36 comparable regions.

The value above the bar indicates the metro area's total cost of doing business index.

Data source: Economy.com

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University.

## APPENDIX A – DATA SOURCE INFORMATION

### SBIR & STTR AWARDS

<http://www.sbirworld.com>  
Sponsored by the National Science  
Foundation

### VENTURE CAPITAL

Thomson Financial Venture  
Economics  
<http://www.thomsonfinancial.com>  
888-989-8373

### INITIAL PUBLIC OFFERINGS

IPO Monitor  
5200 W. Century Blvd., Suite 470  
Los Angeles, CA 90045  
800-266-0126  
<http://www.ipomonitor.com>

### HIGH-TECH OCCUPATIONS

U.S. Department of Labor  
Bureau of Labor Statistics  
<http://www.bls.gov>

### RESEARCH AND DEVELOPMENT

National Science Foundation  
WebCASPAR  
<http://caspar.nsf.gov>  
U.S. Department of Health and  
Human Services  
National Institutes of Health  
<http://www.nih.gov>

### PATENTS

CHI Research, Inc.  
10 White Horse Pike  
Haddon Heights, NJ 08035  
856-546-0600  
<http://www.chiresearch.com>

### BUSINESS INCUBATORS

National Business Incubation  
Association  
20 East Circle Drive, #37198  
Athens, Ohio 45701  
740-593-4331  
<http://www.nbia.org>

### CORPORATE HEADQUARTERS

Fortune Magazine  
<http://www.fortune.com>

### BUSINESS COSTS

Economy.com, Inc.  
121 North Walnut Street, Suite 500  
West Chester, PA 19380  
610-235-5000  
<http://www.economy.com>



## **APPENDIX B – DATA TABLES**

Table B-1. SBIR/STTR Awards by Metropolitan Area, 2000 – 2001

Table B-2. Venture Capital Activity by Metropolitan Area, 2000 – 2003

Table B-3. IPO Activity by Metropolitan Area, 2000 – 2003

Table B-4. High-Tech Employment by Metropolitan Area, 2000 – 2003

Table B-5. High-Tech Employment Including Healthcare Professions by Metropolitan Area, 2003

Table B-6. National Institutes of Health Awards by Metropolitan Area, 2001

Table B-7. University Related R&D Expenditures by Metropolitan Area, 2000 – 2001

Table B-8. Utility Patent Activity by Metropolitan Area

Table B-9. Utility Patents Granted by Industry Cluster by Metropolitan Area, 2000 – 2003

Table B-10. Business Incubators by Metropolitan Area

Table B-11. Corporate Headquarters by Metropolitan Area, 2000 – 2003

Table B-12. Business Cost Indices by Metropolitan Area, 2002

**Table B-1. SBIR/STTR Awards by Metropolitan Area, 2000 - 2001**

METROPOLITAN STATISTICAL AREA	2000			2001		
	Awards	Cos.	Total Value	Awards	Cos.	Total Value
Akron, OH MSA	2	2	\$485,397	5	3	\$1,778,546
Austin-Round Rock, TX MSA	32	13	\$7,702,679	41	17	\$10,365,358
Buffalo-Cheektowaga-Tonawanda, NY MSA	10	6	\$3,522,828	5	4	\$1,750,446
Canton-Massillon, OH MSA	0	0	\$0	0	0	\$0
Charlotte-Gastonia-Concord, NC-SC MSA	1	1	\$400,000	3	3	\$267,760
Cincinnati-Middletown, OH-KY-IN MSA	14	10	\$2,665,316	14	11	\$3,982,257
Cleveland-Lorain-Elyria, OH MSA	12	8	\$4,431,727	17	8	\$3,227,419
Columbus, OH MSA	18	11	\$5,422,649	16	10	\$4,317,197
Denver-Aurora, CO MSA	37	21	\$9,116,525	46	16	\$11,088,063
Grand Rapids-Wyoming, MI MSA	1	1	\$736,706	0	0	\$0
Greensboro-High Point, NC MSA	1	1	\$99,981	1	1	\$69,965
Indianapolis, IN MSA	1	1	\$100,000	0	0	\$0
Jacksonville, FL MSA	0	0	\$0	1	1	\$69,978
Kansas City, MO-KS MSA	0	0	\$0	1	1	\$120,000
Las Vegas-Paradise, NV MSA	0	0	\$0	1	1	\$62,756
Louisville, KY-IN MSA	0	0	\$0	3	2	\$239,982
Memphis, TN-MS-AR MSA	0	0	\$0	0	0	\$0
Milwaukee-Waukesha-West Allis, WI MSA	1	1	\$119,630	3	3	\$897,938
Minneapolis-St. Paul-Bloomington, MN-WI MSA	39	14	\$9,147,952	35	12	\$11,622,090
Nashville-Davidson-Murfreesboro, TN MSA	6	2	\$1,171,526	5	2	\$2,160,856
Oklahoma City, OK MSA	2	2	\$200,000	3	3	\$249,362
Orlando, FL MSA	23	16	\$7,915,022	21	16	\$5,682,502
Phoenix-Mesa-Scottsdale, AZ MSA	20	12	\$4,672,009	17	13	\$5,961,283
Pittsburgh, PA MSA	10	8	\$1,905,037	15	11	\$2,288,271
Portland-Vancouver-Beaverton, OR-WA MSA	5	4	\$409,835	14	9	\$3,213,965
Providence-New Bedford-Fall River, RI-MA MSA	14	14	\$3,273,131	5	5	\$2,438,370
Richmond, VA MSA	1	1	\$67,513	1	1	\$90,521
Riverside-San Bernardino-Ontario, CA MSA	3	3	\$1,509,688	10	6	\$2,031,882
Sacramento-Arden-Arcade-Roseville, CA MSA	8	6	\$2,420,117	9	8	\$2,662,755
San Antonio, TX MSA	3	2	\$517,398	4	4	\$1,028,684
San Diego-Carlsbad-San Marcos, CA MSA	85	51	\$20,335,156	81	35	\$27,626,787
Seattle-Tacoma-Bellevue, WA MSA	29	18	\$8,214,460	24	15	\$7,384,060
St. Louis, MO-IL MSA	11	11	\$2,966,640	6	5	\$1,057,875
Tampa-St. Petersburg-Clearwater, FL MSA	8	4	\$1,868,648	12	7	\$2,982,185
Virginia Beach-Norfolk-Newport News, VA-NC MSA	7	7	\$892,197	13	10	\$4,046,583
Youngstown, OH MSA	0	0	\$0	0	0	\$0
<b>TOTAL</b>	<b>404</b>	<b>251</b>	<b>\$102,289,767</b>	<b>432</b>	<b>243</b>	<b>\$120,765,696</b>

Awards: Total number of awards reported in a metropolitan area.

Cos.: Total number of companies receiving an award in a metropolitan area.

Data source: SBIRWorld.

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University.

