



The  
Pittsburgh  
Region

*Progress Metrics*

**PEOPLE**

**ATTITUDES**

**OPPORTUNITY**

FOR THE

ENTREPRENEURIAL

ECONOMY

November 2000



## Acknowledgements

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*Linda Dickerson, Dickerson & Mangus, Ink.*

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*William Flanagan, KDKA-TV*

*Murry Gerber, Equitable Resources, Inc.*

*William Getty, Claude Worthington Benedum Foundation*

*Douglas Goodall, Redleaf*

*Douglas Heuck, Pittsburgh Post-Gazette*

*Brian Kelley, The Heinz Endowments*

*Harold Miller, Allegheny Conference on Community Development*

*Thomas Murrin, A.J. Palumbo School of Business Administration, Duquesne University*

*Timothy Parks, TDO Advisors LLC*

*David Shapira, Giant Eagle, Inc.*

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*Rocco Tarasi, BusinessTutor.com Corporation*

*Sunil Wadhvani, iGate Capital Corporation*

*The Honorable Jack Wagner, Pennsylvania State Senate*

*William Westberg, Sequel Genetics, Inc.*

*Sharon Williams, Minority Enterprise Corporation of Southwestern Pennsylvania*

*Prepared by Collaborative Economics for member organizations  
of the Pittsburgh Regional Alliance*

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*For The Entrepreneurial Economy*



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## *Special Thanks*

### **SPECIAL THANKS TO THE FOLLOWING ORGANIZATIONS THAT CONTRIBUTED DATA AND EXPERTISE:**

*Allegheny-Singer Research Institute*

*Association of University Technology Managers*

*Babson College*

*Center for Economic Development, Carnegie Mellon University*

*Cognetics, Inc.*

*Department of State, Commonwealth of Pennsylvania*

*Dow Jones Interactive*

*Dun and Bradstreet*

*Global Entrepreneurship Monitor Project (GEM)*

*Junior Achievement of Southwest Pennsylvania, Inc.*

*Minority Enterprise Corporation*

*National Energy Technology Laboratory*

*Office of Technology Transfer and Intellectual Property, University of Pittsburgh*

*Pennsylvania Department of Education*

*Pittsburgh Technology Council*

*Regional Financial Associates*

*Software Engineering Institute*

*Standard & Poor's COMPUSTAT*

*Technology Transfer Office, Carnegie Mellon University*

*University Center for Social & Urban Research, University of Pittsburgh*

*U.S. Bureau of the Census*

*U.S. Patent and Trademark Office*

*U.S. Small Business Administration, Pittsburgh District Office*

*Venture Economics/National Venture Capital*



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### *Entrepreneurial Pittsburgh: Returning to Our Roots*

*After a period of wrenching economic change, Pittsburgh is unmistakably returning to its entrepreneurial roots.* A century ago, Pittsburgh was one of the nation's most entrepreneurial and innovative regions of the industrial era. Today, there are signs that indicate Pittsburgh may again be entering a new era of entrepreneurship. In the next few years, decisions made in the Pittsburgh region will determine if this era is a temporary phase or a sustainable development.

*In less than two decades, the Pittsburgh region has put itself on a new economic path.* Manufacturing was restructured and is now growing again—but looking quite different than in the past. A small number of large companies has given way to a large number of smaller establishments. New kinds of advanced manufacturing and light manufacturing companies have emerged. Whole new industries have appeared to supplement and support the manufacturing base—such as information technology and communications. And employment in specialized technical and management services that support business innovation grew almost 80% (i.e., 36,000 jobs ) in the past decade.

*Entrepreneurship and innovation are rippling through the Pittsburgh economy.* In just five years, between 1993 and 1998, more than 950 Pittsburgh companies became fast-growth firms—experiencing an average increase of 50% in employment. Most of these companies employed fewer than 20 people. Whereas some were new start-ups in emerging technology industries, most were smaller, established companies across a range of industry sectors. Almost 60% of Pittsburgh's fastest-growing firms have been in business 15 years or more. Venture capital investment also increased dramatically from \$9.9 million in 1995 to \$165 million in 1999.

*At the same time, the Pittsburgh region is only beginning to tap its entrepreneurial potential.* Just over 4% of adults in the region are actively engaged in starting a business—a figure half the U.S. average. The total annual number of new business incorporations grew very slowly during the 1990s. Although local universities and other institutions have spun off twice as many new companies as they did four years ago, the total number of spin-offs in 1999 was 12.

*Pittsburgh may also be losing future entrepreneurs and innovative employees.* Since the mid-1990s, the number of engineering degree recipients from local universities choosing to remain in the region has declined. Today, less than half of engineering and information technology degree recipients stay. Less than two-thirds of business degree recipients remain in the region.



*Although the Pittsburgh region may be returning to its entrepreneurial roots, the journey has only begun.* Among the key questions that remain to be answered:

*What are the implications of the region's shift to smaller establishments?* The average size of a Pittsburgh “business establishment” today—either an entire company or an office of a larger company—is less than 30 employees, or about half of what it was 25 years ago. Pittsburgh will need growing amounts of flexible space in smaller units to accommodate its most entrepreneurial, innovative, and fast-growing firms.

*How should the region focus its economic development activities?* Although for many years it made sense to serve the needs of a few large companies, that period is over. Today's reality is smaller, fast-changing companies and entrepreneurial start-ups. Nationally, the focus is shifting away from one-on-one business support programs to regional strategies that build networks, recruit talent, link firms with universities, improve quality of life, and pursue other systemic strategies that improve the ability of growing small firms to compete in national markets. Because they hold the key to the future success of the Pittsburgh economy, economic development activities should focus on the resources, networking, and quality-of-life requirements of these new economic drivers.

*Why don't more Pittsburgh residents become entrepreneurs?* About 90% of residents believe that starting a new business is a respected occupation, with half saying that a good opportunity exists to start a business in the region in the next few months — a percentage just under the U.S. average. At the same time, a majority of residents prefer working for an established company to working for a start-up firm. Only 22% of 25- to 44-year-olds would prefer working for a start-up.

*What amenities and community resources are important to attract and retain entrepreneurial people?* This very important but complex area requires significantly more research. Among other feedback, more than 80% of surveyed technology executives indicated that “gathering places” for entrepreneurs that encourage networking were “important” or “very important”. Two-thirds of respondents believed that too few such places were available in the Pittsburgh region. In addition, the relative lack of ethnic and cultural diversity in the region in contrast to other growing communities is often cited as an issue for new economy firms and entrepreneurs.





*The Progress Metrics for the Entrepreneurial Economy tracks progress toward the realization of an entrepreneurial future.*

### **THE METRICS IS:**

- *A reliable source of information about the Pittsburgh region's entrepreneurial capacity and the commitments needed for its growth*
- *An indication of the progress the Pittsburgh region is making in becoming a center of entrepreneurship*
- *A way to spotlight potential barriers to entrepreneurial development*
- *A process to foster the region's identity as an emerging entrepreneurial economy*
- *A proposed framework for economic development in the 21st century.*

### **THE METRICS IS NOT:**

- *A blueprint of policies, recommendations, or "ten steps to success"*
- *A marketing document for the region.*

**THE METRICS UNDERSCORES THREE AREAS FOR REGIONAL COMMITMENT TO GROW AN ENTREPRENEURIAL ECONOMY. THEY ARE:**

#### **REGIONAL COMMITMENT TO ENTREPRENEURIAL OPPORTUNITY**

The Pittsburgh region must accelerate the growth of its critical mass of entrepreneurial companies.

#### **REGIONAL COMMITMENT TO ENTREPRENEURIAL PEOPLE**

The Pittsburgh region must intensify its efforts in the support, development, and attraction of people needed by entrepreneurial companies at all levels.

#### **REGIONAL COMMITMENT TO ENTREPRENEURIAL ATTITUDES**

The Pittsburgh region must work to nurture an environment that values innovative and risk-taking attitudes.

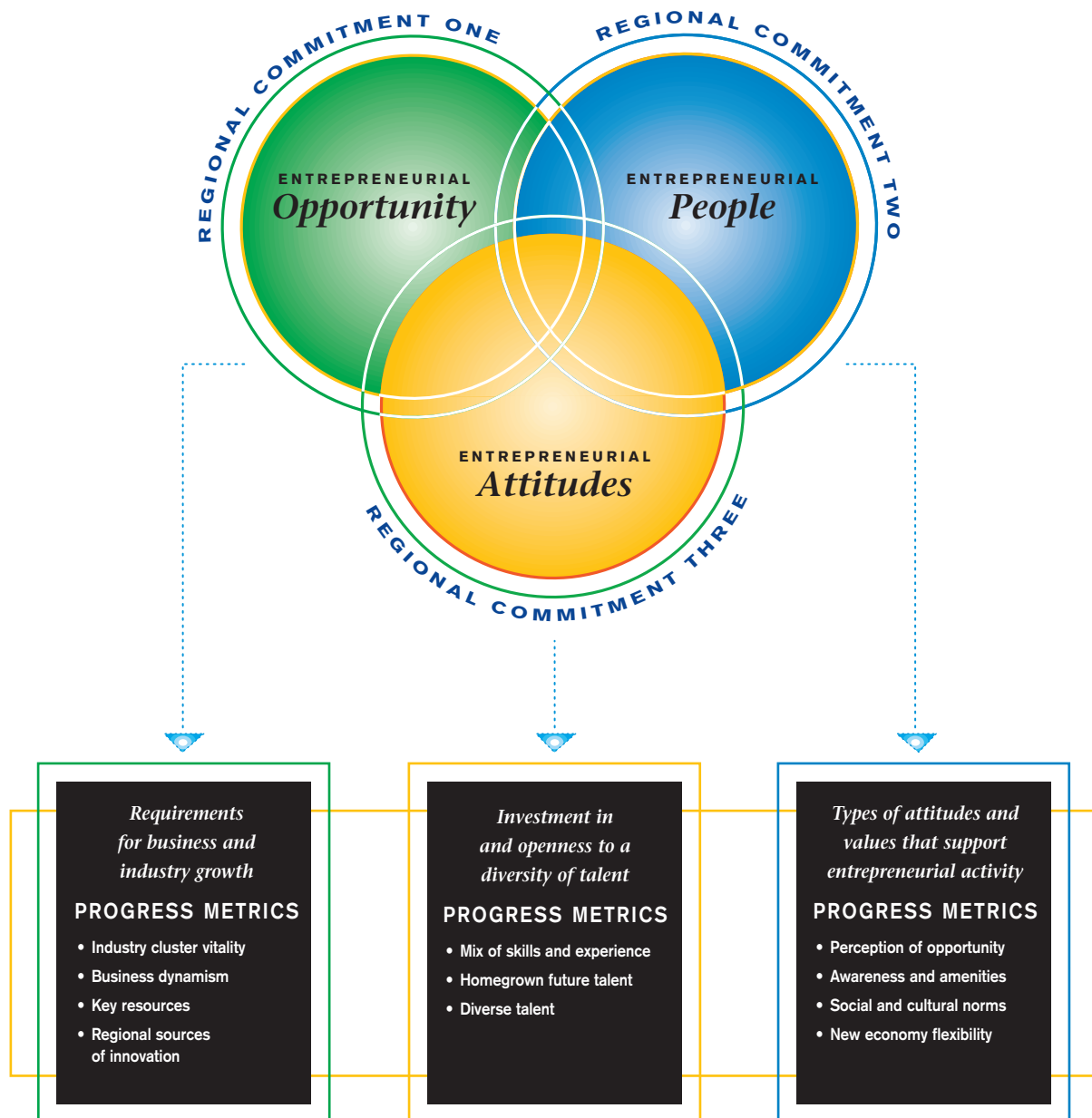


*We use the term regional commitment because economic development in the 21st century will not be the result of a few decision makers or organizations.*

Economic development in today's economy is dependent on all organizations from all parts of the region making a commitment to development and change. The region needs to make a commitment to all three strategic areas. These elements are interdependent and mutually rein-

forcing. At their intersection lies the future of the entrepreneurial Pittsburgh region.

The Metrics provides measures that track progress in each of the three Regional Commitment areas.





## Entrepreneurship and innovation in today's economy

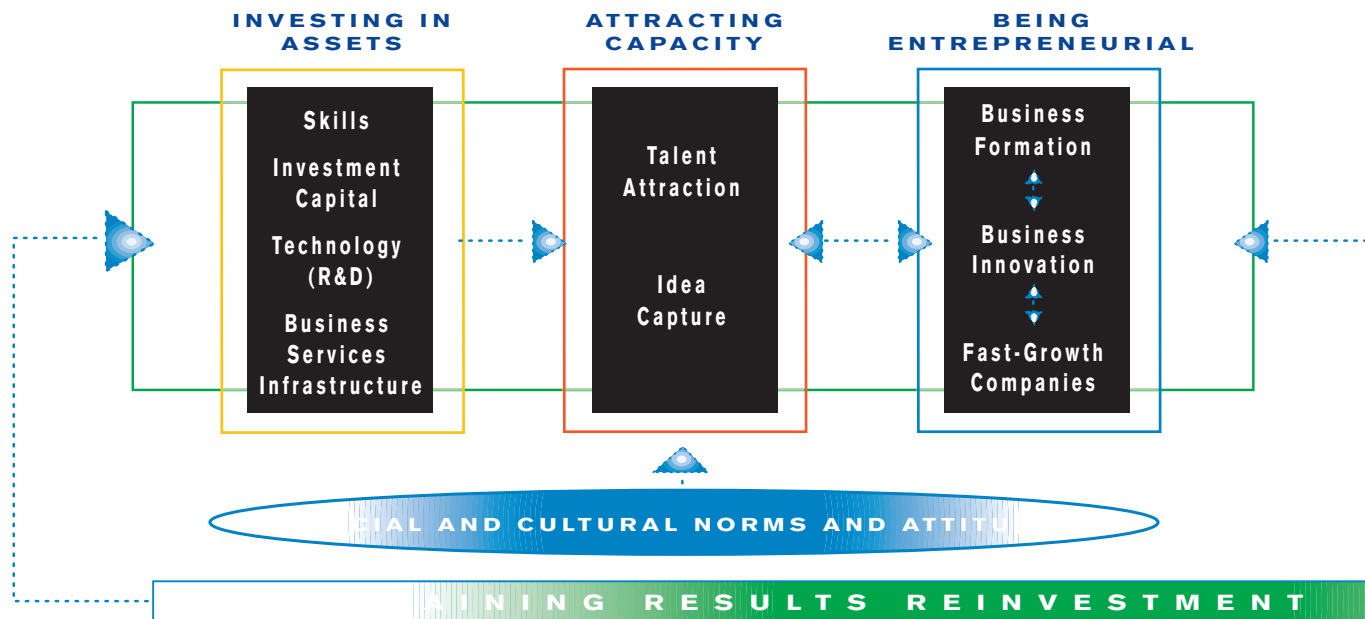
Entrepreneurship and innovation are fundamental drivers in today's economy. This principle applies as much to food processing as to computer processing. What is the connection between entrepreneurship and innovation?

Entrepreneurial activity turns innovative ideas into commercial outcomes. Entrepreneurs recognize opportunities to apply innovations to develop or modify a product, process, or service. At the same time, they see opportunities to connect these innovations to the marketplace. Entrepreneurship in leading regional economies is occurring at all types of companies—small, medium, and large, as well as established and new.

### WHAT DOES IT MEAN TO BE ENTREPRENEURIAL IN TODAY'S ECONOMY?

In an earlier economic era, being entrepreneurial meant finding new ways to control resources, people, and markets, which led to the development of larger, slower-moving firms. These companies tended to be more bureaucratic and have a top-down leadership style. Innovation mainly occurred within companies and was a closed process. In general, collaboration among companies was not encouraged. Today, closed systems of knowledge development, hierarchical leadership, and vertical business integration are impediments to innovation and entrepreneurship.

