

Entrepreneurial Pittsburgh: Uncovering the New Economy



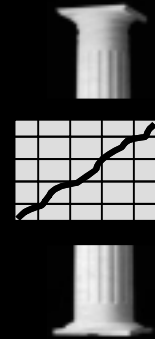
Talent



Venture



Technology



Startups

Key Findings & Policy Recommendations

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Introduction

A recent period of rapid technological innovation has fueled one of the largest economic expansions in United States history. For most of the twentieth century, successful regional and national economies were built on a manufacturing base that was geared toward standardized production of a large volume of goods. The wealth and economic success of a region stemmed from natural comparative advantages. However, the growth of information technology has revolutionized the nation’s economy. The resulting paradigm shift to the New Economy has been hallmarked by changes in four underlying economic factors: technology, human capital, start-up companies and venture capital financing. The *Entrepreneurial Pittsburgh* project explores the relationship between research universities and these four “pillars” of the New Economy, and examines how these factors interact with one another. The project also applies these findings specifically to Pittsburgh, Pennsylvania in order to formulate policy recommendations that may assist the region in its ongoing transition into the New Economy.

The methodology employed attempts to expand the theory that major research universities can play a significant and crucial role in the development of regional New Economic success. The role that the project team asserts is played by the university in the New Economy is diagrammed in the process model presented in Figure A.

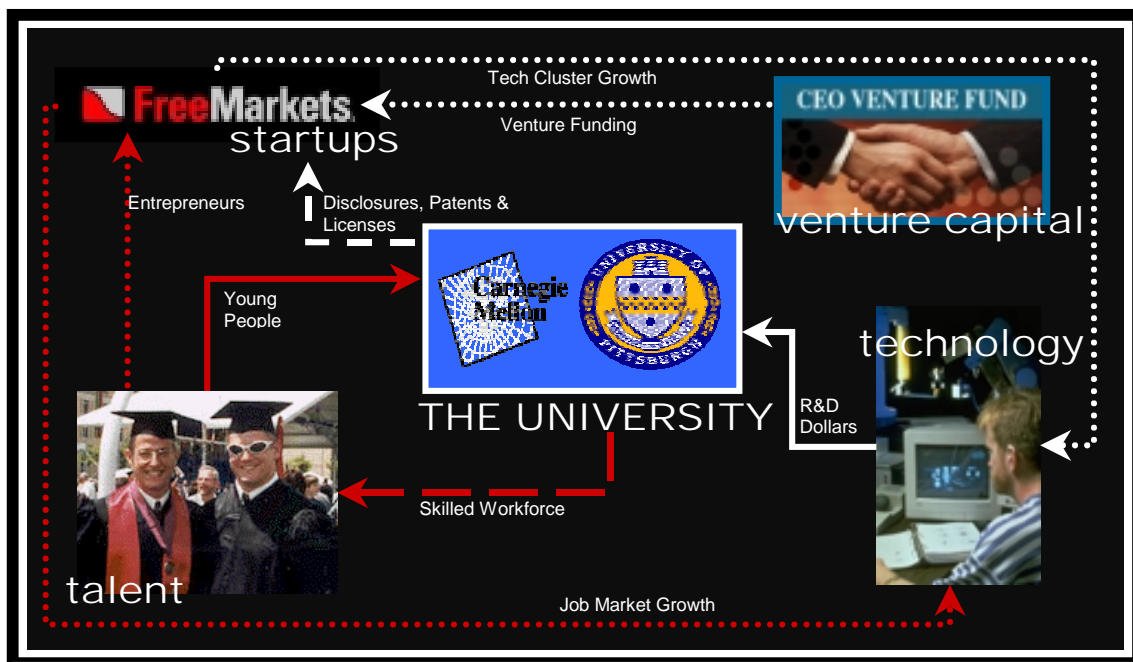


Figure A. Process Model.