Table B-2. Venture Capital Activity by Metropolitan Area, 2000 – 2003

Metropolitan Statistical Area	2000		2001		2002		2003	
	Deals	Investment	Deals	Investment	Deals	Investment	Deals	Investment
Akron, OH MSA	3	\$56,000,000	1	\$11,000,000	3	\$60,580,000	1	\$3,500,000
Austin-Round Rock, TX MSA	193	\$2,343,640,000	134	\$1,170,280,000	67	\$433,050,000	71	\$531,520,000
Buffalo-Cheektowaga-Tonawanda, NY MSA	10	\$130,530,000	7	\$8,940,000	9	\$39,900,000	8	\$50,820,000
Canton-Massillon, OH MSA	0	\$0	1	\$15,200,000	0	\$0	0	\$0
Charlotte-Gastonia-Concord, NC-SC MSA	29	\$582,930,000	16	\$87,450,000	20	\$96,230,000	19	\$84,030,000
Cincinnati-Middletown, OH-KY-IN MSA	21	\$185,510,000	16	\$109,510,000	16	\$178,900,000	9	\$22,220,000
Cleveland-Lorain-Elyria, OH MSA	27	\$316,170,000	20	\$45,920,000	19	\$81,960,000	16	\$33,250,000
Columbus, OH MSA	26	\$318,450,000	12	\$65,700,000	12	\$82,170,000	6	\$36,450,000
Denver-Aurora, CO MSA	159	\$2,929,430,000	76	\$765,320,000	58	\$356,900,000	56	\$494,580,000
Grand Rapids-Wyoming, MI MSA	3	\$3,110,000	0	\$0	0	\$0	1	\$4,500,000
Greensboro-High Point, NC MSA	14	\$100,120,000	8	\$17,030,000	3	\$46,120,000	5	\$21,190,000
Indianapolis, IN MSA	27	\$285,960,000	7	\$45,450,000	7	\$34,350,000	3	\$37,650,000
Jacksonville, FL MSA	13	\$110,290,000	2	\$14,500,000	4	\$72,400,000	4	\$82,450,000
Kansas City, MO-KS MSA	42	\$565,070,000	14	\$163,460,000	9	\$17,100,000	7	\$14,300,000
Las Vegas-Paradise, NV MSA	3	\$13,950,000	4	\$90,000	3	\$3,150,000	2	\$11,000,000
Louisville, KY-IN MSA	14	\$161,040,000	8	\$10,480,000	4	\$3,410,000	6	\$5,400,000
Memphis, TN-MS-AR MSA	15	\$66,980,000	10	\$33,050,000	4	\$30,500,000	1	\$20,000,000
Milwaukee-Waukesha-West Allis, WI MSA	9	\$24,950,000	8	\$17,400,000	4	\$4,750,000	3	\$8,850,000
Minneapolis-St. Paul-Bloomington, MN-WI MSA	121	\$1,163,230,000	95	\$571,900,000	60	\$613,130,000	66	\$325,720,000
Nashville-Davidson-Murfreesboro, TN MSA	36	\$325,590,000	25	\$154,760,000	16	\$88,030,000	19	\$81,250,000
Oklahoma City, OK MSA	6	\$35,890,000	3	\$23,400,000	4	\$25,000,000	0	\$0
Orlando, FL MSA	23	\$229,210,000	15	\$198,250,000	7	\$64,400,000	8	\$38,890,000
Phoenix-Mesa-Scottsdale, AZ MSA	66	\$636,470,000	38	\$257,770,000	20	\$167,660,000	21	\$55,070,000
Pittsburgh, PA MSA	80	\$874,380,000	54	\$448,220,000	35	\$158,580,000	30	\$434,000,000
Portland-Vancouver-Beaverton, OR-WA MSA	69	\$1,031,020,000	50	\$373,990,000	29	\$245,780,000	31	\$132,150,000
Providence-New Bedford-Fall River, RI-MA MSA	18	\$92,670,000	9	\$41,870,000	13	\$59,370,000	10	\$43,110,000
Richmond, VA MSA	18	\$176,280,000	10	\$49,800,000	8	\$18,170,000	5	\$4,550,000
Riverside-San Bernardino-Ontario, CA MSA	2	\$16,250,000	3	\$7,800,000	2	\$6,000,000	0	\$0
Sacramento-Arden-Arcade-Roseville, CA MSA	18	\$276,920,000	15	\$134,210,000	9	\$95,560,000	9	\$65,050,000
San Antonio, TX MSA	13	\$57,600,000	15	\$44,160,000	2	\$18,550,000	7	\$66,400,000
San Diego-Carlsbad-San Marcos, CA MSA	260	\$2,378,390,000	181	\$1,805,560,000	14	\$1,165,880,000	147	\$849,120,000
Seattle-Tacoma-Bellevue, WA MSA	272	\$2,750,480,000	166	\$1,089,210,000	112	\$589,420,000	97	\$437,190,000
St. Louis, MO-IL MSA	39	\$697,990,000	19	\$273,930,000	31	\$171,840,000	34	\$112,480,000
Tampa-St. Petersburg-Clearwater, FL MSA	24	\$393,110,000	15	\$97,770,000	17	\$136,310,000	16	\$70,800,000
Virginia Beach-Norfolk-Newport News, VA-NC MSA	6	\$5,360,000	5	\$17,240,000	3	\$5,400,000	1	\$2,300,000
Youngstown, OH MSA	2	\$10,390,000	4	\$6,400,000	0	\$0	0	\$0
<b>TOTAL</b>	<b>1681</b>	<b>\$19,345,360,000</b>	<b>1066</b>	<b>\$8,177,020,000</b>	<b>754</b>	<b>\$5,170,550,000</b>	<b>719</b>	<b>\$4,179,790,000</b>

Deals: Total number of VC deals finalized in the respective metropolitan area.

Investment: Total monies invested by all venture capitalists in the respective metropolitan area.

Data Source: Thomson Financial Venture Economics

Note: Data is continuously updated by Thomas Financial and may be subject to change.

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Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University.