Being entrepreneurial involves connecting and leveraging sources of innovation across businesses and institutions in a region. Doing so entails a different leadership style and a different approach to knowledge development and management in companies and in regions.





## The regional entrepreneurship and innovation cycle

Regional *assets* in today's economy tend more often to be intangible and require investment for their development. They are not simply extracted from the ground like natural resources. Knowledge-based assets can provide an important source of regional competitive advantage. For instance, universities and labs are important assets, both for the generation and transfer of new knowledge. It is important to invest in and tap these assets for building a region's *capacity*.

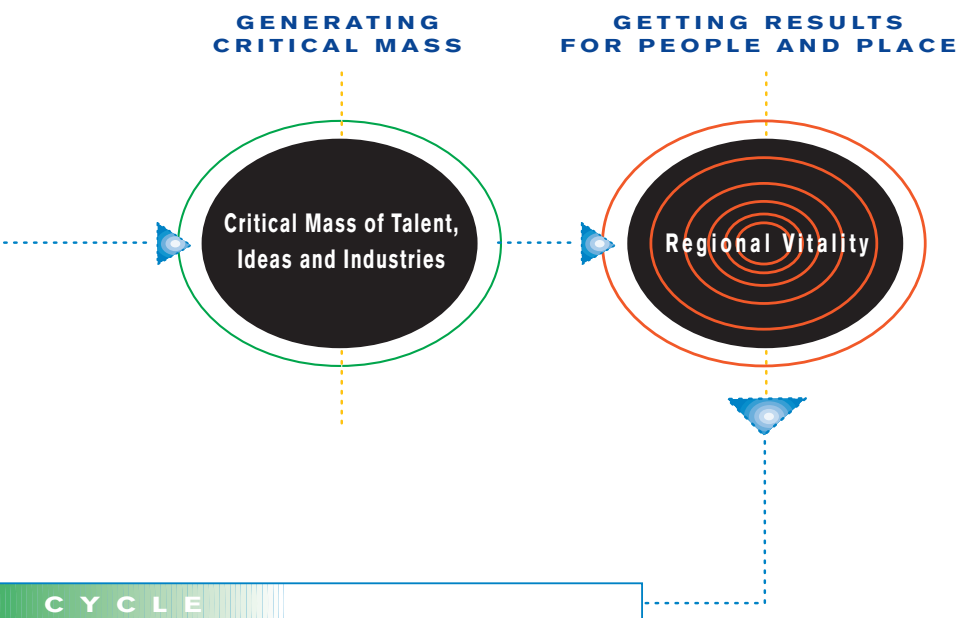
The churn of *new business formation* and deaths is *business dynamism*. A strong relationship exists between this business turbulence and economic growth. New companies form, some die, and the talent and ideas freed up from these deaths often migrate to other businesses that benefit and, as a result, are more likely to evolve into sustainable companies.

From the churn emerge *fast-growth companies*, which typically engage in continuous *business innovation* to derive a majority of their sales revenue from new products and

services. Fast-growth firms, in particular, are creating the greatest numbers of new jobs in today's economy. Often associated with significant job creation and outputs, these growth-oriented companies have dynamic work environments that become a training ground for entrepreneurs and dynamic workers. These businesses are often responsible for spin-offs, both directly and indirectly.

As these rapidly growing companies become clusters of firms, they attract talent and other companies, building the momentum for *critical mass*. This momentum results in the growth of diverse but specialized clusters of companies, industries, and talent that, at the point of critical mass, stimulate and support the development of the region's asset base. Their shared demand for assets creates a reinforcing cycle that stimulates *regional vitality*. A responsive region will work proactively to develop an environment that helps to spur and support this momentum, even before the region achieves critical mass.

Affecting this business and economic activity are regional *social and cultural norms and attitudes*. These intangibles can have a strong impact on policy making and investment decisions in a region.





### *About the progress Metrics for the entrepreneurial economy*

#### HOW THE PROGRESS MEASURES WERE SELECTED

Progress measures are indicators of how well the region is doing in its efforts to realize the regional commitments.

Thirty-two progress measures were selected in consultation with an advisory group of academics, entrepreneurs, economic developers, business professionals, and government.

Measures were selected if they:

- Reflect fundamental progress toward meeting regional commitments
- Measure the fundamentals of entrepreneurial capacity and activity
- Are meaningful to the region
- Are measurable on a frequent basis.

At the outset, a decision was made not to benchmark the region against other regions, but to measure the region against itself in order to gauge its progress over time.

#### THE USE OF SURVEYS

Often, data were simply unavailable from secondary sources, so two surveys were developed and implemented. In this inaugural *Metrics*, a baseline of data has been created from the survey results, allowing for the region's progress to be assessed in future years.

The Entrepreneurial Industry Opportunity Survey focused on industry requirements for success as identified by technology industry executives. The Entrepreneurial Attitudes Survey was an adult population survey on entrepreneurial attitudes and values. In addition, two questionnaires were used to collect data on technology licensing at major universities, research institutions, and federal labs, as well as to collect information on the number of university students retained in the region following the receipt of their degrees. Appendix A contains more detailed information about survey methods, as well as the sources of all data in the *Metrics*.

#### THE DEFINITION OF THE REGION

The *Metrics* measures progress in the Pittsburgh region, which is defined as the ten counties of Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland. All measures observe this definition unless otherwise noted in Appendix A.

#### HOW CLUSTERS ARE DEFINED

In some cases, the *Metrics* assesses entrepreneurial capacity using industry clusters recognized as important to the Pittsburgh regional economy. Ten industry clusters have been identified that significantly affect the region. These clusters range from the long-established Light Manufacturing and Food Processing to relative newcomers such as IT & Communications Services and Business & Innovation Services (a combination of highly technical and professional fields such as engineering services and commercial physical research). Appendix B provides a definition for each of these clusters and the methods used to select them.

## Entrepreneurial Opportunity

*“The Pittsburgh region must accelerate the growth of its critical mass of entrepreneurial companies.”*

### WHY IS THIS REGIONAL COMMITMENT IMPORTANT?

Critical mass is an important driver of long-term opportunity for the Pittsburgh region. The region must develop the critical mass of competitive companies and clusters of companies in complementary industries necessary to stimulate and support the development of the region’s economy. A shared demand for resources and services will create a reinforcing cycle that stimulates regional vitality. A critical mass of companies is necessary to attract skilled employees and management talent, because the opportunities for career development are more plentiful where similar companies and industries are in close proximity.

A number of ways exist to understand and assess the region’s progress in developing critical mass and the strength of the elements that sustain it.

### HOW WILL THE REGION MEASURE PROGRESS?

*Industry cluster vitality* is a basic indicator of critical mass. Industry clusters are geographic concentrations of interdependent industries that create competitive advantage through the benefits of their physical proximity. Concentrations of related companies in a place tend to spur growth of existing companies, new business formation, and the attraction of competitors and suppliers. This growth leads to healthy *business dynamism*. Concentration also creates shared demand for regional sources of innovation.

Underlying vital clusters and entrepreneurial business dynamism are many resources. Two *key resources* for entrepreneurial growth are investment capital and professional support services.

In addition, entrepreneurial activity in the economy relies on the availability of *regional sources of innovation*. A region rich in these assets is fertile ground for growing critical entrepreneurial mass.

### PROGRESS METRICS

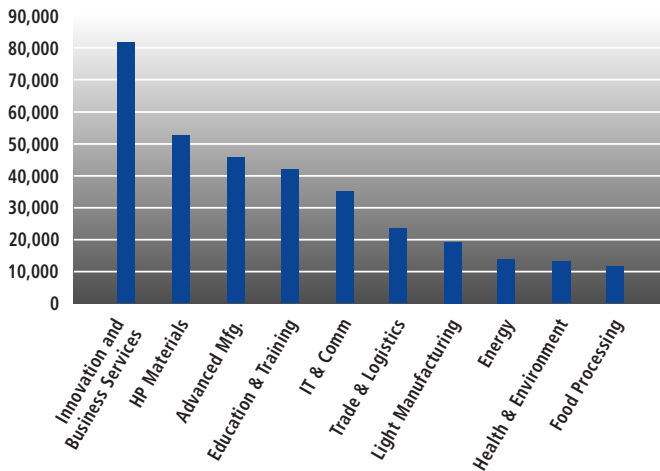
Industry cluster vitality  
Business dynamism  
Key resources  
Regional sources of innovation

## Why is industry cluster vitality important?

A well-rounded portfolio of concentrated and growing industry clusters is a good indicator of industry critical mass. Vital clusters of companies attract talent, because the opportunities for career development are more plentiful where there are concentrations of similar companies.

## How is the region doing?

TOTAL EMPLOYMENT IN KEY INDUSTRY CLUSTERS, PITTSBURGH REGION, 1999



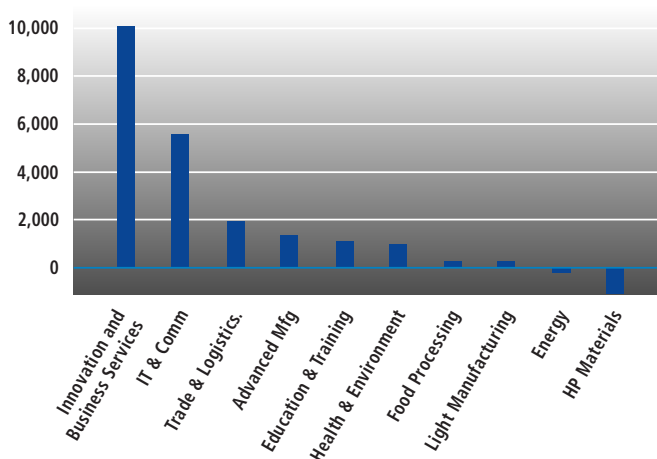
Source: Regional Financial Associates, Collaborative Economics

### A DIVERSE PORTFOLIO OF DRIVING INDUSTRY CLUSTERS IS DEVELOPING IN THE REGION

Outward-oriented clusters generate wealth through national and international sales and, in turn, stimulate local-serving industries. Striking the right balance between a diverse industry base and a specialized one is part of the recipe for critical mass.

With over 339,000 people, the ten driving clusters of the Pittsburgh region represented nearly one-third of its nongovernment employment in 1999. The region has a diverse portfolio of clusters, in which both services and manufacturing are growing. In 1999, Innovation & Business Services was the largest employer, with 81,531 people; High Performance Materials (52,513) and Advanced Manufacturing (45,791) were the second- and third-largest employers.

NET EMPLOYMENT GROWTH IN KEY INDUSTRY CLUSTERS, PITTSBURGH REGION, 1997-1999



Source: Regional Financial Associates, Collaborative Economics

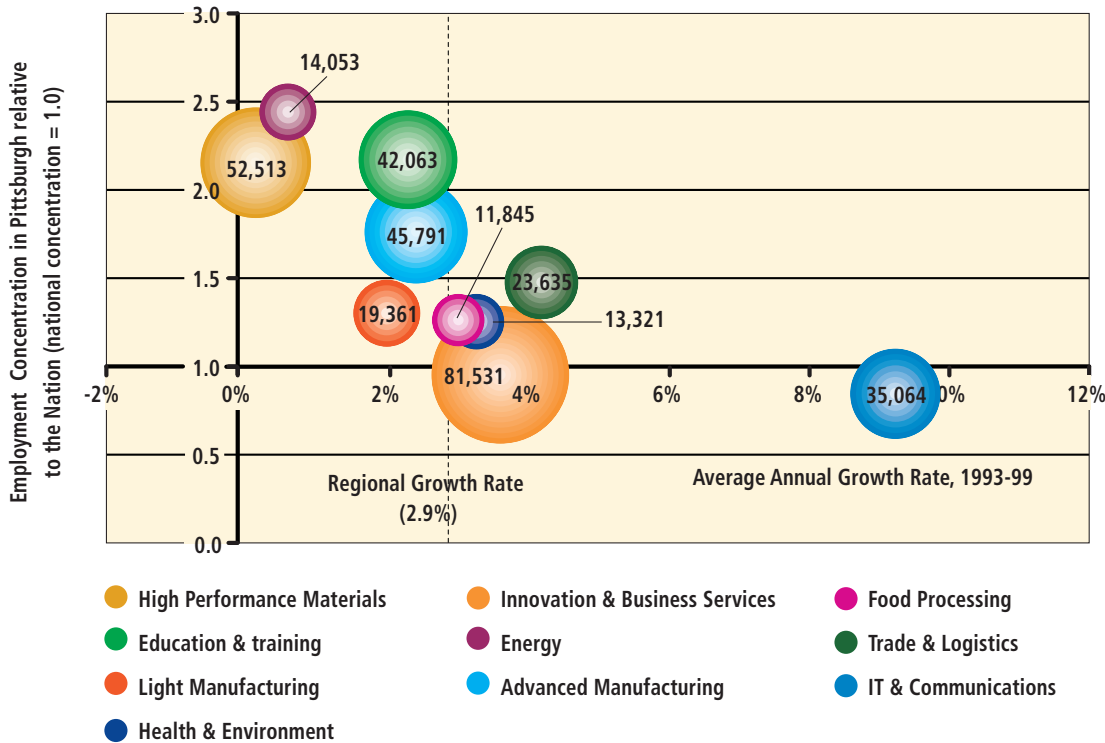
### DIVERSIFIED CLUSTER GROWTH INCREASES REGIONAL MOMENTUM

Cluster employment growth adds momentum and spurs critical mass. From 1997 to 1999, all the clusters experienced employment growth except Energy and High Performance Materials, which lost 213 jobs and 1,068 jobs, respectively. The region's growth was strengthened by the addition of more than 10,000 positions in Innovation & Business Services and more than 5,500 jobs in IT & Communications Services from 1997 to 1999.





PORTFOLIO OF KEY INDUSTRY CLUSTERS BY EMPLOYMENT SIZE, CONCENTRATION, AND GROWTH, PITTSBURGH REGION, 1993-1999



Source: Regional Financial Associates, Collaborative Economics

**CRITICAL MASS IS STILL GREATEST IN MANUFACTURING SECTORS**

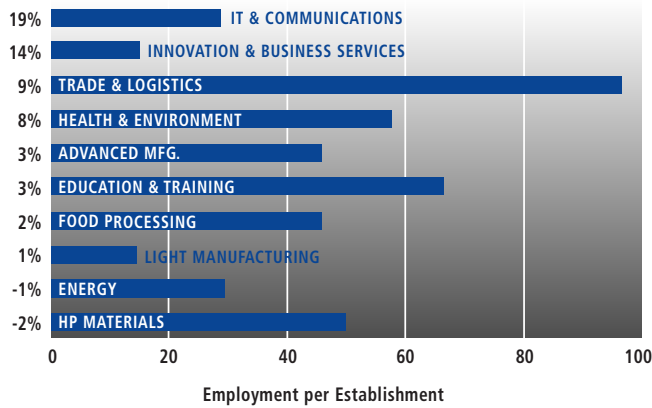
Concentrated clusters indicate a potential source of competitive advantage. In 1999, Energy (2.4 times), High Performance Materials (2.2 times), and Education & Training (2.2 times) were the most concentrated clusters relative to the nation. IT & Communications (.85) and Innovation & Business Services (.95) were the least concentrated of the clusters relative to the nation.

Rapid employment growth in a diversity of industry clusters is a basic sign of economic vitality. IT & Communications Services grew rapidly, averaging more than 9% annually from 1993 to 1999. The clusters with the next highest average annual growth rates of approximately 4% were Trade & Logistics and Innovation & Business Services. The overall growth rate of the region was nearly 3% during this period.