As the model portrays, the university plays a key role in attracting students to a particular region. Universities bring in large numbers of students, and train those students in a wide variety of fields including those most important to the New Economy: business, engineering and the computer sciences. Knowledge-based jobs will make up 33% of total employment in the United States by 2006¹. As a result, the quality of a region’s workforce will determine that region’s ability to succeed in the New Economy.

The university also plays a key role in the transfer of technological research to the commercial environment. Both the federal government and private industries spend large amounts of money

¹ Robert D. Atkinson, Randolph H. Court and Joseph M. Ward, *The State New Economy Index: Benchmarking Economic Transformation in the States*, July 1999. p. 16.

in order to have faculty and students use university facilities and resources to research and develop new innovations. The Bayh-Dole Act of 1980² allows universities to take a percentage stake in the technological innovations discovered and refined on their campuses. This act, and the Federal Technology Transfer Acts of 1986 and 1989, encourages universities to turn their research into commercial ventures through disclosures, patents and licenses. Technological innovation is one of the most important drivers of growth in the New Economy³. A company's competitive advantage is now based on knowledge and the movement of concepts and intellectual property, rather than the movement of natural resources.

Through its talent attraction and retention activities, the university also plays a role in the development of start-up companies. Technically trained students are the most likely to form start-up companies, a major source of innovation in the New Economy. To succeed in this economy, companies must be flexible, and quick enough to capitalize on the latest innovations and bring products to market before competitors. Start-ups can accommodate the rapid pace of technological development. With time, these companies form high-tech clusters and lead to regional job market growth.

According to the 1998 Entrepreneurial Vitality Scorecard, a report on new business activity published by Carnegie Mellon University for the greater Pittsburgh region, venture capital is described as a "small but very important and visible source of investment capital and expertise for new businesses and . . . can be used as an index in measuring an entrepreneurial environment."⁴ Venture capital (VC) has replaced banks as the primary source of funding for high-risk entrepreneurial endeavors, based on VC firms' willingness to risk the considerable possibility of failure. In addition to funding, VC firms provide managerial experience and access to networks for business services. In exchange, the firms receive a percentage of the company's ownership. Venture capital firms do not simply invest in any company with promise. Instead, they invest in solid business opportunities, backed by not only a promising technological innovation, but also an experienced management team. Universities, in creating the environment in which companies can form, can also play a role in making those companies strong candidates for venture capital financing.

Methodology

In order to accurately study these four pillars of the New Economy, the project team conducted a significant amount of analysis, both quantitative and qualitative. Quantitative analysis has consisted of an examination of a wide range of research papers and data sources, examples of which include the Entrepreneurial Vitality Scorecard (1998), the AUTM Report and United States Census data, as well as academic works by professors Richard Florida and Don Smith, to name a few. In addition to previously published sources, the team collected new data regarding the four pillars including, but not limited to, 1999 venture capital investments, recent student migration and population data.

Qualitative analysis performed has included a number of surveys, both local and national in scope. These surveys were designed to add nuance and anecdotal evidence to support the quantitative data that was gathered. The Pittsburgh venture capital community was surveyed to gauge their opinion on the local investment environment and opportunities. Additionally, the project team conducted a survey of undergraduate and graduate students at Carnegie Mellon University. These students were in the fields of business, engineering and computer science. They were surveyed on the importance of job market and quality of life factors in making relocation decisions. They were also polled on their likelihood of starting their own companies.

² Florida, 1999.

³ Atkinson, Court and Ward, *The State New Economy Index: Benchmarking Economic Transformation in the States*, July 1999.

⁴ 1998 Entrepreneurial Vitality Scorecard, Carnegie Mellon University.

Using the collected data, the project team has been able to conduct a significant New Economy benchmarking study. The following Metropolitan Statistical Areas (MSAs) were selected and compared to the Pittsburgh region on a variety of factors.