**Table B-3. IPO Activity by Metropolitan Area, 2000 – 2003**

METROPOLITAN STATISTICAL AREA	NUMBER OF IPOs PER CALENDAR YEAR					NUMBER OF IPOs PER SECTOR			
	2000	2001	2002	2003	TOTAL	TECHNOLOGY	HEALTHCARE	SERVICES	OTHER
Akron, OH MSA	0	0	0	1	1	0	0	0	1
Austin-Round Rock, TX MSA	4	0	0	1	5	3	2	0	0
Buffalo-Cheektowaga-Tonawanda, NY MSA	1	0	0	0	1	1	0	0	0
Canton-Massillon, OH MSA	0	0	0	0	0	0	0	0	0
Charlotte-Gastonia-Concord, NC-SC MSA	0	1	0	0	1	0	1	0	0
Cincinnati-Middletown, OH-KY-IN MSA	1	0	0	0	1	0	0	1	0
Cleveland-Lorain-Elyria, OH MSA	0	0	0	0	0	0	0	0	0
Columbus, OH MSA	0	0	0	0	0	0	0	0	0
Denver-Aurora, CO MSA	5	0	4	2	11	2	3	3	3
Grand Rapids-Wyoming, MI MSA	0	0	0	0	0	0	0	0	0
Greensboro-High Point, NC MSA	0	0	0	0	0	0	0	0	0
Indianapolis, IN MSA	0	2	1	0	3	0	0	2	1
Jacksonville, FL MSA	0	0	0	0	0	0	0	0	0
Kansas City, MO-KS MSA	0	2	0	1	3	0	0	0	3
Las Vegas-Paradise, NV MSA	0	0	2	1	3	0	0	3	0
Louisville, KY-IN MSA	0	0	0	0	0	0	0	0	0
Memphis, TN-MS-AR MSA	0	1	0	1	2	0	1	0	1
Milwaukee-Waukesha-West Allis, WI MSA	0	0	0	1	1	0	0	1	0
Minneapolis-St. Paul-Bloomington, MN-WI MSA	6	1	2	1	10	3	3	1	3
Nashville-Davidson-Murfreesboro, TN MSA	2	0	0	2	4	0	1	2	1
Oklahoma City, OK MSA	1	0	0	0	1	0	0	1	0
Orlando, FL MSA	0	0	1	0	1	0	0	0	1
Phoenix-Mesa-Scottsdale, AZ MSA	6	0	1	1	8	4	1	2	1
Pittsburgh, PA MSA	2	0	1	0	3	1	0	1	1
Portland-Vancouver-Beaverton, OR-WA MSA	2	0	0	0	2	2	0	0	0
Providence-New Bedford-Fall River, RI-MA MSA	0	0	1	0	1	0	0	1	0
Richmond, VA MSA	0	0	0	1	1	0	0	0	1
Riverside-San Bernardino-Ontario, CA MSA	0	1	0	0	1	0	0	0	1
Sacramento-Arden-Arcade-Roseville, CA MSA	1	0	0	0	1	1	0	0	0
San Antonio, TX MSA	0	0	0	0	0	0	0	0	0
San Diego-Carlsbad-San Marcos, CA MSA	7	3	2	5	17	5	5	3	4
Seattle-Tacoma-Bellevue, WA MSA	6	3	2	0	11	2	5	3	1
St. Louis, MO-IL MSA	2	1	0	0	3	1	0	0	2
Tampa-St. Petersburg-Clearwater, FL MSA	1	0	0	2	3	0	1	0	2
Virginia Beach-Norfolk-Newport News, VA-NC MSA	0	0	1	0	1	0	0	1	0
Youngstown, OH MSA	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>	<b>47</b>	<b>15</b>	<b>18</b>	<b>20</b>	<b>100</b>	<b>25</b>	<b>23</b>	<b>25</b>	<b>27</b>

Data Source: IPO Monitor

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

**Table B-4. High-Tech Employment by Metropolitan Area, 2000 – 2003**

METROPOLITAN STATISTICAL AREA	2000	2001	2002	2003
	% HIGH-TECH	% HIGH-TECH	% HIGH-TECH	% HIGH-TECH
Akron, OH MSA	2.9%	2.9%	3.5%	3.6%
Austin-Round Rock, TX MSA	8.6%	7.1%	8.1%	7.5%
Buffalo-Cheektowaga-Tonawanda, NY MSA	3.2%	3.7%	3.2%	3.3%
Canton-Massillon, OH MSA	1.8%	1.8%	1.8%	1.6%
Charlotte-Gastonia-Concord, NC-SC MSA	4.2%	3.9%	3.9%	3.4%
Cincinnati-Middletown, OH-KY-IN MSA	3.7%	4.0%	4.0%	4.2%
Cleveland-Lorain-Elyria, OH MSA	3.7%	3.5%	3.4%	3.3%
Columbus, OH MSA	4.6%	4.4%	4.6%	4.7%
Denver-Aurora, CO MSA	7.1%	6.8%	6.3%	6.7%
Grand Rapids-Wyoming, MI MSA	3.2%	3.2%	3.5%	3.4%
Greensboro-High Point, NC MSA	2.9%	2.9%	3.0%	2.7%
Indianapolis, IN MSA	3.6%	3.5%	3.9%	3.6%
Jacksonville, FL MSA	4.1%	3.8%	4.0%	3.7%
Kansas City, MO-KS MSA	5.4%	5.2%	4.5%	4.6%
Las Vegas-Paradise, NV MSA	1.9%	1.7%	1.7%	1.8%
Louisville, KY-IN MSA	2.9%	3.1%	2.9%	2.9%
Memphis, TN-MS-AR MSA	2.8%	2.8%	2.7%	2.9%
Milwaukee-Waukesha-West Allis, WI MSA	4.0%	4.1%	4.5%	4.6%
Minneapolis-St. Paul-Bloomington, MN-WI MSA	5.7%	5.6%	5.3%	5.7%
Nashville-Davidson-Murfreesboro, TN MSA	3.0%	2.8%	3.0%	3.0%
Oklahoma City, OK MSA	3.1%	3.9%	3.4%	3.6%
Orlando, FL MSA	4.1%	3.5%	3.9%	3.8%
Phoenix-Mesa-Scottsdale, AZ MSA	5.6%	5.2%	4.6%	4.1%
Pittsburgh, PA MSA	4.1%	4.1%	4.0%	4.2%
Portland-Vancouver-Beaverton, OR-WA MSA	4.9%	5.0%	4.7%	5.0%
Providence-New Bedford-Fall River, RI-MA	2.9%	3.2%	2.8%	3.4%
Richmond, VA MSA	4.7%	4.5%	4.5%	4.7%
Riverside-San Bernardino-Ontario, CA MSA	1.7%	1.8%	2.1%	2.0%
Sacramento-Arden-Arcade-Roseville, CA MSA	5.0%	5.6%	5.1%	5.6%
San Antonio, TX MSA	2.9%	3.0%	3.7%	3.2%
San Diego-Carlsbad-San Marcos, CA MSA	5.9%	5.9%	5.7%	5.8%
Seattle-Tacoma-Bellevue, WA MSA	9.1%	8.9%	7.6%	7.7%
St. Louis, MO-IL MSA	4.3%	4.1%	4.3%	4.5%
Tampa-St. Petersburg-Clearwater, FL MSA	3.9%	3.6%	3.6%	3.4%
Virginia Beach-Norfolk-Newport News, VA-NC MSA	4.0%	4.7%	4.4%	4.6%
Youngstown, OH MSA	1.8%	1.6%	1.8%	1.9%

% High-Tech: Estimated high-tech employment share in the respective metropolitan area.

High-tech employment shares in the above table do not include persons employed in healthcare-related professions such as doctors, nurses, medical technicians, etc.

Data source: U.S. Bureau of Labor Statistics

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University.