## Entrepreneurial Opportunity

AVERAGE ESTABLISHMENT SIZE OF INDUSTRY CLUSTERS RANKED BY PERCENT EMPLOYMENT GROWTH, PITTSBURGH REGION, 1997-1999



Source: Regional Financial Associates, Collaborative Economics

### AVERAGE ESTABLISHMENT SIZE IS LESS THAN 30 EMPLOYEES

The average establishment size by employment is an indicator of cluster structure and stage of evolution. Newer establishments tend to be younger and faster growing. Their smaller size often allows them to be faster and more flexible than larger establishments, contributing to their overall competitiveness in a fast-moving economy. The average size of the Pittsburgh region's establishments is less than 30 employees. The clusters with the smallest establishment size are Light Manufacturing with an average of 14 employees, Innovation & Business Services with an average of 15 employees, and Information Technology & Communications with an average of 27 employees.

### *What does this mean for an entrepreneurial Pittsburgh region?*

*The region's diverse cluster growth, spanning both manufacturing and value-added services, creates opportunities for increased entrepreneurship in the Pittsburgh region. The growing depth of employment opportunities will help attract and retain talent that entrepreneurial companies can tap. The widening breadth of cluster industries increases opportunities for synergy across clusters, because greater opportunities exist for cross-fertilization. It is important for the region to build on the cluster growth to create concentrations of talent and to promote concentrations of specialization and excellence both internally and externally.*



## Why is entrepreneurial business dynamism important?

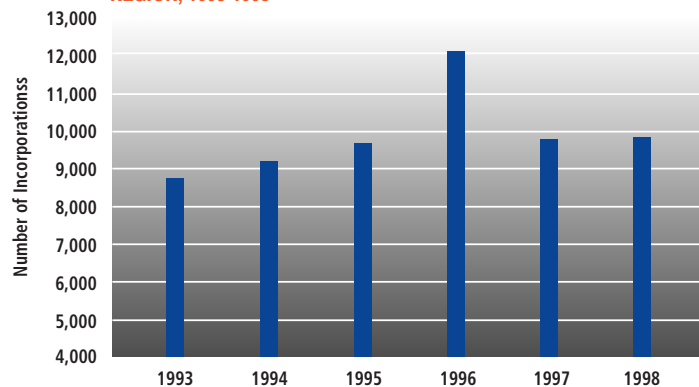
Business dynamism is the level of economic activity generated by the combined effects of new business formation, business deaths, and fast-growth companies. High levels of business dynamism create a churning effect associated with the economic reinvigoration of regions. Importantly, fast-growth companies are a training ground for entrepreneurs.

## How is the region doing?

### OVERALL NEW BUSINESS INCORPORATIONS GROW SLOWLY

New business formation is a basic way to capture entrepreneurial activity and indirectly measure an environment's receptivity to risk taking and innovation. This activity feeds a pipeline of potential growth-oriented companies that will be sustainable over the longer term. The number of new business incorporations grew incrementally from 8,755 in 1993 to 9,835 in 1998, except for a spike in activity during 1996.

NUMBER OF NEW BUSINESS INCORPORATIONS, PITTSBURGH REGION, 1993-1998

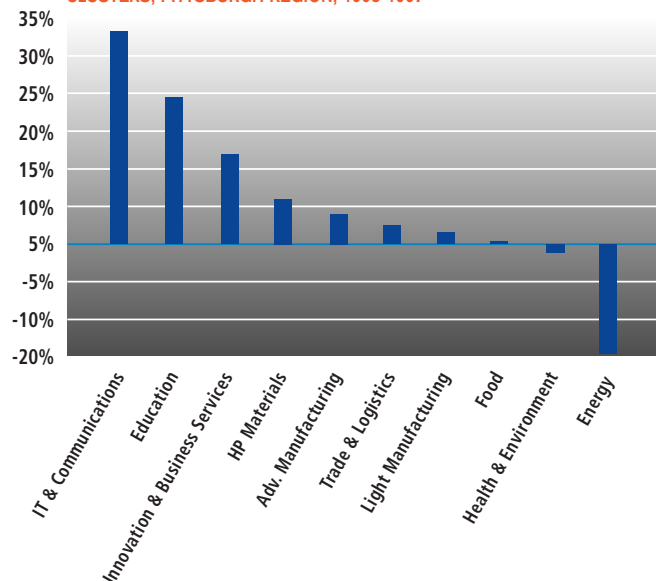


Source: Commonwealth of Pennsylvania, Department of State

### EIGHT OF THE TEN DRIVING CLUSTERS POST NET ESTABLISHMENT GAINS

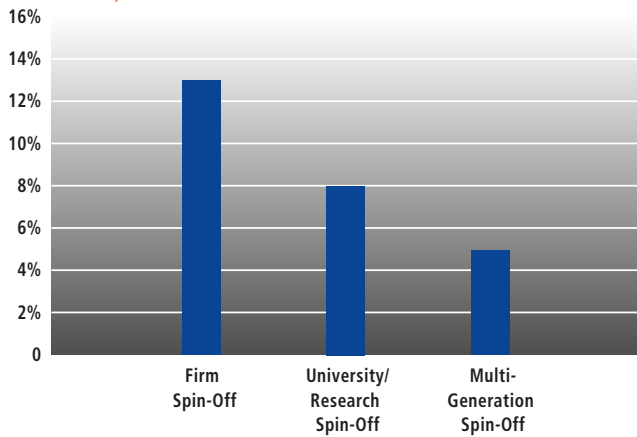
The net change in business establishments highlights the aftereffects of the churning caused by new business starts and deaths. Eight of the ten clusters had a net increase in the number of new establishments from 1993 to 1997. Almost 29% of the IT & Communications establishments in 1997 did not even exist in 1993. For the Energy cluster, the story trends in the opposite direction. Nearly 15% of the establishments in 1993 no longer existed in 1997. (Note: An individual company may have multiple establishments.)

PERCENTAGE CHANGE IN NET ESTABLISHMENTS IN THE KEY INDUSTRY CLUSTERS, PITTSBURGH REGION, 1993-1997



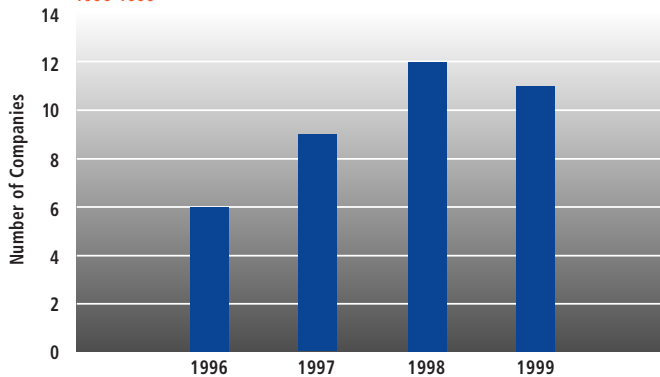
Source: County Business Patterns, U.S. Census Bureau

AMOUNT OF SPIN-OFF ACTIVITY FROM REGIONAL FIRMS AND INSTITUTIONS, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000



Source: Entrepreneurial Industry Opportunity Survey, 2000

NUMBER OF START-UPS LAUNCHED BY UNIVERSITIES AND MAJOR NONPROFIT RESEARCH INSTITUTIONS, PITTSBURGH REGION, 1996-1999



Source: AUTM, Collaborative Economics Survey

### MYRIAD SPIN-OFF POSSIBILITIES ADD TO WAYS NEW COMPANIES CAN BE FORMED

Already existing companies that launch other companies are an important source of new business formation and a significant contributor to the creation of critical mass. In a survey of the region's technology industry executives, 13% indicated that their company was a spin-off from another regional firm. An additional 5% were spin-offs of spin-offs. Looking toward the future, one-third of the technology industry survey respondents said that they plan to spin out a new venture in the next 18 months.

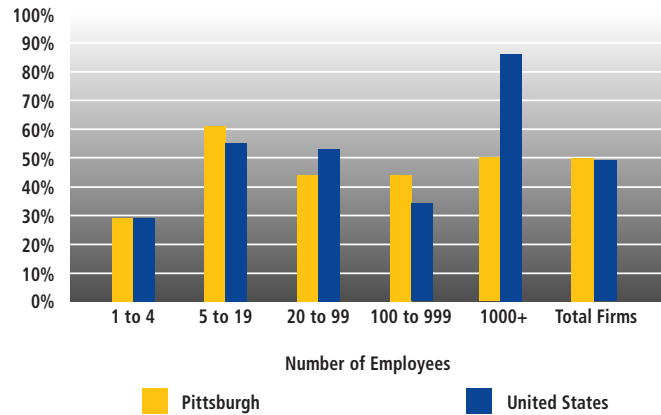
In an entrepreneurial economy, it is not just firms that spin out other firms. Universities, labs, and other nonprofit research institutions also launch companies. The number of enterprises formed by these institutions nearly doubled from 6 in 1996 to 11 in 1999, despite the closure of Allegheny University Health Sciences in 1998.



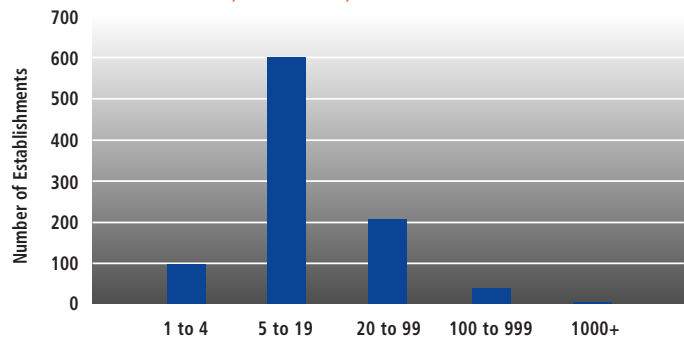
**FAST-GROWTH FIRMS MULTIPLY, KEEPING PACE WITH NATION**

Fast-growth gazelle companies create significant numbers of jobs, providing opportunities to gain experience in dynamic work environments. Gazelles are growth-oriented firms that increase their sales at an average annual compound rate of 20% or more over four consecutive years. Fast-growth firms grew by 50% from 1993 (1,902) to 1998 (2,851), closely tracking U.S. gazelle firm and gazelle employment growth over the same period. Growth in the number of gazelle firms by company size differed between Pittsburgh and the nation. In Pittsburgh, the number of companies with 5 to 19 employees grew the most (61%). This baby gazelle growth contrasted with growth in the nation as a whole, where companies with more than 1,000 employees showed the largest percent growth in the number of gazelle firms (86%).

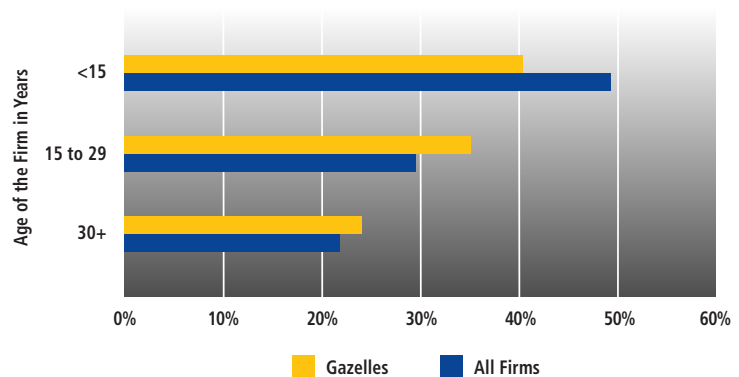
PERCENTAGE CHANGE IN EMPLOYMENT OF FAST-GROWTH "GAZELLE" FIRMS BY SIZE OF EMPLOYMENT, PITTSBURGH, 1993-1998



CHANGE IN THE NUMBER OF FAST-GROWTH "GAZELLE" FIRMS BY SIZE OF EMPLOYMENT, PITTSBURGH, 1993-1998

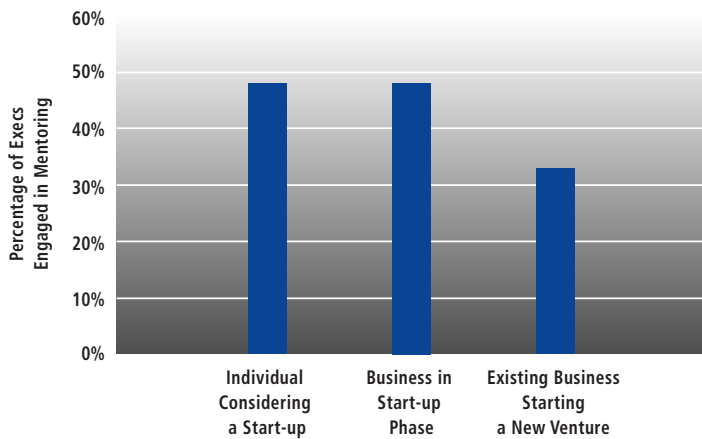


AVERAGE AGE OF FAST-GROWTH "GAZELLE" FIRMS, PITTSBURGH, 1993-1998



Source: Cognetics, Inc.

NUMBER OF EXECUTIVES WHO HAVE MENTORED LOCAL ENTREPRENEURS, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000



Source: Entrepreneurial Industry Opportunity Survey, 2000

### ENTREPRENEURIAL KNOW-HOW IS ACTIVELY SHARED

Business dynamism is multiplied when entrepreneurs share their experience and know-how. In the past 18 months, nearly half of the surveyed technology industry executives have mentored individuals considering a start-up or those in a start-up phase. One-third have mentored existing businesses that were starting a new venture.

### *What does this mean for an entrepreneurial Pittsburgh region?*

*The region's business dynamism and the diverse routes to new company formation are vital to its entrepreneurial future. New and fast-growing businesses need timely access to a supportive network of advisors, financiers, researchers, and employees. To sustain the growth of new and fast-growth companies, the Pittsburgh region must inform and encourage local talent about the opportunities at these small to midsize gazelle firms. It must also continue creating an environment in which mentoring and the sharing of know-how and know-who occur easily.*



## Why are entrepreneurial resources important?

The development of entrepreneurial critical mass depends on the availability of key resources. Two particularly important resources for entrepreneurial growth are investment capital and business support services. Capital for investment in new and growing companies is important for a range of firm development phases. It is an important driver of critical mass, often fueling the growth of high-potential firms that will generate significant job growth. Critical mass is also fostered by a technology savvy, entrepreneurial-friendly professional support services infrastructure.

## How is the region doing?

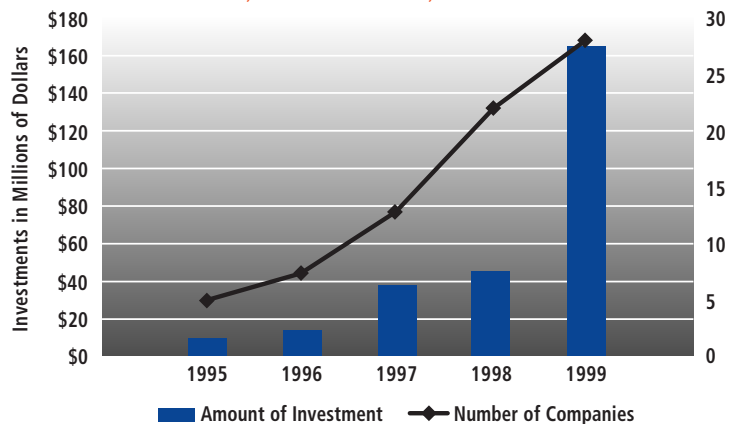
### MARKET-DRIVEN INVESTMENT SOARS RECENTLY; FUNDS ARE DISTRIBUTED ACROSS LEADING SECTORS

Venture capital investment in the region's companies is an important barometer of entrepreneurship. Total venture capital investment in the region increased from \$9.9 million in 1995 to \$164.8 million in 1999. More than five times as many companies received venture capital in 1999 as in 1995. Between 1998 and 1999, venture capital to the region's firms increased by 264%.