Benchmark City	Local Research University
Atlanta, GA	Emory University, Georgia Tech
Austin, TX	University of Texas, Austin
Baltimore, MD	Johns Hopkins University & U of MD
Boston, MA	MIT, Harvard
Cleveland, OH	Case Western Reserve University
Madison, WI	University of Wisconsin
Minneapolis, MN	University of Minnesota
Philadelphia, PA	University of Pennsylvania
Raleigh-Durham-Chapel Hill, NC	UNC, Duke & NC State
St. Louis, MO	Washington University
San Diego, CA	University of California, San Diego
Seattle, WA	University of Washington

Figure B. Benchmark Regions.

These twelve benchmark regions were selected for several reasons. First, each contained at least one major research university. Many of these cities have also appeared in other Pittsburgh regional benchmarking studies. Lastly, the list of benchmark regions includes areas that are both comparable to the Pittsburgh region in size and history, and offer examples of New Economy “Best Practices”. For example, many of the benchmark regions have undergone economic decline as the Old Economy has transitioned into the New. Austin and Boston, specifically, have undergone significant economic change and have blossomed.

It is not enough, however, to show where Pittsburgh ranks in comparison to other regions. To show the connection between the “pillars” of the New Economy, the team created several correlation graphs. These graphs depict the interactions between factors, and not simply a region’s performance on individual factors.

These correlation graphs revealed that several cities excelled in many factors. Combined with the benchmarking analysis performed, the team uncovered best practices: examples of how regions were able to succeed in many factors. The team studied these practices and their ability to be replicated in other regions.

Finally, the *Entrepreneurial Pittsburgh* project offers several policy recommendations. Derived from both the correlations and best practices, these suggestions are meant to assist Pittsburgh in developing and nurturing its regional New Economy. These recommendations fall into two broad categories: **Incubating Opportunities & Capturing Innovation** and **Attracting & Retaining Talent**.

Incubating Opportunities and Capturing Innovation

As centers of intellectual exchange and practical training, major research universities serve as focal points of innovation. At the onset of this project, there was some question as to whether regions are capitalizing on the economic benefits of these innovations that stem from their local universities. After examining the commercialization process, the project team formed a model that captures the process in which innovation and discovery are often realized. In this model:

1. Research and development (R&D) money flows into the university, from such sources as corporate research divisions and government grants.

2. University students enrolled in computer & engineering programs create new innovations during the course of study.
3. With the help of university technology transfer offices, ideas can be disclosed, patented, and licensed.
4. Companies with enough real or perceived commercial appeal often benefit from venture capital investments.
5. As companies take root and grow in a particular region, they interact with one another and form social and commercial exchange centers known as 'tech clusters.' These areas are replete with networks of professionals and ideas, attracting further R&D and venture capital funding dollars.

As the data demonstrates, University research and development spending, particularly in Pittsburgh, is typically more concerned with the innovation itself rather than the commercialization of that innovation.

Testing the Process Model

Examining the correlations between various steps in the process tested the model. As seen in Figure C, a strong correlation exists between the amount of R&D spending in the benchmark regions in 1997 and the number of invention disclosures coming out of those regions' research universities in the same year. As a rule, more disclosures are emerging from better-funded environments. Such a correlation is expected and suggests that R&D funding is spurring intended innovations.

In light of this correlation, venture capital and subsequent business activity were investigated to determine whether these are attracted to a region when its universities are producing and disclosing high volumes of innovations. The correlation between the number of new invention disclosures coming out of the benchmark regions' universities and the subsequent venture capital activity in those regions is quite weak. The data generally suggests that the presence of an active research university or universities is an insufficient factor for an active venture capital market to develop.