**Table B-5. High-Tech Employment, Including Healthcare Professions, by Metropolitan Area, 2003**

METROPOLITAN STATISTICAL AREA	2003
	% HIGH-TECH
Akron, OH MSA	8.7%
Austin-Round Rock, TX MSA	11.1%
Buffalo-Cheektowaga-Tonawanda, NY MSA	8.4%
Canton-Massillon, OH MSA	7.4%
Charlotte-Gastonia-Concord, NC-SC MSA	7.6%
Cincinnati-Middletown, OH-KY-IN MSA	9.3%
Cleveland-Lorain-Elyria, OH MSA	8.8%
Columbus, OH MSA	9.8%
Denver-Aurora, CO MSA	10.7%
Grand Rapids-Wyoming, MI MSA	7.6%
Greensboro-High Point, NC MSA	7.5%
Indianapolis, IN MSA	8.9%
Jacksonville, FL MSA	8.3%
Kansas City, MO-KS MSA	9.7%
Las Vegas-Paradise, NV MSA	5.4%
Louisville, KY-IN MSA	8.3%
Memphis, TN-MS-AR MSA	8.5%
Milwaukee-Waukesha-West Allis, WI MSA	9.7%
Minneapolis-St. Paul-Bloomington, MN-WI MSA	10.2%
Nashville-Davidson-Murfreesboro, TN MSA	8.7%
Oklahoma City, OK MSA	9.6%
Orlando, FL MSA	8.0%
Phoenix-Mesa-Scottsdale, AZ MSA	8.0%
Pittsburgh, PA MSA	10.2%
Portland-Vancouver-Beaverton, OR-WA MSA	9.4%
Providence-New Bedford-Fall River, RI-MA	9.5%
Richmond, VA MSA	9.9%
Riverside-San Bernardino-Ontario, CA MSA	6.3%
Sacramento-Arden-Arcade-Roseville, CA MSA	10.0%
San Antonio, TX MSA	8.2%
San Diego-Carlsbad-San Marcos, CA MSA	9.6%
Seattle-Tacoma-Bellevue, WA MSA	12.2%
St. Louis, MO-IL MSA	9.8%
Tampa-St. Petersburg-Clearwater, FL MSA	7.9%
Virginia Beach-Norfolk-Newport News, VA-NC MSA	9.0%
Youngstown, OH MSA	8.5%

% High-Tech: Estimated high-tech employment share in the respective metropolitan area.

High-tech employment shares in the above table include persons employed in healthcare-related professions such as doctors, nurses, medical technicians, etc.

Data source: U.S. Bureau of Labor Statistics

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University.

**Table B-6. National Institutes of Health Awards by Metropolitan Area, 2001**

<b>METROPOLITAN STATISTICAL AREA</b>	<b>TOTAL AWARD VALUE</b>	<b>NO. OF AWARDS</b>
Akron, OH MSA	\$6,491,974	29
Austin-Round Rock, TX MSA	\$38,030,721	167
Buffalo-Cheektowaga-Tonawanda, NY MSA	\$78,877,975	278
Canton-Massillon, OH MSA	\$0	0
Charlotte-Gastonia-Concord, NC-SC MSA	\$2,485,476	16
Cincinnati-Middletown, OH-KY-IN MSA	\$119,267,952	400
Cleveland-Lorain-Elyria, OH MSA	\$226,962,290	714
Columbus, OH MSA	\$123,591,747	381
Denver-Aurora, CO MSA	\$201,899,202	629
Grand Rapids-Wyoming, MI MSA	\$1,022,664	3
Greensboro-High Point, NC MSA	\$3,439,927	20
Indianapolis, IN MSA	\$97,596,176	290
Jacksonville, FL MSA	\$6,669,362	18
Kansas City, MO-KS MSA	\$54,881,269	183
Las Vegas-Paradise, NV MSA	\$1,007,050	5
Louisville, KY-IN MSA	\$28,275,277	120
Memphis, TN-MS-AR MSA	\$88,156,839	278
Milwaukee-Waukesha-West Allis, WI MSA	\$81,901,516	245
Minneapolis-St. Paul-Bloomington, MN-WI MSA	\$200,811,781	627
Nashville-Davidson-Murfreesboro, TN MSA	\$177,202,256	555
Oklahoma City, OK MSA	\$49,882,760	149
Orlando, FL MSA	\$1,934,450	8
Phoenix-Mesa-Scottsdale, AZ MSA	\$24,375,831	102
Pittsburgh, PA MSA	\$340,862,296	967
Portland-Vancouver-Beaverton, OR-WA MSA	\$141,033,177	475
Providence-New Bedford-Fall River, RI-MA MSA	\$94,736,831	363
Richmond, VA MSA	\$58,558,066	226
Riverside-San Bernardino-Ontario, CA MSA	\$18,743,331	67
Sacramento-Arden-Arcade-Roseville, CA MSA	\$88,732,880	302
San Antonio, TX MSA	\$133,704,742	335
San Diego-Carlsbad-San Marcos, CA MSA	\$759,820,518	1,567
Seattle-Tacoma-Bellevue, WA MSA	\$596,761,721	1,367
St. Louis, MO-IL MSA	\$335,332,908	984
Tampa-St. Petersburg-Clearwater, FL MSA	\$34,964,371	129
Virginia Beach-Norfolk-Newport News, VA-NC MSA	\$9,352,690	47
Youngstown, OH MSA	\$120,580	1
<b>TOTAL</b>	<b>\$4,227,488,606</b>	<b>12,047</b>