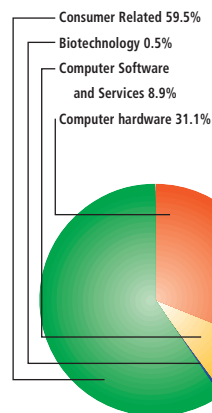
Venture capital is being invested across an increasingly diverse range of industry sectors, with concentrated investment in software and Internet-related ventures. In 1994, 60% of venture investment was consumer related, and more than 31% was computer-hardware specific. In 1999, the highest industry areas of investment were computer & software services at 35% followed by the Internet at 32%, and communications and computer hardware, both at 7%.

Only a small percentage of firms receive start-up capital from venture firms. On what other forms of investment capital has the region relied? According to technology industry executive survey respondents, the top three sources of funding for the Pittsburgh region's firms were commercial banks (48%), family and friends (45%), and angel investors (27%). A majority of this funding came from within the region.

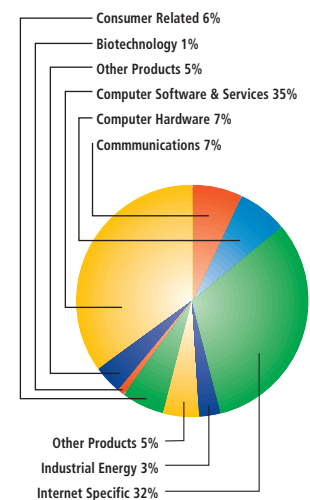
AMOUNT OF VENTURE CAPITAL AND NUMBER OF COMPANIES RECEIVING VENTURE CAPITAL, PITTSBURGH REGION, 1995-1999



DISTRIBUTION OF VENTURE CAPITAL BY INDUSTRY AREA, PITTSBURGH REGION, 1994



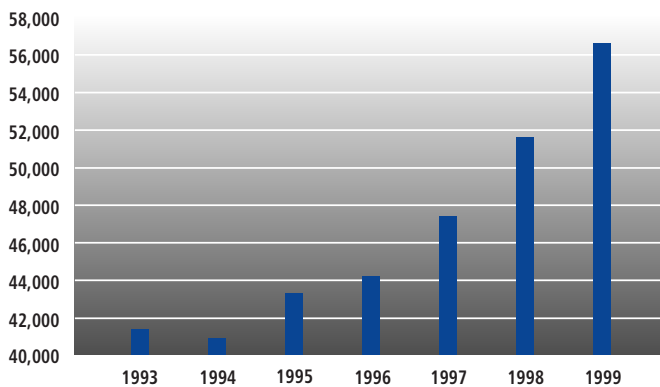
DISTRIBUTION OF VENTURE CAPITAL BY INDUSTRY AREA, PITTSBURGH REGION, 1999



Source: Venture Economics/  
National Venture Capital

## Entrepreneurial Opportunity

TOTAL EMPLOYMENT IN PROFESSIONAL BUSINESS SUPPORT SERVICES, PITTSBURGH REGION, 1993-1999

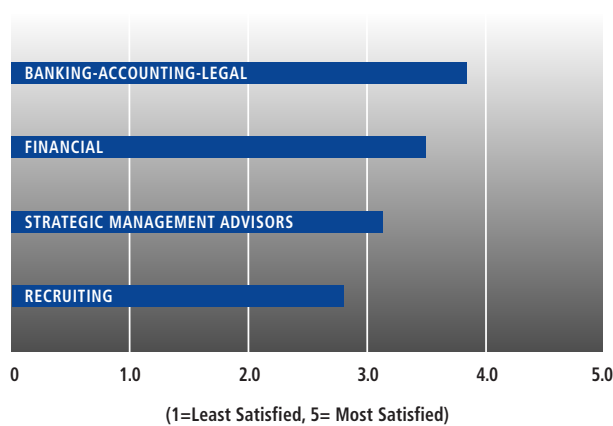


Source: Regional Financial Associates, Collaborative Economics

### PROFESSIONAL BUSINESS SUPPORT RESOURCES INCREASE SIGNIFICANTLY

Entrepreneurial activity occurs in fast-moving environments in which a gap of support services can impede a company's growth potential. Professional support services such as accounting, public relations, and legal services for newly formed and growing firms are on the increase. There were 600 more establishments in 1997, than in 1993, focused on some aspect of professional support services. This service sector area added more than 15,000 jobs between 1993 and 1999. Technology industry executives rate the services of this growing professional business support sector as "average."

RATING OF PROFESSIONAL BUSINESS SUPPORT SERVICES, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000



Source: Entrepreneurial Industry Opportunity Survey, 2000

### What does this mean for an entrepreneurial Pittsburgh region?

The growing presence of key entrepreneurial resources is an important indicator of the Pittsburgh region's ability and potential to grow entrepreneurial companies. Increased venture capital investment suggests confidence in the region's entrepreneurs and start-up companies. Growing professional services indicates real and anticipated demand from a growing entrepreneurial sector. The region needs to attract continued venture investment as well as cultivate angel investors and other financing options for would-be entrepreneurs.





## Why are regional sources of innovation important?

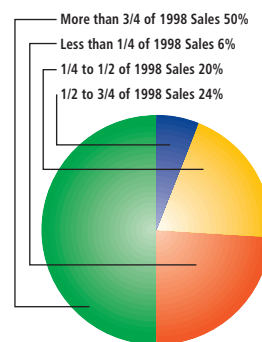
*Innovation is the competitive advantage of companies in an entrepreneurial economy. In this economy, growing and sustaining critical mass means innovating constantly. Doing so requires steady investment in research and development and often entails moving beyond a company's internal resources to leverage regional sources of innovation. Regions rich in the sources of innovation and that have the collaborative mechanisms to leverage those resources are well positioned to sustain critical mass in this economy.*

## How is the region doing?

### A MAJORITY OF BUSINESSES GAIN AT LEAST ONE-HALF OF REVENUES FROM NEW INNOVATIONS

Many companies in the Pittsburgh region are focused on innovation. According to technology industry executives, 82% of the companies undertook projects in the past three years to develop a new or significantly improved product, process, or service. When asked to allocate the portion of their sales attributable to new and significantly improved products or services, 75% of the respondents derived one-half or more of their sales from these innovations. Only 6% generated less than one-quarter of their sales from innovation.

### PERCENTAGE OF FIRMS AND THE PROPORTION OF SALES ATTRIBUTED TO NEW OR IMPROVED PRODUCTS AND SERVICES, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000

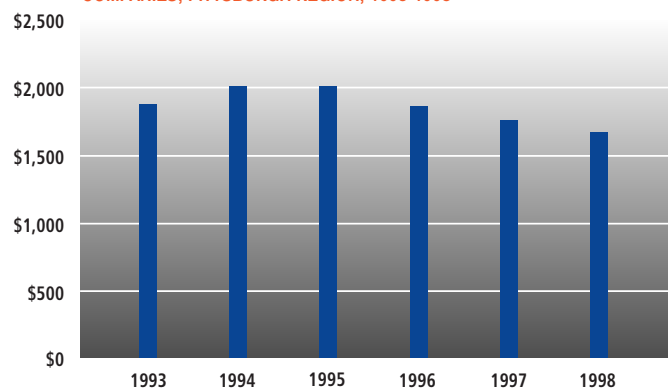


Source: Entrepreneurial Industry Opportunity Survey, 2000

### CORPORATE R&D SPENDING PER EMPLOYEE DECREASES

Investment in corporate research and development is an important indicator of how established companies are investing in their future. R&D is essential for developing new products and services that help companies stay on the leading edge, grow, and produce more jobs in the long term. In the Pittsburgh region, corporate R&D spending per employee has decreased since 1995 from \$2,014 to \$1,670 in 1998, a decline of 17% in inflation-adjusted terms.

### CORPORATE R&D EXPENDITURES PER EMPLOYEE FOR PUBLICLY TRADED COMPANIES, PITTSBURGH REGION, 1993-1998



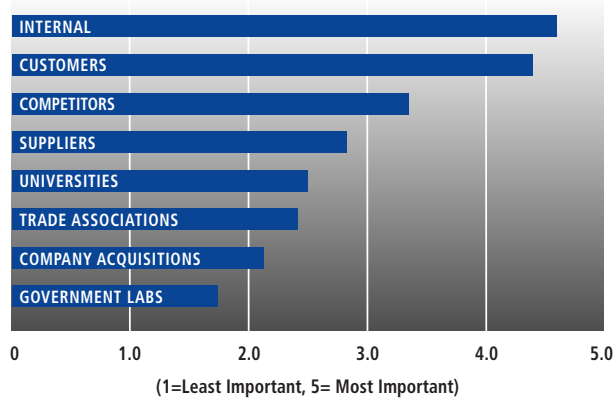
Source: Standard and Poor's COMPUSTAT





## Entrepreneurial Opportunity

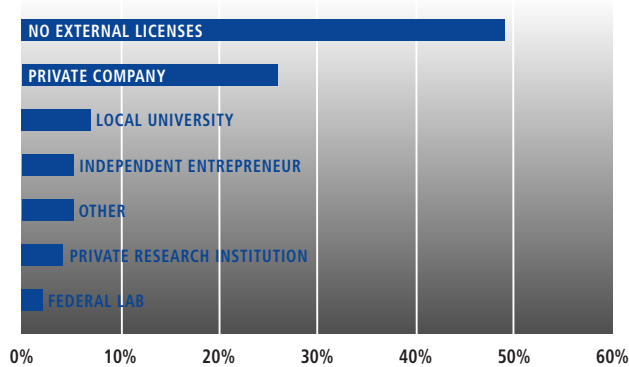
RATING OF REGIONAL SOURCES OF INNOVATION, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000



### NONCOMMERCIAL SOURCES OF REGIONAL INNOVATION GO LARGELY UNTAPPED

How aware is industry of the region's sources of innovation? According to the Entrepreneurial Industry Opportunity Survey, the most important sources of innovation for companies were their company, customers, and competitors. This finding suggests traditional cluster dynamic activity with customer-driven innovation, close supplier-producer relationships, and competition spurring innovation. Regional sources of innovation outside the company such as universities were ranked between "important" and "less important," with only 7% of the companies having licensed technology. Federal labs were identified as "less" to "unimportant," with 2% of respondents leveraging their technology.

DISTRIBUTION OF TECHNOLOGY LICENSING ACTIVITIES BY SOURCE OF LICENSE, TECH-INTENSIVE FIRMS, PITTSBURGH REGION, 2000



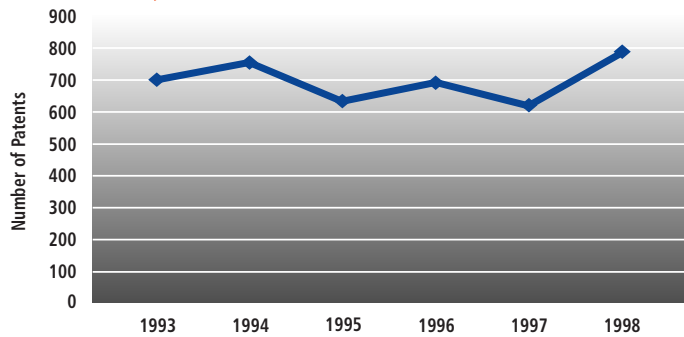
Source: Entrepreneurial Industry Opportunity Survey, 2000



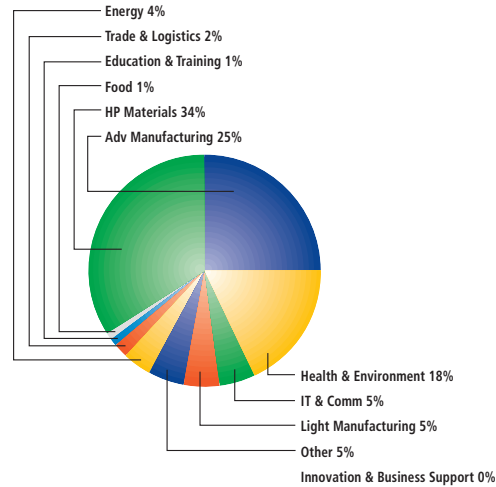
**OVERALL GROWTH IN PATENTS REMAINS LOW, ALTHOUGH ACTIVITY IS DISTRIBUTED ACROSS MORE COMPANIES**

How fertile are the regional sources of innovation? Patents reflect the generation and registry of innovative ideas, often with potential relevance to a marketable product or process. The Pittsburgh region has not shown significant progress in generating increasing numbers of patents over time. The absolute number of patents generated increased moderately from 700 in 1993 to 793 in 1998, representing a 4% average annual rate of growth. Throughout this period, patent activity was volatile. Patent activity was concentrated in High Performance Materials (31%), Advanced Manufacturing (21%) and Health & Environmental Technology (21%) in 1998. Except for IT & Communications Services, which doubled its patents from 1993 to 1998, the distribution of patent activity remained similar over this period.

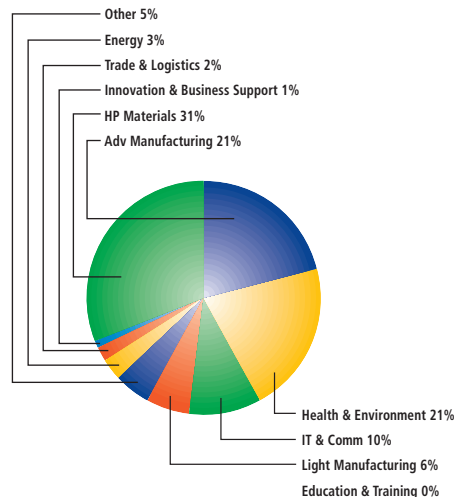
**NUMBER OF UTILITY PATENTS GRANTED TO INVENTORS, PITTSBURGH REGION, 1993-1998**



**DISTRIBUTION OF UTILITY PATENTS BY INDUSTRY CLUSTER, PITTSBURGH REGION, 1993**

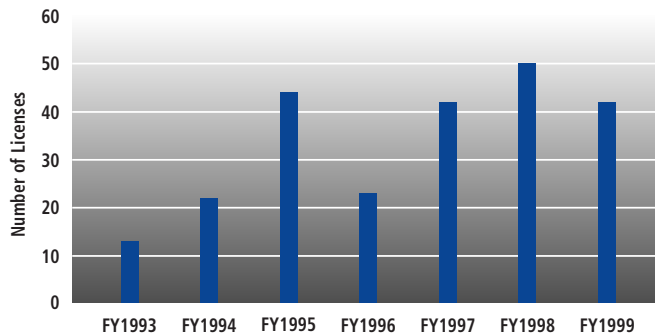


**DISTRIBUTION OF UTILITY PATENTS BY INDUSTRY CLUSTER, PITTSBURGH REGION, 1998**



Source: U.S. Patent and Trademark Office

NUMBERS OF TECHNOLOGY LICENSES ISSUED BY MAJOR UNIVERSITIES, HOSPITALS, AND RESEARCH INSTITUTIONS, PITTSBURGH REGION, 1993-1999



Source: AUTM, ASRI, Univ. Of Pittsburgh, CMU, NETL, and SEI

### TECHNOLOGY LICENSING ACTIVITY MORE THAN TRIPLES SINCE 1993

Technology licensing opportunities with universities, hospitals, and labs are another potential source of innovative ideas for commercialization. Technology licensing activity has been uneven, but licensing activity has more than tripled since 1993, growing from 13 in 1993 to 42 in 1999. This overall activity includes the birth and death of Allegheny University Health Sciences (1995 to 1998).

### *What does this mean for an entrepreneurial Pittsburgh region?*

*Developing and leveraging regional sources of innovation is important to the Pittsburgh region's ability to grow and to attract and sustain entrepreneurial activity in a knowledge-based economy. The regional innovation infrastructure—including labs, corporate R&D, and university technology licensing—shows mixed signs of health. The region must encourage the development of the infrastructure, including both basic and applied research and technology commercialization. Continued strengthening of collaborative linkages between the research and business communities will enable businesses to connect to and leverage university and other research assets. Without such connections, these assets will have minimal economic impact within the region. In research areas where the local industry is still in an early phase of development, the region should consider creative ways to incubate university research virtually until it can result in new stand-alone companies.*

## Entrepreneurial People

*“The Pittsburgh region must intensify its efforts in the support, development, and attraction of people needed by entrepreneurial companies at all levels.”*

### WHY IS THIS COMMITMENT IMPORTANT?

Entrepreneurial *people* are the most valuable asset of today’s economy. The vitality of an economy depends in large part on the skills, know-how, and ability of people to be lifelong learners in a rapidly changing environment. There are a number of ways to assess the health and resiliency of this vital resource in the Pittsburgh region.