Awards: Total number of awards reported in a metropolitan area

Data Source: National Institutes of Health

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

**Table B-7. University Related R&D Expenditures by Metropolitan Area, 2000 – 2001**

METROPOLITAN STATISTICAL AREA	FY 2000		FY 2001	
	Inst	R&D Expenditures	Inst	R&D Expenditures
Akron, OH MSA	3	\$34,323,000	3	\$38,114,000
Austin-Round Rock, TX MSA	3	\$459,514,000	3	\$516,734,000
Buffalo-Cheektowaga-Tonawanda, NY MSA	2	\$189,375,000	2	\$188,381,000
Canton-Massillon, OH MSA	0	\$0	0	\$0
Charlotte-Gastonia-Concord, NC-SC MSA	2	\$8,077,000	2	\$8,100,000
Cincinnati-Middletown, OH-KY-IN MSA	4	\$183,912,000	3	\$206,916,000
Cleveland-Lorain-Elyria, OH MSA	4	\$205,034,000	4	\$212,079,000
Columbus, OH MSA	3	\$361,982,000	3	\$391,291,000
Denver-Aurora, CO MSA	3	\$30,386,000	3	\$36,806,000
Grand Rapids-Wyoming, MI MSA	1	\$1,191,000	1	\$1,300,000
Greensboro-High Point, NC MSA	3	\$16,579,000	3	\$20,335,000
Indianapolis, IN MSA	0	\$0	0	\$0
Jacksonville, FL MSA	0	\$0	1	\$1,222,000
Kansas City, MO-KS MSA	2	\$20,324,000	2	\$19,961,000
Las Vegas-Paradise, NV MSA	1	\$24,215,000	1	\$27,008,000
Louisville, KY-IN MSA	2	\$64,524,000	2	\$73,912,000
Memphis, TN-MS-AR MSA	4	\$29,284,000	2	\$30,713,000
Milwaukee-Waukesha-West Allis, WI MSA	4	\$100,264,000	4	\$116,702,000
Minneapolis-St. Paul-Bloomington, MN-WI MSA	5	\$413,707,000	5	\$464,928,000
Nashville-Davidson-Murfreesboro, TN MSA	5	\$196,805,000	5	\$213,084,000
Oklahoma City, OK MSA	3	\$153,964,000	3	\$152,353,000
Orlando, FL MSA	1	\$47,646,000	1	\$79,287,000
Phoenix-Mesa-Scottsdale, AZ MSA	1	\$108,117,000	1	\$118,763,000
Pittsburgh, PA MSA	3	\$435,451,000	3	\$496,235,000
Portland-Vancouver-Beaverton, OR-WA MSA	7	\$168,897,000	7	\$174,673,000
Providence-New Bedford-Fall River, RI-MA MSA	4	\$136,602,000	4	\$152,052,000
Richmond, VA MSA	4	\$94,491,000	4	\$106,188,000
Riverside-San Bernardino-Ontario, CA MSA	3	\$109,746,000	3	\$122,812,000
Sacramento-Arden-Arcade-Roseville, CA MSA	1	\$364,789,000	1	\$432,396,000
San Antonio, TX MSA	4	\$115,644,000	4	\$128,088,000
San Diego-Carlsbad-San Marcos, CA MSA	5	\$575,291,000	4	\$615,291,000
Seattle-Tacoma-Bellevue, WA MSA	1	\$529,342,000	1	\$589,626,000
St. Louis, MO-IL MSA	4	\$404,460,000	4	\$450,438,000
Tampa-St. Petersburg-Clearwater, FL MSA	1	\$145,397,000	1	\$171,550,000
Virginia Beach-Norfolk-Newport News, VA-NC MSA	5	\$94,387,000	5	\$99,880,000
Youngstown, OH MSA	1	\$532,000	1	\$849,000
<b>TOTAL</b>	<b>99</b>	<b>\$5,824,252,000</b>	<b>96</b>	<b>\$6,458,067,000</b>

Inst: Number of institutions in a metropolitan area reporting R&D expenditures

Data Source: National Science Foundation

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs,  
Cleveland State University

**Table B-8. Utility Patent Activity by Metropolitan Area**

METROPOLITAN STATISTICAL AREA	Patents Granted 2003	Patents Granted 2000-2003	Patents Granted 1994-2003
Akron, OH MSA	523	2,098	4,460
Austin-Round Rock, TX MSA	2,129	7,997	15,019
Buffalo-Cheektowaga-Tonawanda, NY MSA	407	1,671	3,630
Canton-Massillon, OH MSA	199	701	1,493
Charlotte-Gastonia-Concord, NC-SC MSA	294	1,323	2,891
Cincinnati-Middletown, OH-KY-IN MSA	1,194	4,596	10,216
Cleveland-Lorain-Elyria, OH MSA	890	3,756	8,378
Columbus, OH MSA	463	1,855	4,233
Denver-Aurora, CO MSA	771	3,110	6,911
Grand Rapids-Wyoming, MI MSA	248	1,029	2,108
Greensboro-High Point, NC MSA	191	687	1,418
Indianapolis, IN MSA	645	2,602	6,079
Jacksonville, FL MSA	156	543	1,236
Kansas City, MO-KS MSA	376	1,374	2,774
Las Vegas-Paradise, NV MSA	216	767	1,499
Louisville, KY-IN MSA	197	707	1,620
Memphis, TN-MS-AR MSA	192	752	1,770
Milwaukee-Waukesha-West Allis, WI MSA	684	2,947	6,333
Minneapolis-St. Paul-Bloomington, MN-WI MSA	2,833	10,404	21,629
Nashville-Davidson-Murfreesboro, TN MSA	211	825	1,756
Oklahoma City, OK MSA	173	749	1,638
Orlando, FL MSA	398	1,486	2,757
Phoenix-Mesa-Scottsdale, AZ MSA	1,426	5,540	11,613
Pittsburgh, PA MSA	803	3,245	7,843
Portland-Vancouver-Beaverton, OR-WA MSA	1,783	5,798	10,459
Providence-New Bedford-Fall River, RI-MA MSA	616	2,444	5,271
Richmond, VA MSA	221	855	1,944
Riverside-San Bernardino-Ontario, CA MSA	551	2,094	4,560
Sacramento-Arden-Arcade-Roseville, CA MSA	655	2,334	4,612
San Antonio, TX MSA	267	1,124	2,413
San Diego-Carlsbad-San Marcos, CA MSA	2,623	9,524	18,475
Seattle-Tacoma-Bellevue, WA MSA	1,905	6,879	13,609
St. Louis, MO-IL MSA	801	3,124	7,357
Tampa-St. Petersburg-Clearwater, FL MSA	438	1,747	3,839
Virginia Beach-Norfolk-Newport News, VA-NC MSA	207	754	1,640
Youngstown, OH MSA	73	358	835
<b>TOTAL</b>	<b>25,759</b>	<b>97,799</b>	<b>204,318</b>

Data Source: CHI Research, Inc.

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs,  
Cleveland State University

Table B-9. Utility Patents Granted by Industry Cluster by Metropolitan Area, 2000 – 2003

METROPOLITAN STATISTICAL AREA	Metal-Working	Rank	Plastics/Chemicals	Rank	Motor Vehicles	Rank	Biomed	Rank	ICE	Rank	IT	Rank
Akron, OH MSA	261	13	658	4	173	2	71	29	165	17	151	14
Austin-Round Rock, TX MSA	287	9	275	10	26	25	241	18	2,247	1	3,442	1
Buffalo-Cheektowaga-Tonawanda, NY MSA	281	10	246	11	59	17	144	20	100	24	33	28
Canton-Massillon, OH MSA	117	25	130	19	64	15	6	36	29	32	53	24
Charlotte-Gastonia-Concord, NC-SC MSA	196	19	188	16	47	21	71	29	88	25	48	25
Cincinnati-Middletown, OH-KY-IN MSA	739	2	906	3	74	11	874	4	167	16	130	15
Cleveland-Lorain-Elyria, OH MSA	638	3	540	5	115	8	279	13	463	8	126	16
Columbus, OH MSA	248	15	217	13	54	19	265	15	144	19	105	18
Denver-Aurora, CO MSA	251	14	199	14	67	14	381	7	316	10	455	8
Grand Rapids-Wyoming, MI MSA	92	29	52	31	116	7	62	31	48	28	11	33
Greensboro-High Point, NC MSA	49	33	36	34	11	36	26	34	42	29	46	26
Indianapolis, IN MSA	271	12	298	9	159	4	604	6	133	21	103	19
Jacksonville, FL MSA	45	35	52	31	23	27	94	27	26	33	30	29
Kansas City, MO-KS MSA	117	25	131	18	33	24	139	21	121	22	86	21
Las Vegas-Paradise, NV MSA	48	34	24	35	23	27	58	33	23	35	27	30
Louisville, KY-IN MSA	105	28	92	24	12	35	86	28	26	33	9	35
Memphis, TN-MS-AR MSA	45	35	61	28	15	32	278	14	32	31	11	33
Milwaukee-Waukesha-West Allis, WI MSA	280	11	124	20	163	3	125	23	716	7	168	12
Minneapolis-St. Paul-Bloomington, MN-WI MSA	927	1	1,037	2	125	5	1,744	2	1,506	2	1,188	4
Nashville-Davidson-Murfreesboro, TN MSA	123	24	56	30	43	22	127	22	60	27	24	31
Oklahoma City, OK MSA	61	31	62	27	15	32	100	25	33	30	207	10
Orlando, FL MSA	185	20	47	33	19	30	107	24	396	9	125	17
Phoenix-Mesa-Scottsdale, AZ MSA	588	4	189	15	236	1	245	17	1,259	3	710	6
Pittsburgh, PA MSA	549	5	508	6	61	16	280	12	227	14	258	9
Portland-Vancouver-Beaverton, OR-WA MSA	345	7	184	17	70	13	188	19	1,097	4	1,438	3
Providence-New Bedford-Fall River, RI-MA MSA	198	18	226	12	18	31	339	9	263	12	154	13
Richmond, VA MSA	106	27	92	24	25	26	100	25	87	26	35	27
Riverside-San Bernardino-Ontario, CA MSA	208	17	114	21	86	10	375	8	217	15	176	11
Sacramento-Arden-Arcade-Roseville, CA MSA	134	22	105	23	23	27	310	10	290	11	621	7
San Antonio, TX MSA	89	30	77	26	43	22	256	16	155	18	63	23
San Diego-Carlsbad-San Marcos, CA MSA	463	6	1,197	1	120	6	2,141	1	906	5	723	5
Seattle-Tacoma-Bellevue, WA MSA	327	8	433	7	74	11	884	3	782	6	2,104	2
St. Louis, MO-IL MSA	248	15	324	8	50	20	647	5	240	13	93	20
Tampa-St. Petersburg-Clearwater, FL MSA	160	21	114	21	58	18	282	11	137	20	78	22
Virginia Beach-Norfolk-Newport News, VA-NC MSA	129	23	58	29	108	9	62	31	120	23	15	32
Youngstown, OH MSA	58	32	18	36	13	34	8	35	17	36	2	36

Data Source: CHI Research, Inc.

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

**Table B-10. Business Incubators by Metropolitan Area**

METROPOLITAN STATISTICAL AREA	NO. INCUBATORS
Akron, OH MSA	3
Austin-Round Rock, TX MSA	6
Buffalo-Cheektowaga-Tonawanda, NY MSA	4
Canton-Massillon, OH MSA	1
Charlotte-Gastonia-Concord, NC-SC MSA	3
Cincinnati-Middletown, OH-KY-IN MSA	7
Cleveland-Lorain-Elyria, OH MSA	7
Columbus, OH MSA	5
Denver-Aurora, CO MSA	4
Grand Rapids-Wyoming, MI MSA	2
Greensboro-High Point, NC MSA	1
Indianapolis, IN MSA	6
Jacksonville, FL MSA	4
Kansas City, MO-KS MSA	5
Las Vegas-Paradise, NV MSA	4
Louisville, KY-IN MSA	5
Memphis, TN-MS-AR MSA	2
Milwaukee-Waukesha-West Allis, WI MSA	11
Minneapolis-St. Paul-Bloomington, MN-WI MSA	14
Nashville-Davidson-Murfreesboro, TN MSA	5
Oklahoma City, OK MSA	5
Orlando, FL MSA	4
Phoenix-Mesa-Scottsdale, AZ MSA	0
Pittsburgh, PA MSA	10
Portland-Vancouver-Beaverton, OR-WA MSA	3
Providence-New Bedford-Fall River, RI-MA MSA	0
Richmond, VA MSA	2
Riverside-San Bernardino-Ontario, CA MSA	2
Sacramento-Arden-Arcade-Roseville, CA MSA	3
San Antonio, TX MSA	2
San Diego-Carlsbad-San Marcos, CA MSA	5
Seattle-Tacoma-Bellevue, WA MSA	4
St. Louis, MO-IL MSA	12
Tampa-St. Petersburg-Clearwater, FL MSA	3
Virginia Beach-Norfolk-Newport News, VA-NC MSA	1
Youngstown, OH MSA	1
<b>TOTAL</b>	<b>156</b>

Source: National Business Incubator Association (NBIA)  
 Data provided does not reflect a specific year. The NBIA maintains an incubator database that is updated upon receipt of new information. Therefore, the above data may not accurately reflect the actual number of incubators in a specific metro area.  
 Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University

**Table B-11. Corporate Headquarters by Metropolitan Area, 2000 - 2003**

METROPOLITAN STATISTICAL AREA	NO. CORPORATE HEADQUARTERS			
	2003	2002	2001	2000
Akron, OH MSA	3	3	2	2
Austin-Round Rock, TX MSA	2	2	2	2
Buffalo-Cheektowaga-Tonawanda, NY MSA	0	0	0	0
Canton-Massillon, OH MSA	1	0	0	0
Charlotte-Gastonia-Concord, NC-SC MSA	8	8	8	6
Cincinnati-Middletown, OH-KY-IN MSA	10	9	8	8
Cleveland-Lorain-Elyria, OH MSA	6	8	9	9
Columbus, OH MSA	5	5	5	5
Denver-Aurora, CO MSA	5	4	5	3
Grand Rapids-Wyoming, MI MSA	1	2	2	1
Greensboro-High Point, NC MSA	2	2	2	2
Indianapolis, IN MSA	4	4	3	3
Jacksonville, FL MSA	3	1	1	1
Kansas City, MO-KS MSA	4	6	5	5
Las Vegas-Paradise, NV MSA	3	2	3	3
Louisville, KY-IN MSA	3	3	3	2
Memphis, TN-MS-AR MSA	2	2	3	2
Milwaukee-Waukesha-West Allis, WI MSA	8	8	8	7
Minneapolis-St. Paul-Bloomington, MN-WI MSA	15	17	15	14
Nashville-Davidson-Murfreesboro, TN MSA	3	1	2	2
Oklahoma City, OK MSA	3	2	3	2
Orlando, FL MSA	2	2	1	2
Phoenix-Mesa-Scottsdale, AZ MSA	3	3	4	5
Pittsburgh, PA MSA	7	7	6	7
Portland-Vancouver-Beaverton, OR-WA MSA	0	0	2	2
Providence-New Bedford-Fall River, RI-MA MSA	2	2	2	2
Richmond, VA MSA	6	6	6	7
Riverside-San Bernardino-Ontario, CA MSA	0	0	0	1
Sacramento-Arden-Arcade-Roseville, CA MSA	0	0	0	0
San Antonio, TX MSA	5	5	7	6
San Diego-Carlsbad-San Marcos, CA MSA	4	3	3	4
Seattle-Tacoma-Bellevue, WA MSA	10	11	9	10
St. Louis, MO-IL MSA	8	7	8	9
Tampa-St. Petersburg-Clearwater, FL MSA	2	2	2	2
Virginia Beach-Norfolk-Newport News, VA-NC MSA	1	2	2	2
Youngstown, OH MSA	0	0	0	0
<b>TOTAL</b>	<b>141</b>	<b>138</b>	<b>141</b>	<b>138</b>