### HOW WILL THE REGION MEASURE PROGRESS?

When entrepreneurship is the imperative, human creativity combined with technical capacity and business know-how are a must. An entrepreneurial economy needs a healthy *mix of skills and levels of experience* to develop and sustain growth.

In today’s economy, people are highly mobile. Every region competing in this economy faces similar challenges to maintaining the population that will sustain its economic growth. For

this reason, it has become crucial to gain a talented workforce through attraction based on opportunity, diversity, and openness to outsiders with different talents and backgrounds. In this economy of individual mobility, the focus shifts from business attraction to talent attraction.

Diversity is a mainstay of an entrepreneurial economy. It is a magnet for people with new methods and perspectives that contribute to the churn of innovation, which entrepreneurs exploit. Entrepreneurship values diversity, because it affords access to the greatest range of talent, new ideas, and new markets. *Diversity* acts as a self-reinforcing magnet for global talent.

A region’s universities and colleges can play a role in attracting and training domestic and foreign-born students, creating a potential pool of management, technical, and entrepreneurial talent.

Further bridging the talent gap in the short term involves exploring ways to connect today’s workforce demands with this potential supply. In the long term, it involves investing in and cultivating *homegrown, future talent*.

### PROGRESS METRICS

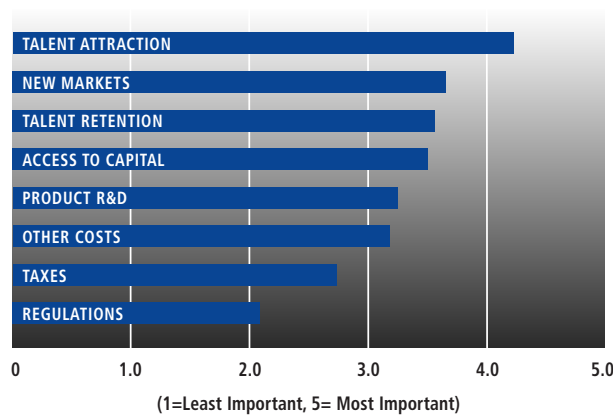
Mix of skills and experience  
Homegrown future talent  
Future diverse talent

## Why is a mix of skills and experience important?

Entrepreneurial economies require technical, management, and marketing skills at all levels. Universities and colleges are one potential source of this talent. However, the Pittsburgh region competes with the rest of the globe for the talent its educational institutions train. Maximizing the presence of talent also means developing ways to connect workforce demand with supply.

## How is the region doing?

RATING OF GREATEST CHALLENGES TO COMPANY GROWTH, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000

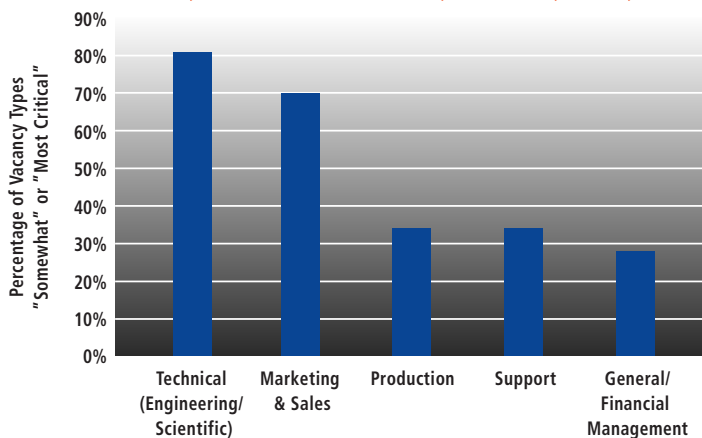


Source: Entrepreneurial Industry Opportunity Survey, 2000

## VACANCIES ARE MOST CRITICAL FOR MARKETING AND TECHNICAL JOBS

Listening to the needs of the business community is the first step in understanding the “demand side” of the entrepreneurial people equation. Technology industry executives indicated that attracting talent was their greatest challenge to company growth. They identify their most critical vacancy needs as technical (engineering and scientific) and marketing and sales at the present time in their company’s development.

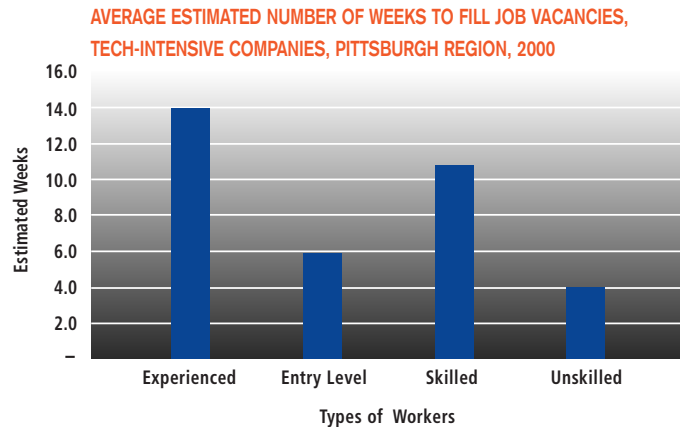
PERCENTAGE OF JOB VACANCIES RATED AS “SOMEWHAT” OR “MOST CRITICAL,” TECH-INTENSIVE COMPANIES, PITTSBURGH, REGION, 2000



Source: Entrepreneurial Industry Opportunity Survey, 2000

### THE AVERAGE TIME TO FILL JOBS IS NEARLY TWO MONTHS FOR EXPERIENCED POSITIONS

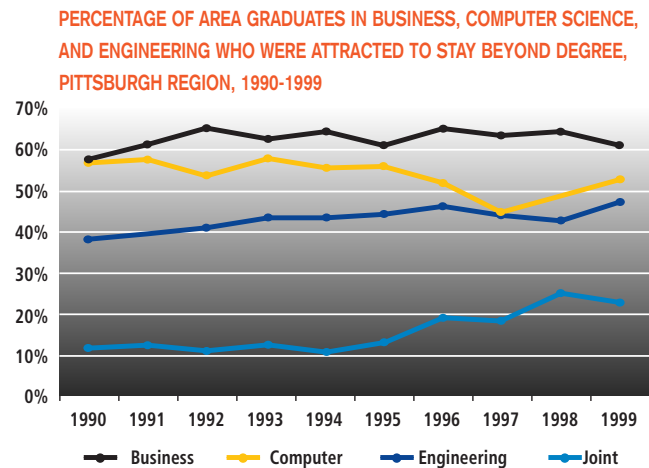
The average number of weeks to fill a vacant position is the “talent cycle time.” This cycle time is longest at 14 weeks for positions that require experience, according to the Entrepreneurial Industry Opportunity Survey. Skilled positions go unfilled for an estimated 11 weeks, followed by entry-level positions at 6 weeks.



Source: Entrepreneurial Industry Opportunity Survey, 2000

### STUDENTS TRAINED AT AREA UNIVERSITIES STAY AFTER GRADUATION AT VARYING RATES

From 1990 to 1999, the Pittsburgh region attracted on average from its three major institutions 63% of the business degree recipients, 46% of the information technology (IT) and engineering degree holders, and 17% of joint degree earners in these fields. The number of engineering degree earners attracted to stay in the region has declined since 1994.



Source: Center for Economic Development, Carnegie Mellon University

## What does this mean for an entrepreneurial Pittsburgh region?

*Talent is the most important ingredient for an entrepreneurial economy, and the Pittsburgh region faces challenges in attracting people at various levels of skills and experience, both domestically and internationally. The domestic shortages of talent faced by many other regions only heightens the need for the Pittsburgh region to enhance its competitive position for attracting talent.*

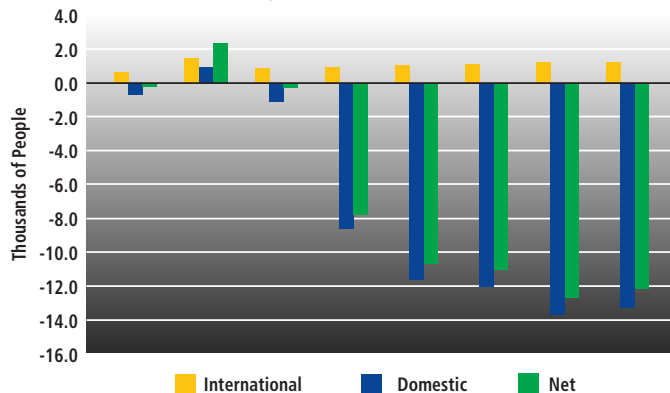
*When businesses are constrained chronically by workforce shortfalls, their growth strategies in the longer term are affected. This constraint dampens employment demand and, in turn, affects the ability of the region to build a critical mass of talent—an underpinning for a critical mass of entrepreneurial businesses and industries. This type of negative feedback loop could adversely affect the Pittsburgh region's long-term growth potential. Creating vital communities attractive to young talent and people relocating from other places is an important strategy for growing an entrepreneurial talent pool.*

## Why is diverse entrepreneurial talent important?

*A diverse talent pool is a seedbed for entrepreneurial activity. Diverse backgrounds, talents, and perspectives are an important catalyst for innovation. A diverse community and openness to outsiders also act as attractors of top national and global talent of all races, ethnicities, ages, and genders.*

## How is the region doing?

**INTERNATIONAL, DOMESTIC AND NET MIGRATION,  
PITTSBURGH REGION, 1991-1998**



Source: Regional Financial Associates, Collaborative Economics

### LACK OF INTERNATIONAL IMMIGRATION IS CHRONIC

Migration trends are important indicators of talent flow. In a highly mobile economy, out-migration is not uncommon but must be offset by in-migration. Domestic out-migration far exceeded international and domestic in-migration from 1991 to 1998. International immigration grew from a small base of 600 in 1991 to 1200 in 1998. Migration trends from 1997 to 1998 showed some easing in the net effects of out-migration on the region.

### MINORITY POPULATION OWNS FEW BUSINESSES IN THE REGION

Among the entrepreneurs identified in the Entrepreneurial Attitudes Survey, a significant number identified themselves as minority. Fostering the development of minority enterprise will only add to the positive synergies that make Pittsburgh a magnet for top talent, for all races and ethnicity. According to data on minority business ownership provided by the Minority Enterprise Corporation, 0.6% of the minority population were business owners in 1999.

## What does this mean for an entrepreneurial Pittsburgh region?

*In today's highly mobile world, regions compete nationally and globally for talent. The Pittsburgh region's workforce shortfalls suggest the need for new competitive strategies to attract people. A key to developing this new strategy is in recognizing the link between talent attraction, diversity, and openness to outsiders with different backgrounds and talents. Diversity is a magnet for top talent with new methods and perspectives that can contribute to innovative thinking in an entrepreneurial environment.*



## Why is homegrown, future talent important?

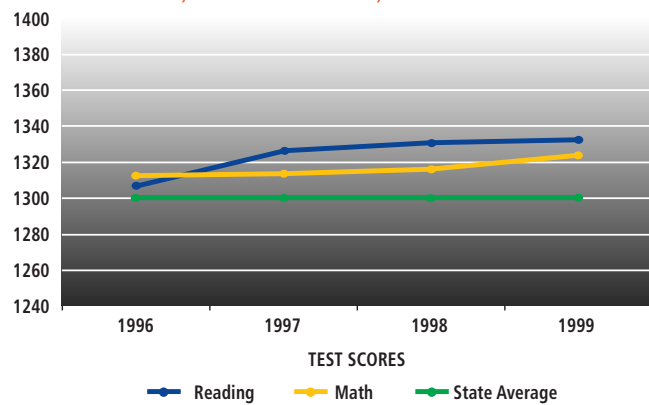
Investment in the potential workforce of tomorrow is essential for sustaining an entrepreneurial economy in the long term. The continuous innovation and entrepreneurship on which this economy is built requires mastering the basics that enable people to become lifelong learners. In addition, to create a generation of “job makers” rather than “job takers,” young people need exposure to the fundamentals of entrepreneurship and enterprise. Entrepreneurship, like most skills, is learned, and learning is most effective when it begins early.

## How is the region doing?

### FIFTH GRADERS SHOW IMPROVEMENT IN MATH AND READING PERFORMANCE

Excellence in the basics is a prerequisite for creating lifelong learners. In both math and reading at the fifth grade level, the region’s students have been making steady improvement, performing slightly above the state average on the Pennsylvania System of School Assessment exams from 1996 to 1999. The region’s strategy for overall improvement is focused on increasing the number of top and decreasing the number of bottom performers. Continuous improvement and progress are imperative in these areas.

PSSA SCALED AVERAGE SCORES FOR FIFTH-GRADERS IN MATH AND READING, PITTSBURGH REGION, 1996-1999

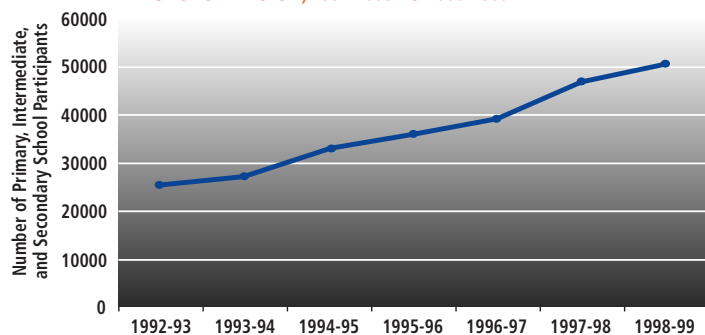


Source: Pennsylvania Department of Education

### YOUNG PEOPLE’S PARTICIPATION IN JUNIOR ACHIEVEMENT GROWS SIGNIFICANTLY

Junior Achievement is one way young people in primary, intermediate, and secondary school gain experience and exposure to enterprise and how the economy works. Whether through business plan competitions or the development of benchmarks that increase understanding of the region’s economy, students learn about the economy through Junior Achievement. The number of students participating in Junior Achievement climbed from 25,277 in the 1992–93 period to 50,738 in the 1998–99 period, representing an increase of more than 100%.

NUMBER OF PRIMARY, MIDDLE, AND SECONDARY SCHOOL STUDENTS PARTICIPATING IN JUNIOR ACHIEVEMENT, PITTSBURGH REGION, 1992-1993 TO 1998-1999



Source: Junior Achievement of Southwest PA, Inc.



## *What does this mean for an entrepreneurial Pittsburgh region?*

*Reading and math are building blocks for continuous learning in today's economy, and the Pittsburgh region's fifth graders show improved performance in these areas. The region must make its strategy of increasing the number of top and decreasing the number of bottom performers a continued priority. Standards and strategies in support of perpetually raising the bar will help the region's future workforce be competitive in the global arena. Continued exposure to how their economy works will also help young people to make informed decisions about their future.*

*Entrepreneurial Attitudes*

*“The Pittsburgh region must nurture an environment that values innovative and risk-taking attitudes.”*

#### WHY IS THIS COMMITMENT IMPORTANT?

Entrepreneurial attitudes are a primary ingredient in the recipe for an entrepreneurial region. No matter how well endowed a region is with assets and possible opportunity, this potential will remain unrealized without entrepreneurial attitudes and values.

A number of ways exist to tap into the entrepreneurial attitudes of the Pittsburgh region to understand better this intangible driver of entrepreneurial activity.

#### HOW WILL THE REGION MEASURE PROGRESS?

People need to *perceive opportunity* first. *Awareness* of entrepreneurial activity and the opportunities it affords can be increased through coverage of entrepreneurship and innovation in the popular media and press.