Data Source: *Fortune* MagazinePrepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs,  
Cleveland State University

**Table B-12. Business Cost Indices by Metropolitan Area, 2002**

METROPOLITAN STATISTICAL AREA	INDICES				
	Total Cost	Labor	Energy	Taxes	Office Rent
Akron, OH MSA	101.9	96.9	129.1	110.7	84.1
Austin-Round Rock, TX MSA	94.1	97.3	87	83.6	94.4
Buffalo-Cheektowaga-Tonawanda, NY MSA	107.3	102.1	128.3	131.3	85.1
Canton-Massillon, OH MSA	99.3	96.5	129.1	106.2	65.9
Charlotte-Gastonia-Concord, NC-SC MSA	94.1	95.1	85.3	94.7	99.6
Cincinnati-Middletown, OH-KY-IN MSA	98.2	100.9	94.1	107.9	77
Cleveland-Lorain-Elyria, OH MSA	105.2	100.4	132.9	111.9	87.9
Columbus, OH MSA	98.5	99.1	92.8	111.6	90.5
Denver-Aurora, CO MSA	100.3	109.8	81.5	87.2	79.4
Grand Rapids-Wyoming, MI MSA	106.1	112	106.9	103.5	69.3
Greensboro-High Point, NC MSA	91.1	93.5	85.3	95.9	79.2
Indianapolis, IN MSA	95.1	99	93.5	90.3	77.4
Jacksonville, FL MSA	95.6	100	94.4	88.4	75.9
Kansas City, MO-KS MSA	95.5	98.9	88.1	91.6	88.7
Las Vegas-Paradise, NV MSA	98.1	96.1	99.9	94.6	111.4
Louisville, KY-IN MSA	87.8	92	75.2	95.7	71.5
Memphis, TN-MS-AR MSA	93.5	98.4	91.6	80	77.7
Milwaukee-Waukesha-West Allis, WI MSA	101.2	102.8	90	119.3	89.4
Minneapolis-St. Paul-Bloomington, MN-WI MSA	102.6	101.7	97.7	109.7	109
Nashville-Davidson-Murfreesboro, TN MSA	94.2	99.4	88.2	79.2	84.7
Oklahoma City, OK MSA	83.4	85.3	86.4	92.3	57.5
Orlando, FL MSA	99.2	103.2	92.6	96.2	86.1
Phoenix-Mesa-Scottsdale, AZ MSA	101.3	100.3	115.3	94.4	93.6
Pittsburgh, PA MSA	105.9	105.9	116.2	94.9	101.7
Portland-Vancouver-Beaverton, OR-WA MSA	95.5	99.7	75	106.9	87.3
Providence-New Bedford-Fall River, RI-MA MSA	96.5	86.3	141.1	104.6	87.8
Richmond, VA MSA	95	102.6	80	85.4	78.2
Riverside-San Bernardino-Ontario, CA MSA	111	103.9	147.4	109.5	104.5
Sacramento-Arden-Arcade-Roseville, CA MSA	108.9	102.1	135.7	105.7	116
San Antonio, TX MSA	91.6	96	92.6	78.1	74.6
San Diego-Carlsbad-San Marcos, CA MSA	111.2	100.8	163.2	104.5	107.2
Seattle-Tacoma-Bellevue, WA MSA	102.1	104	99.3	107.2	89.2
St. Louis, MO-IL MSA	96.5	99.5	92.5	85	94.5
Tampa-St. Petersburg-Clearwater, FL MSA	99.9	104.6	96.9	92.4	81.7
Virginia Beach-Norfolk-Newport News, VA-NC MSA	95.2	103.8	80	87.2	70.3
Youngstown, OH MSA	101.4	98.7	129.1	106.3	72.9

Total Cost: Total Cost of Doing Business Index

Labor: Unit Labor Cost Index

Energy: Energy Index

Taxes: State and Local Tax Index

Office Rent: Office Rent Index

Source: Economy.com

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University



## APPENDIX C – BUSINESS AND INNOVATION CLIMATE INDEX

### CREATING THE INDEX

The business and innovation climate index is simply a summary measure based on a large number of variables. The methodology used to create the index is based on models found in the *Metro Area and State Competitiveness Report* and a paper entitled: *Have Central Cities Come Back?*<sup>17</sup> The most difficult and often controversial part in creating an index is choosing a weighting scheme. The approach taken here is the simplest and most transparent: within each sub-index, each variable carries equal weight.

The aggregated (overall) index is constructed using seven sub-indices, which were created using 14 economic variables (see table C-1, Appendix C for details). Given the raw data series for each metro area, several steps were needed to construct the index:

*Step 1:* Each variable was standardized using a median-score. The median score is analogous to the familiar z-score, but it uses a set of measures that are less susceptible to the influence of outliers than z-scores. In addition, median-scores are an alternative to z-scores for index creation when the variables used have highly skewed distributions.

*Step 2:* The seven sub-indices were formed as the simple averages of the standardized component variables.

*Step 3:* Each sub-index was then scaled to give it a range from one (worst) to 10 (best).

*Step 4:* The aggregated (overall) index was formed as the simple average of the seven sub-indices.

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<sup>17</sup> Tuerck, David G. (2003). *Metro Area and State Competitiveness Report 2002*. The Beacon Hill Institute at Suffolk University, Boston, MA. <http://www.beaconhill.org>.  
Furdell, K., Wolman, H.L., Hill, E.W. (2004). *Have Central Cities Come Back?* Paper presented at the 2004 annual meeting of the Urban Affairs Association in Washington, DC.

**Table C-1. Sub-Indices Variables**

<b>SUB-NDEX</b>	<b>VARIABLES</b>
SBIR/STTR AWARDS	Number of awards per metro area Number of companies per metro area Total award value per metro area
VENTURE CAPITAL INVESTMENT	Number of deals per metro area Number of companies per metro area Total investment per metro area
INITIAL PUBLIC OFFERING (IPO)	Number of IPOs issued per metro area
HIGH-TECH EMPLOYMENT	High-tech employment share per metro area excluding healthcare professionals  High-tech employment share per metro area including healthcare professionals
RESEARCH & DEVELOPMENT	Number of NIH awards per metro area Total NIH award value per metro area Number of universities with active R&D programs University-related R&D expenditures per metro area
PATENTS	Number of utility patents issued per metro area
CORPORATE HEADQUARTERS	Number of Fortune 500 headquarters per metro area
BUSINESS COSTS	Total business cost index per metro area

**Table C-2. Business and Innovation Climate Index by Sub-Indices Scores**

METROPOLITAN STATISTICAL AREA	AGGREGATED INDEX		SUB-INDICES SCORES							
	INDEX	RANK	SBIR	VC	IPO	EMP	R&D	PATENTS	HQs	COSTS
Akron, OH MSA	2.30	29	1.62	1.05	1.00	3.34	1.79	2.65	2.20	4.79
Austin-Round Rock, TX MSA	5.52	4	5.01	7.30	1.00	8.43	3.73	8.23	2.20	8.28
Buffalo-Cheektowaga-Tonawanda, NY MSA	2.27	30	1.67	1.25	1.00	4.38	2.84	2.34	1.00	3.65
Canton-Massillon, OH MSA	1.76	35	1.00	1.06	1.00	2.46	1.00	1.34	1.00	5.24
Charlotte-Gastonia-Concord, NC-SC MSA	3.53	13	1.33	1.71	4.00	3.87	1.46	2.02	5.80	8.06
Cincinnati-Middletown, OH-KY-IN MSA	3.78	10	2.74	1.72	1.00	4.61	3.49	4.95	5.80	5.89
Cleveland-Lorain-Elyria, OH MSA	3.73	11	2.57	1.73	1.00	4.53	4.74	4.37	6.40	4.46
Columbus, OH MSA	3.37	15	2.80	1.54	1.00	5.21	4.08	2.49	4.00	5.79
Denver-Aurora, CO MSA	4.32	6	5.24	4.79	1.00	7.16	3.72	3.68	4.00	4.95
Grand Rapids-Wyoming, MI MSA	1.96	34	1.00	1.00	1.00	3.28	1.21	1.68	2.20	4.27
Greensboro-High Point, NC MSA	2.62	28	1.11	1.34	1.00	3.06	1.71	1.26	2.20	9.26
Indianapolis, IN MSA	3.55	12	1.00	1.34	7.00	4.24	1.95	3.07	2.80	6.99
Jacksonville, FL MSA	2.24	31	1.11	1.10	1.00	4.27	1.26	1.12	1.60	6.47
Kansas City, MO-KS MSA	3.80	9	1.11	1.76	7.00	6.00	2.02	1.75	4.00	6.79
Las Vegas-Paradise, NV MSA	1.98	33	1.11	1.14	1.00	1.00	1.30	1.40	2.80	6.12
Louisville, KY-IN MSA	2.90	23	1.27	1.27	1.00	3.63	1.97	1.35	2.80	9.94
Memphis, TN-MS-AR MSA	3.10	19	1.00	1.44	4.00	3.43	2.37	1.40	2.80	8.35
Milwaukee-Waukesha-West Allis, WI MSA	3.25	17	1.42	1.30	1.00	4.87	2.96	3.70	5.80	4.92
Minneapolis-St. Paul-Bloomington, MN-WI MSA	6.28	3	4.66	5.23	4.00	6.33	5.49	10.00	10.00	4.50
Nashville-Davidson-Murfreesboro, TN MSA	3.02	21	1.61	2.14	1.00	4.07	4.44	1.50	2.20	7.22
Oklahoma City, OK MSA	3.11	18	1.33	1.15	1.00	4.58	2.57	1.44	2.80	10.00
Orlando, FL MSA	2.62	27	3.54	1.83	1.00	3.52	1.48	2.23	1.60	5.76
Phoenix-Mesa-Scottsdale, AZ MSA	3.52	14	3.25	2.74	1.00	5.41	1.87	5.54	3.40	4.92
Pittsburgh, PA MSA	3.95	7	2.54	3.52	1.00	5.35	6.43	3.72	4.60	4.46
Portland-Vancouver-Beaverton, OR-WA MSA	3.89	8	2.51	3.24	1.00	5.26	4.41	5.73	2.20	6.76
Providence-New Bedford-Fall River, RI-MA	2.94	22	1.83	1.39	1.00	4.41	3.34	2.98	2.20	6.34
Richmond, VA MSA	3.08	20	1.11	1.44	1.00	5.20	2.79	1.45	4.60	7.05
Riverside-San Bernardino-Ontario, CA MSA	2.17	32	2.02	1.13	4.00	1.99	2.19	2.65	1.00	2.42
Sacramento-Arden-Arcade-Roseville, CA MSA	2.70	25	2.19	1.72	1.00	5.87	3.53	2.80	1.00	3.49
San Antonio, TX MSA	3.31	16	1.53	1.53	1.00	3.29	3.40	1.82	5.20	8.74
San Diego-Carlsbad-San Marcos, CA MSA	7.45	1	10.00	10.00	10.00	6.23	10.00	9.61	2.80	1.00
Seattle-Tacoma-Bellevue, WA MSA	7.31	2	3.83	8.27	10.00	10.00	8.22	6.98	6.40	4.76
St. Louis, MO-IL MSA	4.36	5	1.67	2.13	4.00	5.01	6.48	3.64	5.80	6.15
Tampa-St. Petersburg-Clearwater, FL MSA	2.70	26	2.29	1.69	1.00	4.70	2.13	2.31	2.20	5.24
Virginia Beach-Norfolk-Newport News, VA-NC MSA	2.84	24	2.65	1.18	1.00	5.04	2.43	1.35	2.20	6.83
Youngstown, OH MSA	1.73	36	1.00	1.15	1.00	2.67	1.20	1.00	1.00	4.82

SBIR: Small Business Innovation Research/Small Business Technology Transfer awards

VC: Venture Capital

IPO: Initial Public Offering

EMP: High-Tech Employment Share

R&D: Research and Development

Patents: Utility Patents

HQs: Fortune 500 Corporate Headquarters

Costs: Cost of Doing Business

For a description of each sub-index and its associated variables, refer to the section titled "Business and Innovation Climate – Economic Indicators" and Appendix C.

Aggregated Index: Matching indices in Table 1 are due to rounding for presentation. The associated rank order is correct.

Prepared by: Center for Economic Development, Maxine Goodman Levin College of Urban Affairs, Cleveland State University



## APPENDIX D: COMPARABLE METRO AREA IDENTIFICATION CRITERIA

The comparable metropolitan areas included in this report are similar in size to the Cleveland metropolitan statistical area (MSA) and meet at least one additional criterion: structure, location, or growth.

- *Size:* Metropolitan areas must be within one standard deviation of the Cleveland MSA in population or labor force.
- *Structure:* Metropolitan areas whose percentage of the labor force are within one standard deviation of the Cleveland PMSA in each of the following categories: occupations that are related to sales and office support functions; managerial and professional occupations; and employment in industries that comprise the manufacturing sector.<sup>18</sup>
- *Location:* Metropolitan areas that are located in the Midwestern states including North Dakota (ND), South Dakota (SD), Nebraska (NE), Kansas (KS), Minnesota (MN), Iowa (IA), Missouri (MO), Wisconsin (WI), Illinois (IL), Michigan (MI), Indiana (IN), and Ohio (OH).
- *Growth:* Fastest growing metropolitan areas in the United States by actual growth in the labor force or percentage growth in the labor force between June 1997 and June 2002. Data source: Bureau of Labor Statistics.

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<sup>18</sup>Professional occupations include those in areas such as law, engineering, accounting, and information technology.