The extent to which a region embraces entrepreneurial *social and cultural norms* can have an impact on the activities of would-be entrepreneurs. Entrepreneurship is more likely to flourish in areas where this activity is valued and respected and where business failure is seen as essential to the learning process for entrepreneurial success.

In addition, environments supportive of entrepreneurship tend to have gathering places where entrepreneurs, venture capitalists, and innovators connect. These *amenities* are important for facilitating entrepreneurial activities.

*Flexibility* toward work and career is an important variable for growing and sustaining entrepreneurial activity in today’s economy. Not everyone wants to be an entrepreneur, but entrepreneurial economies need people with attitudes that favor innovation and change.

#### PROGRESS METRICS

Perception of opportunity  
Awareness and amenities  
Social and cultural norms  
New economy flexibility

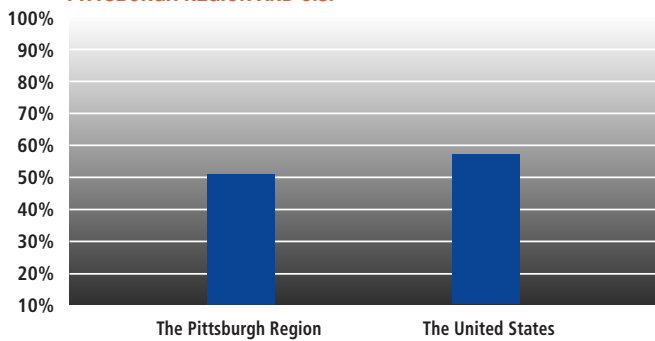
## Entrepreneurial Attitudes

### Why is the perception of opportunity important?

The perception of entrepreneurial opportunity is an obvious driver of entrepreneurial activity and can be compared to actual levels of entrepreneurship. Recognition of opportunity can be heightened by increased public awareness and more chances to learn about entrepreneurship.

### How is the region doing?

**PERCENTAGE OF ADULT RESIDENTS WHO PERCEIVE ENTREPRENEURIAL OPPORTUNITIES IN THE NEXT SIX MONTHS, PITTSBURGH REGION AND U.S.**

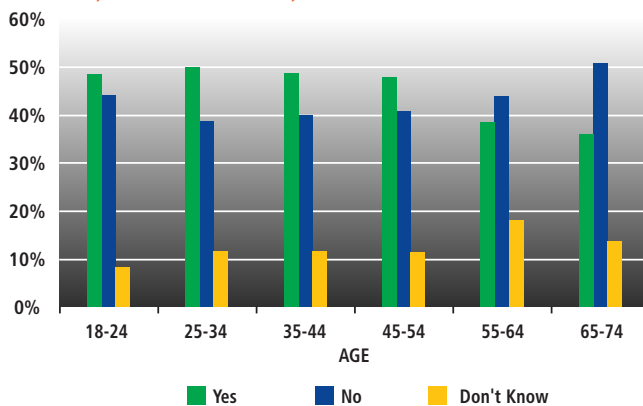


Source: Entrepreneurial Attitudes Survey, 2000; GEM, 1999

### FIFTY PERCENT OF ADULTS PERCEIVE THE REGION AS RIPE FOR ENTREPRENEURIAL OPPORTUNITY

The recognition of new market opportunities is a prerequisite of entrepreneurial activity. One-half of the Pittsburgh region respondents perceived a good opportunity for starting a business in the region in the next six months. This figure compares favorably with the U.S. average of 57%. In the Pittsburgh region, age played a role in the likelihood of perceiving opportunity, with perception declining as the respondent's age increased.

**PERCENTAGE OF ADULT RESIDENTS WHO PERCEIVE ENTREPRENEURIAL OPPORTUNITIES IN THE NEXT SIX MONTHS BY AGE, PITTSBURGH REGION, 2000**



Source: Entrepreneurial Attitudes Survey, 2000

### PERCENTAGE OF ADULTS ENGAGED IN ENTREPRENEURIAL ACTIVITY LAGS NATIONAL AVERAGE

The level of entrepreneurial activity among respondents suggests that 1 in 24 people in the Pittsburgh region—or 4.2%—were engaged in entrepreneurial activity in 1999. This level of activity is one-half that of the United States.

### *What does this mean for an entrepreneurial Pittsburgh region?*

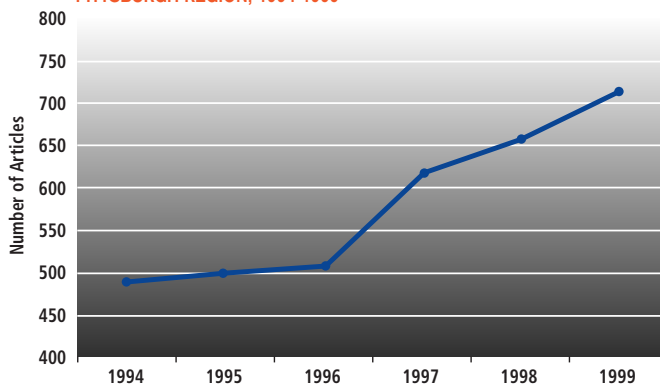
*Perception of opportunity is an important element driving entrepreneurial activity, and the Pittsburgh region shows strong signs that residents recognize opportunities. The relatively small percentage of individuals acting on this recognition means that the region needs to encourage individuals and assess what obstacles may be discouraging entrepreneurial initiative. The recognition of opportunity, though vital, is one of several elements that contribute to entrepreneurial activities. Motivation, flexibility, and positive attitudes toward risk and failure are others.*

## Why are entrepreneurial awareness and amenities important?

Regional media can intensify awareness of entrepreneurial activity. Press coverage of themes of entrepreneurship and innovation can help to engender interest in and learning about these activities. Real places where inventors, entrepreneurs, and venture capitalists can connect are also important amenities for entrepreneurs.

## How is the region doing?

PRESS COVERAGE OF ENTREPRENEURSHIP AND INNOVATION,  
PITTSBURGH REGION, 1994-1999



Source: Dow Jones Interactive

### SHIFT IN PRESS COVERAGE TOWARD ENTREPRENEURSHIP AND INNOVATION TOPICS IS SIGNIFICANT

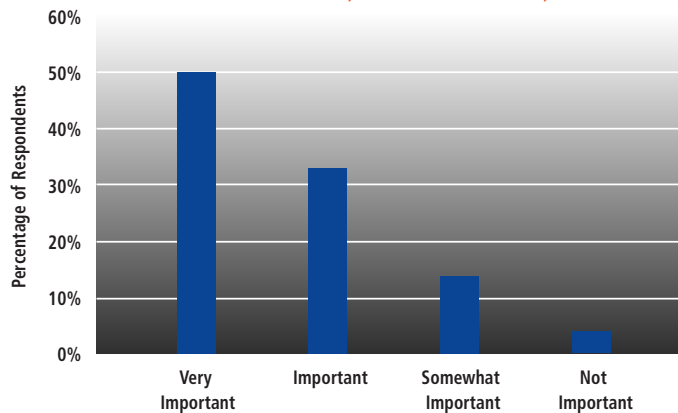
The focus of the press on entrepreneurial and innovative activity can have a reinforcing effect on the creation of an entrepreneurially aware region. The number of articles focused on this type of activity has been on the increase, growing by 31% from 1994 to 1999.



**ENTREPRENEURIAL TECH COMMUNITY CALLS FOR NEW HOTSPOTS TO NETWORK**

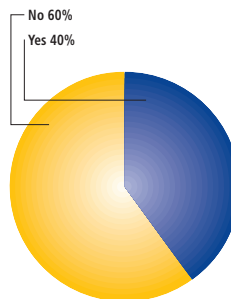
Gathering places and venues for networking and entrepreneurial exchange can add to the entrepreneurial climate palpable in other entrepreneurial hotspots. More than 83% of the Entrepreneurial Industry Opportunity Survey respondents indicated that gathering places for entrepreneurs were “important” or “very important” for facilitating this connectivity. Only 4% did not think that these places were of value. Two-thirds of the respondents did not think that enough gathering places existed for promoting connectivity in the region.

**RATING THE IMPORTANCE OF GATHERING PLACES FOR ENTREPRENEURS, VENTURE CAPITALISTS, AND INVENTORS, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000**



Source: Entrepreneurial Industry Opportunity Survey, 2000

**ARE THERE ENOUGH GATHERING PLACES IN THE REGION?, TECH-INTENSIVE COMPANIES, PITTSBURGH REGION, 2000**



Source: Entrepreneurial Industry Opportunity Survey, 2000

*What does this mean for an entrepreneurial Pittsburgh region?*

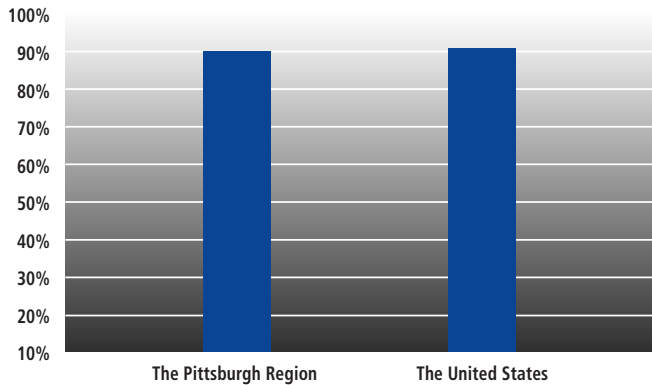
*With the press focusing increased attention on entrepreneurial and innovative activity, the Pittsburgh region is poised to build greater entrepreneurial momentum. To sustain this momentum, gathering places are needed for networking. Without these amenities, entrepreneurs and would-be entrepreneurs remain more isolated and disconnected from regional resources and people.*

## Why are entrepreneurial social and cultural norms important?

Entrepreneurial social and cultural norms shape whether entrepreneurship is viewed as a credible and respected activity—one that could be considered a legitimate career and that is associated with leadership abilities. Many elements underpin these beliefs. Attitudes toward risk and failure are one of the most significant parts. They can have a real impact on the motivation of would-be entrepreneurs to act on a perceived opportunity.

## How is the region doing?

PERCENTAGE OF ADULT RESIDENTS WHO VIEW ENTREPRENEURSHIP AS A RESPECTED OCCUPATION, PITTSBURGH REGION AND U.S.



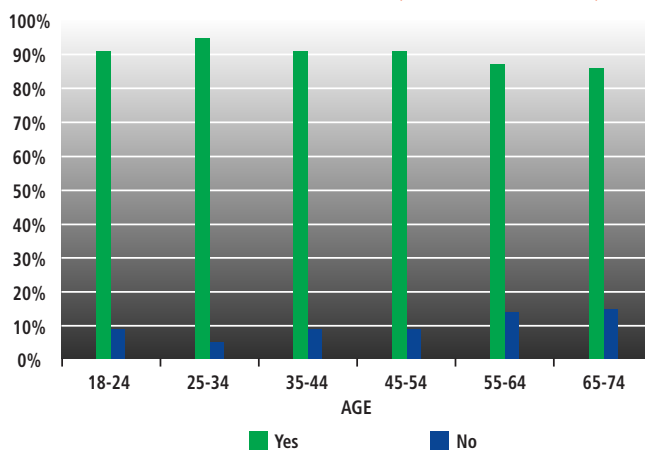
Source: Entrepreneurial Attitudes Survey, 2000; GEM, 1999

### REGION'S ADULTS SAY OVERWHELMINGLY THAT ENTREPRENEURSHIP IS A RESPECTED CAREER ROUTE

When asked whether entrepreneurship is a respected occupation, 90% of the region's adult respondents agreed that it was, aligning with the U.S. average (91%). The percentage of individuals who viewed entrepreneurial activity as a legitimate pursuit remained very high among all the age groups.

Adults responses differed somewhat with age. As the respondent's age increased, he or she was, on the whole, less likely to think entrepreneurship was a respected occupation.

PERCENTAGE OF ADULT RESIDENTS WHO VIEW ENTREPRENEURSHIP AS A RESPECTED OCCUPATION BY AGE, PITTSBURGH REGION, 2000



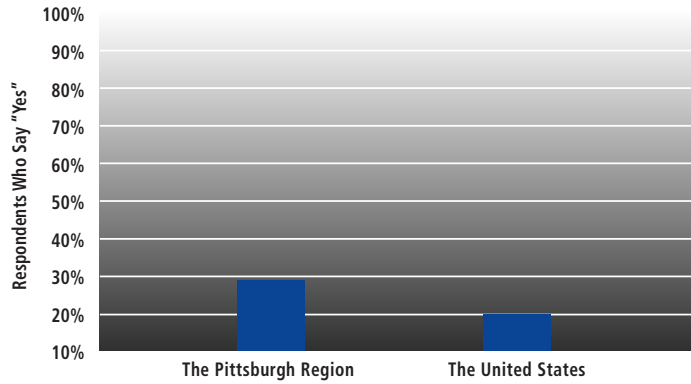
Source: Entrepreneurial Attitudes Survey, 2000



**ONE-THIRD OF ADULT RESIDENTS EQUATE BUSINESS FAILURE WITH PERSONAL FAILURE**

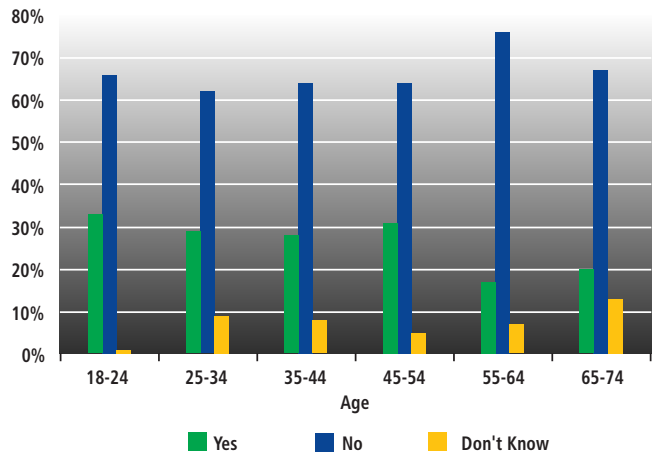
Entrepreneurs perceive potential opportunities. These opportunities can reap significant reward but also involve significant risk. Risk taking and failure are fundamental to the learning process of successful entrepreneurs. Disconnecting business failure from personal failure is an important attribute of the true entrepreneur, who views failure as a lesson in how to succeed. Although the difference between the two is not dramatic, nearly one-third of the Pittsburgh region's adults considered business failure to be a personal failure, as compared to one-fifth of U.S. adults.

**PERCENTAGE OF ADULT RESIDENTS WHO BELIEVE THAT BUSINESS FAILURE EQUALS PERSONAL FAILURE, PITTSBURGH REGION AND U.S.**



Source: Entrepreneurial Attitudes Survey, 2000; GEM, 1999

**PERCENTAGE OF ADULT RESIDENTS WHO BELIEVE THAT BUSINESS FAILURE EQUALS PERSONAL FAILURE BY AGE, PITTSBURGH REGION, 2000**

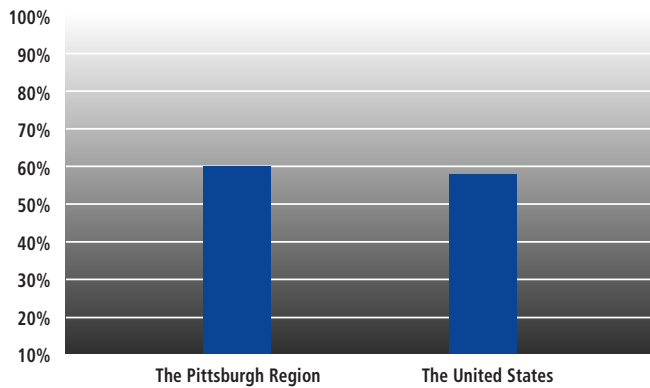


Source: Entrepreneurial Attitudes Survey, 2000



## Entrepreneurial Attitudes

### PERCENTAGE OF ADULT RESIDENTS WHO PERCEIVE LOCAL MOTIVATION TO SEIZE ENTREPRENEURIAL OPPORTUNITIES, PITTSBURGH REGION AND U.S.

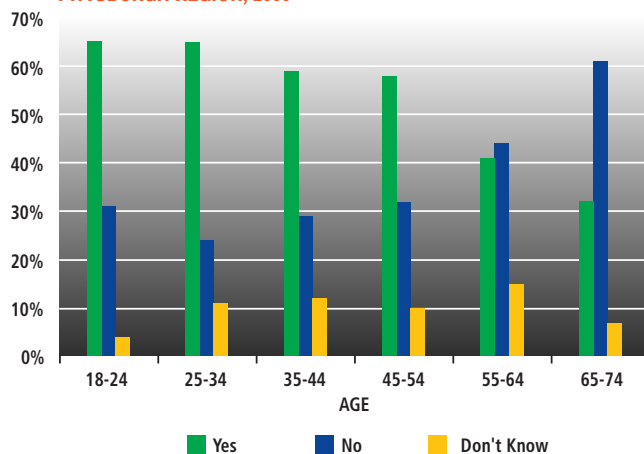


Source: Entrepreneurial Attitudes Survey, 2000; GEM, 1999

### SIGNIFICANT LEVEL OF MOTIVATION TO EXPLOIT ENTREPRENEURIAL OPPORTUNITIES IS PERCEIVED BY ADULTS

Given all the facets that can increase or dampen action on a perceived opportunity, what is the level of perceived motivation to exploit a potential opportunity in the Pittsburgh region? The Entrepreneurial Attitudes Survey suggested that residents thought that there were high levels of motivation. Sixty percent of the survey respondents believed that motivation to seize opportunities were present in the region. This response mirrored the U.S. average of 58%.

### PERCENTAGE OF ADULT RESIDENTS WHO PERCEIVE LOCAL MOTIVATION TO SEIZE ENTREPRENEURIAL OPPORTUNITIES BY AGE, PITTSBURGH REGION, 2000



Source: Entrepreneurial Attitudes Survey, 2000

## What does this mean for an entrepreneurial Pittsburgh region?

The Pittsburgh region overwhelmingly views entrepreneurship as a respected career area. Yet it also puts a stiff price on business failure, which is an unavoidable part of the entrepreneurial career path. This combination of attitudes results in barriers to entrepreneurial activity. Embracing and encouraging entrepreneurial attitudes—whether in government, business, or education—sends a reinforcing message that risk taking is positive and that failure teaches lessons in how to succeed.



## Why is new economy flexibility important?

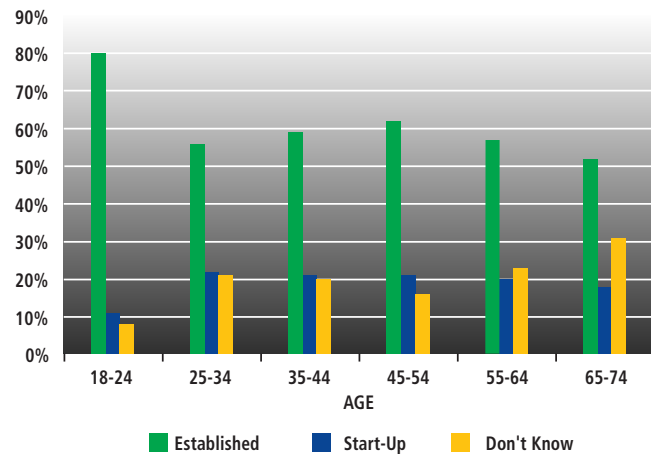
Entrepreneurial regions require attitudes supportive of new business formation. Not everyone wants to be an entrepreneur, but entrepreneurial economies need people with attitudes that favor innovation and change. The desire to work for a start-up rather than an established company suggests less concern for security and a greater tendency toward risk taking. In today's economy, changing jobs and even careers six to seven times over a lifetime is increasingly common. This flexibility appears important for career development. It also makes tacit knowledge or know-how more mobile, increasing opportunities for innovation.

## How is the region doing?

### REGION'S WORKFORCE STILL LONGS FOR "ESTABLISHED" COMPANY JOBS, DESPITE NEW ECONOMY REALITIES

The extent to which people are open to working for start-ups provides an indication of the type of workforce the region has to support entrepreneurial growth. Only 11% of 18- to 24-year olds would prefer to work for a start-up company, whereas 80% would prefer to join an established firm. Nearly one-fifth of the 25- to 64-year-olds would prefer to work for a start-up. The number of residents who were unsure was significant.

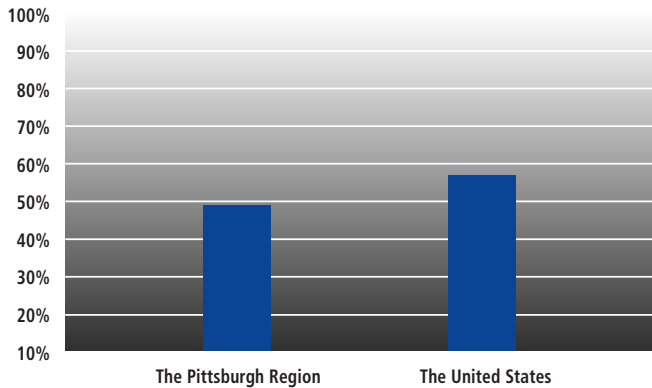
DISTRIBUTION OF ADULT RESIDENTS' PREFERENCES FOR WORKING AT A START-UP OR ESTABLISHED FIRM, PITTSBURGH REGION, 2000



Source: Entrepreneurial Attitudes Survey, 2000

## Entrepreneurial Attitudes

### PERCENTAGE OF ADULT RESIDENTS WILLING TO CHANGE JOBS EVERY THREE YEARS WITHOUT HAVING TO RELOCATE, PITTSBURGH REGION AND U.S.

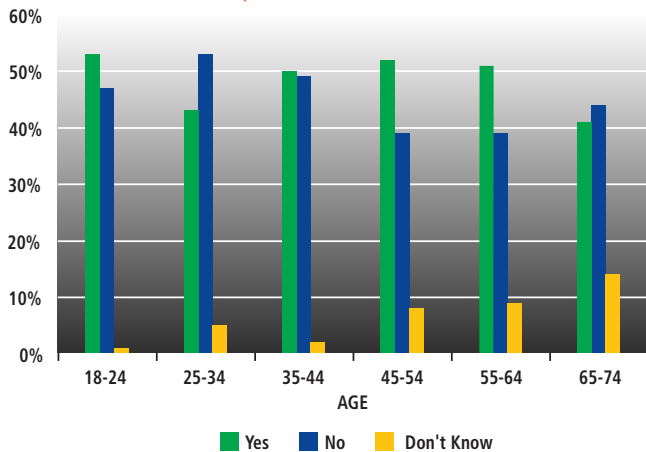


Source: Entrepreneurial Attitudes Survey, 2000; GEM, 1999

### FLEXIBILITY TOWARD JOB CHANGES ARE EVIDENT IN WORKFORCE

When asked whether it would be a major problem to change jobs every five years, even if relocation was not required, 49% of the Pittsburgh Entrepreneurial Attitude Survey respondents indicated it would not be a problem. This response was a little lower on average than the U.S. response of 57%, for whom it would not be a problem.

### PERCENTAGE OF ADULT RESIDENTS WILLING TO CHANGE JOBS EVERY THREE YEARS WITHOUT HAVING TO RELOCATE BY AGE, PITTSBURGH REGION, 2000



Source: Entrepreneurial Attitudes Survey, 2000

## What does this mean for an entrepreneurial Pittsburgh region?

Today, small and mid-sized firms across the country generate the greatest share of new jobs, and the Pittsburgh region is no exception. The 21st-century economy is increasingly built on the premise that people are likely to change jobs many times over a lifetime. The lag in information and attitudes about where and how strong careers can be built has significant implications for growing an entrepreneurial Pittsburgh region. It is vital to target career educational efforts at young people and to the counselors and teachers who influence them, so that they understand how to recognize career opportunity in an entrepreneurial economy.

APPENDICES A & B  
*Data Sources*  
*Industry Cluster Definitions*



Unless otherwise noted below, all data refer to the ten-county Pittsburgh region. This region is defined as the counties of Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Indiana, Lawrence, Washington, and Westmoreland.

## Customized Survey Work

Three surveys were used to develop some of the data used in the creation of the *Metrics*. The following provides a discussion of methods.

### Entrepreneurial Industry Opportunity Survey

The Carnegie Mellon University Center for Economic Development (CED) conducted the Entrepreneurial Industry Opportunity Survey of firms on November 18, 1999, through February 2, 2000. The CED compiled a sample of firms from the Pittsburgh Technology Council, the Hot Team, and internal sources. A total of 764 companies and entrepreneurs constituted the population for the sample.

The final valid sample consisted of 216 responses for a response rate of 28%. The standard error varies for each question, but is generally plus or minus three percentage points for the simple yes/no questions. The standard error with questions with a large number of invalid responses and questions with multiple answers is larger. The CED tested the sample by drawing random samples of responses for key questions and comparing the results to the full sample. The subsamples provided estimates from 1% to 5% of the full sample. It should also be noted that although the responses varied in degree, the subsamples were consistent in the direction of the responses. For example, Attracting talent remained the highest priority, although the estimated value varied by 3%. Given the homogeneity of the population being tested and the nature of the questions investigated, the CED is confident that the sample is representative.

### Entrepreneurial Attitudes Survey

The University Center for Social and Urban Research (UCSUR) at the University of Pittsburgh implemented the Entrepreneurial Attitudes Survey. This survey was adapted from a publicly available survey used in the *Global Entrepreneurship Monitor*, Paul D. Reynolds, Michael Hay, and S. Michael Camp, 1999. Collaborative Economics adapted the instrument for regional use with the consultation of Professor Paul Reynolds of Babson College and the London Business School.

Employing a random-digit-dialing (RDD) telephone methodology, UCSUR conducted interviews of 500 male and 500 female 18- to 74-year-olds living in the ten-county Southwestern Pennsylvania region.

Given gender requirements, two parallel random-digit-dialing (RDD) telephone surveys—one of males and one of females—were conducted. A separate survey approach was used rather than a combined quota approach because of the likelihood of the latter to lead to greater selection biases.

Interviews were conducted between November 15, 1999, and January 27, 2000 (no interviews were done between December 22, 1999, and January 4, 2000, because of the holidays). A minimum of eight call backs were made, with a majority at ten times or more before a sample point was classified as a no contact or noninterview. The average survey length was three to five minutes.

A total of 501 male (20.1% overall completion rate; 36.0% response rate) and 519 female (27.3% overall completion rate; 46.7% response rate) surveys were completed. At 1,020 total surveys completed, the overall completion rate was 23.2%, and the response rate was 40.7%. The refusal and noncontact rates, particularly among males, were fairly high.

## Secondary Data Sources

### Entrepreneurial Opportunity

#### Total Employment Growth

Regional Financial Associates (RFA) track industry statistics at the county level using a methodology based upon individual corporation filings with State Employment Securities Agencies (SEAS) and the Bureau of Labor Statistics (BLS). This dataset does not cover self-employment or employment of military personnel. Cluster employment, wage, gross domestic product, and establishment estimates are drawn from the RFA dataset and are based on federal Standard Industrial Code (SIC) classifications. These codes track economic activity by sector. Definitions for each industry cluster are in Appendix B.

#### Net Employment Growth

Cluster employment estimates derive from the RFA county-level employment dataset for the years 1993 and 1999. This indicator is the difference between employment levels in 1999 and levels in 1993 for each industry cluster as defined by the SIC codes in Appendix B.



### Portfolio of Nine Key Industry Clusters by Employment Size, Concentration, and Growth

Employment size and concentration are developed from RFA county-level data of unemployment insurance filings between 1993 and 1999. Employment concentration is measured as the relative amount of employment in a cluster as a portion of total state employment compared with the same cluster's employment nationally as a portion of total U.S. employment. For each cluster, the level of national employment is indexed at 1.0. Therefore, the Energy Cluster's employment, at 2.4, is almost two and one-half times more concentrated in the Pittsburgh Region than at the national level. The annual average growth rate is the rate of change in industry cluster employment over the six periods from 1993 to 1999. The size of each circle on the chart reflects the relative size of employment in the Pittsburgh region. The largest circle, Innovation and Business Support Services, employed 81,531 people in 1999.

### Average Establishment Size

Cluster employment and establishment statistics derive from the RFA county-level employment dataset for the years 1997 and 1999 for each industry cluster as defined by the SIC codes in Appendix B. The average establishment size was calculated by dividing the cluster employment and the total number of establishments in the cluster as reported in the RFA dataset. The cluster employment growth from 1997 to 1999 was derived by calculating the net employment growth from 1997 to 1999 and dividing that number by the cluster employment in 1997.

### New Business Incorporations

Data are provided by the Corporation Bureau, Department of State of the Commonwealth of Pennsylvania.

### Change in Establishments

Cluster establishment estimates are drawn from the County Business Patterns (CBP) data set for the years 1993 and 1997 for each industry cluster as defined by the SIC codes in Appendix B. The CBP is the official data set of the U.S. Department of Commerce, the Economics and Statistics Administration, and the U.S. Census Bureau for four-digit SIC code employment, wages, and establishment data. The percent change in cluster establishments was derived by calculating the net change in establishments from 1993 to 1997 and dividing that number by the number of establishments in 1993.

### Spin-Off Activity

Data are taken from the Entrepreneurial Industry Opportunity Survey. Firms that are the result of multi-generational spin-off activity are not counted in the other possible responses.

Data on firm plans to spin out companies in the next 18 months derive from the Entrepreneurial Industry Opportunity Survey.

Data on companies formed by major universities and research institutions are from the Association of University Technology Managers and surveys of individual institutions. Institutions included in the dataset are Allegheny University of the Health Sciences, Carnegie Mellon University, and the University of Pittsburgh.

### Fast-Growth "Gazelle" Companies

Data for the number of gazelle firms come from the 1993 and 1998 Corporate Almanac published by Cognetics, Inc. David Birch of Cognetics coined the term gazelle. The data used in this report are drawn primarily from the Dun and Bradstreet DMI file, which covers about 9 million companies in the United States. As a credit rating agency, Dun and Bradstreet gathers employment, establishment, and sales data from companies that employ almost all the private-sector workers in the United States. The change in the number of gazelle firms by enterprise size in Pittsburgh was derived by subtracting the Corporate Almanac's gazelle counts in 1998 from the counts in 1993.

Gazelle and nongazelle firm data come from 1998 *Corporate Almanac*. In the *Corporate Almanac*, the gazelle and nongazelle firms' data are sorted by number of years in business, so no additional calculations were needed to generate the data.

The data reflect the Pittsburgh MSA only.

### Entrepreneurial Mentoring

Data come from the Entrepreneurial Industry Opportunity Survey.

### Venture Capital and Other Sources of Financing

Data for total venture capital investment, venture capital by number of companies, investment by industry activity, and venture capital by place of origin are provided by Venture Economics/National Venture Capital. Industry category designations are determined by Venture Economics/National Venture Capital.

Data for sources of funding for firms are taken from the Entrepreneurial Industry Opportunity Survey.

#### Professional Business Support Employment

Professional business support employment cluster employment estimates derive from the RFA county-level employment data set for the years 1990 to 1999.

Professional business support is a subset of the Innovation & Business Services cluster defined by the SIC codes in Appendix B.

Data on degree of satisfaction with local professional support services come from the Entrepreneurial Industry Opportunity Survey.

#### Company Product and Service Innovation

Data come from the Entrepreneurial Industry Opportunity Survey.

#### Corporate R&D Expenditures per Employee

Research and development (R&D) expenditure data were calculated from a data set provided by Standard & Poor's COMPUSTAT database of publicly traded companies. It is a database of 10K and 10Q data for all publicly traded companies in the United States. Standard & Poor's continually updates the information weekly as companies file 10Q and 10K reports to the SEC. The data represent the sum of all R&D expenditures for companies filing 10K reports in the Pittsburgh Region for years 1993 to 1998.

#### Rating of Regional Sources of Innovation

Data come from the Entrepreneurial Industry Opportunity Survey.

#### Number of Patents

Utility patent data for the Pittsburgh Region are provided by the United States Patent and Trademark Office (USPTO). Patents issued for every technology class were summed to derive the yearly totals for 1993 to 1998.

Technology class descriptions provided by the USPTO were used to cross-reference patents with the industry cluster definitions in order to calculate the distribution of patents activity by cluster.

#### Technology Licensing Activity by Major Universities, Hospitals, and Research Institutions

Data on licensing agreements are from the Association of University Technology Managers and surveys of individual institutions. Institutions included in data are Allegheny University Health Sciences (declared bankruptcy in July 1998), Carnegie Mellon University, the National Energy Technology Laboratory (formerly the Federal Energy Technology Center), the Software Engineering Institute (an FFRDC), and the University of Pittsburgh. Duquesne University is in the process of opening a technology licensing office.

#### Entrepreneurial People

##### Challenges to Company Growth

Data come from the Entrepreneurial Industry Opportunity Survey.

##### Average Number of Weeks to Fill Job Vacancies

Data come from the Entrepreneurial Industry Opportunity Survey.

##### Number of Graduates Attracted to Stay beyond Degree

Graduate data were collected from the alumni databases of the University of Pittsburgh, Duquesne University, Carnegie Mellon University, and Robert Morris College by the Carnegie Mellon University Center for Economic Development. The data show alumni who graduated between 1990 and 1999, who are listed as living in the ten-county Pittsburgh Region, and who majored in business, computer, or engineering related fields.

The percentage of graduates staying in the Pittsburgh region derive from the Center for Economic Development's alumni data of local universities. Percentages are calculated by dividing the number of alumni majoring in a certain field by the total number of graduates.

##### International and Domestic Migration

International and Domestic Migration figures are derived by RFA using annual income tax returns provided by the IRS. To calculate the migration patterns, RFA compares the Social Security Numbers of the main filers to data from previous years. This data were reported at the MSA level, and not for the Pittsburgh Regional definition.



### Minority Population Business Ownership

Data are provided by the Minority Enterprise Corporation.

### Fifth-Grade Average Math and Reading Scores

The data set from which the average scores in reading and math were calculated was provided by the Pennsylvania Board of Education.

### Junior Achievement Participation

Junior Achievement of Southwest Pennsylvania operates in the classroom at the elementary, middle, and secondary school levels. Programs are tailored to each grade level. Data on student participation are provided by Junior Achievement of Southwest Pennsylvania, Inc., for the Pittsburgh region.

## Entrepreneurial Attitudes

### Perception of a Near-Term Entrepreneurial Opportunity

Data derive from the Entrepreneurial Attitudes Survey for the Pittsburgh region, which is an adaptation of the publicly available GEM survey, 1999. The U.S. comparison data come from the Global Entrepreneurship Monitor study (1999), conducted jointly by Babson College and the London Business School.

### Adults Engaged in Entrepreneurial Activity

Data derive from the Entrepreneurial Attitudes Survey for the Pittsburgh region, which is an adaptation of the publicly available GEM survey, 1999. The U.S. comparison data come from the Global Entrepreneurship Monitor study (1999), conducted jointly by Babson College and the London Business School.

### Press Coverage of Entrepreneurship and Innovation

Using Dow Jones Interactive, a search was performed of five regional publications in Southwestern Pennsylvania, including Executive Report, Pittsburgh Business Times, Pittsburgh Post Gazette, Small Business News, and the Tribune Review.

The search included the following keywords: new business, new company, innovation, and entrepreneurship. The search was conducted for January 1990 through December 1999. However, search results were affected by the life span of the individual publications.

### Gathering Places for Entrepreneurial Development

Data come from the Entrepreneurial Industry Opportunity Survey.

### Entrepreneurship Is a Respected Occupation

Data derive from the Entrepreneurial Attitudes Survey for the Pittsburgh region, which is an adaptation of the publicly available GEM survey, 1999. The U.S. comparison data are from the Global Entrepreneurship Monitor study (1999), conducted jointly by Babson College and the London Business School.

### Does Business Failure Equal Personal Failure?

Data derive from the Entrepreneurial Attitudes Survey for the Pittsburgh region, which is an adaptation of the publicly available GEM survey, 1999. The U.S. comparison data are from the Global Entrepreneurship Monitor study (1999), conducted jointly by Babson College and the London Business School.

### Perception of Motivation to Act on Entrepreneurial Opportunities

Data derive from the Entrepreneurial Attitudes Survey for the Pittsburgh region, which is an adaptation of the publicly available GEM survey, 1999. The U.S. comparison data are from the Global Entrepreneurship Monitor study (1999), conducted jointly by Babson College and the London Business School.

### Preference for a Start-Up or Established Firm

Data derive from the Entrepreneurial Attitudes Survey for the ten-county region.

### Major Problem to Change a Job without Relocating

Data derive from the Entrepreneurial Attitudes Survey for the Pittsburgh region, which is an adaptation of the publicly available GEM survey, 1999. The U.S. comparison data are from the Global Entrepreneurship Monitor study (1999), conducted jointly by Babson College and the London Business School.



## Industry Cluster Definitions

Where possible, data were collected for the economic region of Pittsburgh. This region includes the following ten counties:

County	FIPS Code
Allegheny	42003
Armstrong	42005
Beaver	42007
Butler	42019
Fayette	42051
Greene	42059
Indiana	42063
Lawrence	42073
Washington	42125
Westmoreland	42129

### Defining Key Industry Clusters in Pittsburgh

The analysis of key industry clusters within Pittsburgh begins with a disaggregation of all Pittsburgh industry activity to the four-digit Standard Industrial Classification (SIC) code level. (SIC codes are set by the Executive Office of the President, Office of Management and Budget. These codes were last revised in 1987.) Employment, payroll, and the number of establishments for all four-digit industries are examined. Industry data are analyzed through the following measures:

#### Employment concentration relative to that of the nation

- Payroll per employee relative to the state average
- Average annual growth rate and absolute change of employment
- Absolute number of establishments.

Clusters are crafted from those interrelated SIC code industries that showed themselves to be individually significant according to the above measures.

#### Advanced Manufacturing

2431	Millwork
3542	Machine tools, metal forming types
3264	Porcelain electrical supplies
3544	Special dies, tools, jigs and fixtures
3269	Pottery products, n.e.c.
3545	Machine tool accessories
3291	Abrasive products
3547	Rolling mill machinery
3295	Minerals, ground or treated
3549	Metalworking machinery, n.e.c.
3297	Nonclay refractories
3555	Printing trades machinery

3315	Steel wire and related products
3559	Special industry machinery, n.e.c.
3363	Aluminum die-castings
3563	Air and gas compressors
3365	Aluminum foundries
3564	Blowers and fans
3366	Copper foundries
3565	Packaging machinery
3369	Nonferrous foundries, n.e.c.
3566	Speed changers, drives, and gears
3399	Primary metal products, n.e.c.
3567	Industrial furnaces and ovens
3423	Hand and edge tools, n.e.c.
3569	General industrial machinery, n.e.c.
3433	Heating equipment, except electric
3589	Service industry machinery, n.e.c.
3441	Fabricated structural metal
3593	Fluid power cylinders and actuators
3442	Metal doors, sash, and trim
3599	Industrial machinery, n.e.c.
3443	Fabricated plate work (boiler shops)
3612	Transformers, except electronic
3444	Sheet metalwork
3613	Switchgear and switchboard apparatus
3446	Architectural metal work
3621	Motors and generators
3451	Screw machine products
3625	Relays and industrial controls
3452	Bolts, nuts, rivets, and washers
3643	Current-carrying wiring devices
3462	Iron and steel forgings
3645	Residential lighting fixtures
3469	Metal stampings, n.e.c.
3646	Commercial lighting fixtures
3491	Industrial valves
3691	Storage batteries
3495	Wire springs
3821	Laboratory apparatus and furniture
3499	Fabricated metal products, n.e.c.
3822	Environmental controls
3532	Mining machinery
3825	Instruments to measure electricity
3536	Hoists, cranes, and monorails
3861	Mfg. — Photographic equipment and supplies
3541	Machine tools, metal cutting types
4961	Steam & Air Conditioning Supply



### Energy

1200 Coal mining  
 1311 Crude Petroleum and Natural Gas  
 1321 Natural Gas Liquids  
 1381 Drilling oil and gas wells  
 1382 Oil and gas exploration services  
 1389 Oil and gas field services, n.e.c.  
 2911 Mfg. — Petroleum refining  
 2992 Lubricating oils and greases  
 3569 General industrial machinery, n.e.c.  
 5171 Petroleum bulk stations and terminals

### Food Processing

2026 Fluid milk  
 2038 Frozen specialties, n.e.c.  
 2052 Cookies and crackers  
 2053 Frozen bakery products, except bread  
 2064 Candy and other confectionery products  
 2066 Chocolate and cocoa products  
 2077 Animal and marine fats and oils  
 2082 Malt beverages  
 2086 Bottled and canned soft drinks  
 5142 Packaged frozen foods  
 5143 Dairy products, exc. dried or canned  
 5144 Poultry and poultry products  
 5147 Meats and meat products  
 5148 Fresh fruits and vegetables  
 5149 Groceries and related products, n.e.c.

### Health & Environmental Technologies

2394 Canvas and related products  
 2834 Pharmaceutical preparations  
 2836 Biological products except diagnostic  
 2842 Polishes and sanitation goods  
 2865 Cyclic crudes and intermediates  
 2869 Industrial organic chemicals, n.e.c.  
 2899 Chemical preparations, n.e.c.  
 3589 Service industry machinery, n.e.c.  
 3812 Mfg. — Search and navigation equipment  
 3821 Laboratory apparatus and furniture  
 3823 Process control instruments  
 3824 Fluid meters and counting devices  
 3826 Analytical instruments  
 3827 Optical instruments and lenses  
 3829 Measuring and controlling devices, n.e.c.  
 3841 Surgical and medical instruments  
 3842 Surgical appliances and supplies  
 3843 Dental equipment and supplies  
 3845 Electromedical equipment

### High Performance Materials

1459 Clay and related minerals, n.e.c.  
 3241 Cement, hydraulic  
 2295 Coated fabrics, not rubberized  
 3255 Clay refractories  
 2673 Bags: plastics, laminated, and coated  
 3271 Concrete block and brick  
 2813 Industrial gases  
 3272 Concrete products, n.e.c.  
 2819 Industrial inorganic chemicals, n.e.c.  
 3273 Ready-mixed concrete  
 2821 Plastics materials and resins  
 3312 Blast furnaces and steel mills  
 2851 Paints and allied products  
 3316 Cold finishing of steel shapes  
 2865 Cyclic crudes and intermediates  
 3317 Steel pipe and tubes  
 2869 Industrial organic chemicals, n.e.c.  
 3325 Steel foundries, n.e.c.  
 2893 Printing ink  
 3339 Primary nonferrous metals, n.e.c.  
 2951 Asphalt paving mixtures and blocks  
 3341 Secondary nonferrous metals  
 2952 Asphalt felts and coatings  
 3351 Copper rolling and drawing  
 3011 Tires and inner tubes  
 3356 Nonferrous rolling and drawing, n.e.c.  
 3069 Fabricated rubber products, n.e.c.  
 3357 Nonferrous wiredrawing and insulating  
 3081 Unsupported plastics film and sheet  
 3398 Metal heat treating  
 3083 Laminated plastics plate and sheet  
 3479 Metal coating and allied services  
 3085 Plastics bottles  
 5051 Metals service centers and offices  
 3086 Plastics foam products  
 5052 Coal and other minerals and ores  
 3087 Custom compound purchased resins  
 5162 Plastics materials and basic shapes  
 3088 Plastics plumbing fixtures  
 5169 Chemicals and allied products, n.e.c.  
 3089 Plastics products, n.e.c.  
 5199 Nondurable goods, n.e.c.  
 3229 Pressed and blown glass, n.e.c.

## Industry Cluster Definitions

### Higher Education & Training

- 8220 Colleges and universities
- 8231 Libraries
- 8240 Vocational schools
- 8299 Schools & Educational Services, n.e.c.
- 8331 Job training and related services

### Information Technology & Communications Services

- 3571 Electronic computers
- 4830 Radio and television broadcasting
- 3577 Computer peripheral equipment, n.e.c.
- 4841 Cable & Other Pay TV Services
- 3661 Telephone and telegraph apparatus
- 7371 Computer programming services
- 3663 Radio and TV communications equipment
- 7372 Prepackaged software
- 3671 Electron tubes
- 7373 Computer integrated systems design
- 3672 Printed circuit boards
- 7374 Data processing and preparation
- 3674 Semiconductors and related devices
- 7375 Information retrieval services
- 3677 Electronic coils and transformers
- 7376 Computer facilities management
- 3678 Electronic connectors
- 7377 Computer rental and leasing
- 4812 Radiotelephone communications
- 7378 Computer maintenance and repair
- 4813 Telephone communications, exc. radio
- 7379 Computer related services, n.e.c.
- 4822 Telegraph & Other Message Communication
- 4830 Radio and television broadcasting
- 4830 Radio and television broadcasting

### Innovation & Business Services

- 7311 Advertising agencies
- 8712 Architectural services
- 7319 Advertising, n.e.c.
- 8713 Surveying services
- 7361 Employment agencies
- 8721 Accounting, auditing, & bookkeeping
- 7363 Help supply services
- 8731 Commercial physical research
- 7381 Detective and armored car services
- 8732 Commercial nonphysical research
- 7382 Security systems services
- 8733 Noncommercial research organizations
- 7383 News syndicates

- 8734 Testing laboratories
- 7384 Photofinishing laboratories
- 8741 Management services
- 8111 Legal Services
- 8742 Management consulting services
- 8611 Business Associations
- 8743 Public relations services
- 8621 Professional Membership Organizations
- 8999 Services, n.e.c.
- 8711 Engineering services

### Light Manufacturing

- 2434 Wood kitchen cabinets
- 3931 Mfg. — Musical Instruments
- 2522 Office furniture, except wood
- 3953 Marking devices
- 2541 Wood partitions and fixtures
- 3999 Manufacturing industries, n.e.c.
- 2599 Furniture and fixtures, n.e.c.
- 5039 Construction materials, n.e.c.
- 2676 Sanitary paper products
- 5078 Refrigeration equipment and supplies
- 2732 Book printing
- 5082 Construction and mining machinery
- 2782 Blankbooks and looseleaf binders
- 5084 Industrial machinery and equipment
- 2789 Bookbinding and related work
- 5085 Industrial supplies
- 3221 Glass containers
- 5093 Scrap and waste materials
- 3231 Mfg. — Products of purchased glass
- 5112 Stationery and office supplies

### Trade & Logistics

- 2653 Corrugated and solid fiber boxes
- 3412 Metal barrels, drums, and pails
- 3713 Truck and bus bodies
- 3715 Truck trailers
- 3743 Mfg. — Railroad equipment
- 4226 Special warehousing and storage, n.e.c.
- 4449 Water Transport of Freight n.e.c.
- 4491 Marine cargo handling
- 4492 Towing and tugboat service
- 4493 Marinas
- 4510 Air transportation, scheduled
- 4581 Airports & Airport Terminal Facilities
- 4741 Rental of Railroad Cars
- 5088 Transportation equipment and supplies