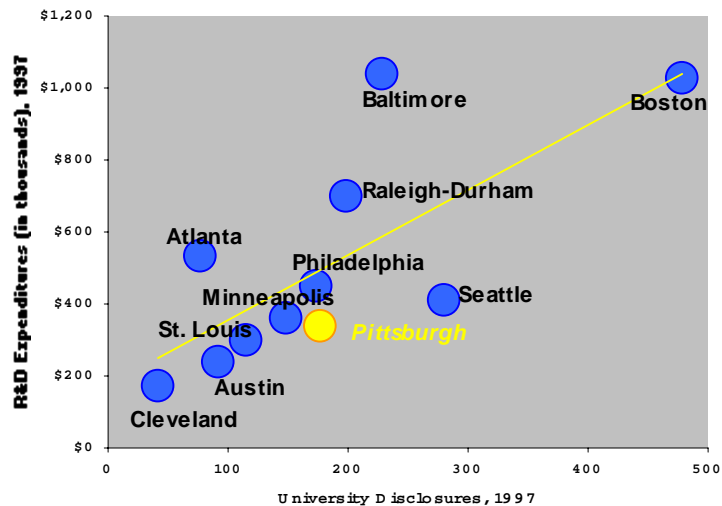


Figure C. R&D vs. Invention Disclosures, 1997.

Venture capital is by nature very flexible and mobile; much of it can be outsourced from financial centers to various regions and, as the evidence demonstrates, spending volumes can change dramatically over short periods.

But venture capital financing continues to drive the development of regional technology clusters. As seen in Figure D, among the strongest correlations is that between the benchmark regions' recent change in high tech employees, as defined by Department of Commerce Standard Industrial Classification (SIC) codes⁵ and the related change in those regions' venture capital funding level for similar periods.

⁵ US Census Bureau

Benchmarking Pittsburgh

Local venture capital firms were surveyed to further determine the importance of venture capital to growing Pittsburgh's New Economy. The PriceWaterhouseCoopers' Moneytree Report provides the most concise, helpful survey of venture capital data across U.S. regions. Regional totals for the number of VC deals and total amount of VC investment in 1995 and 1999 are represented in Figure E. While Pittsburgh's VC market has experienced considerable gains over this period, this news is tempered by the dramatic gains of many of our counterparts such as Seattle, Austin and Atlanta⁶.

REGION	Total Investment 1995	Total Investment 1999	Total Deals 1995	Total Deals 1999
Atlanta, GA	\$170,835,000	\$ 737,945,753	31	111
Austin, TX	\$ 76,052,168	\$ 794,693,805	14	109
Baltimore, MD	\$102,452,959	\$ 445,639,913	16	38
Cleveland, OH	\$ 24,741,000	\$ 36,647,000	7	13
Madison, WI	\$ 14,000,000	\$ 50,800,000	3	5
Minneapolis, MN	\$178,790,279	\$ 458,326,537	65	77
PITTSBURGH, PA	\$ 22,200,000	\$ 132,184,500	20	36
Philadelphia, PA	\$150,680,400	\$ 393,551,000	71	82
Raleigh-Durham, NC	\$ 95,156,000	\$ 58,012,917	23	43
Seattle, WA	\$156,458,698	\$1,183,654,248	34	133
St. Louis, MO	\$155,844,000	\$ 279,662,772	12	17

Figure E. Venture Capital Investment, 1995 & 1999.

Pittsburgh's R&D funding per capita is behind other cities, but the University of Pittsburgh and Carnegie Mellon University continue to use their R&D funding more efficiently. Based on statistics from the National Science Foundation (NSF) and the U.S. Census Bureau, Pittsburgh's ranks ninth out of the thirteen focus regions in university R&D expenditures adjusted for population. But according to a report by the Association of University Technology Managers (AUTM), Carnegie Mellon University has increased its patent efficiency by 400% between 1993 and 1997⁷.

The Pittsburgh region has also lagged behind others in technology related employment. Of the thirteen benchmark cities, Pittsburgh had the smallest share of its employment sector devoted to technology clusters between 1993-1997.

In essence, Pittsburgh's economy is inhibited by a disconnect between R&D funding and significant technology cluster growth. This situation prevents Pittsburgh from sufficiently translating R&D money and invention disclosures at the university level into VC, startups and growth in tech cluster activity. The local venture capital market, while improving, still lags behind many of the benchmark cities.

For Pittsburgh's technological economy to be jumpstarted, the fundamental pillars require more coordination. Studies have warned against the tendency for renowned yet isolated universities such as Johns Hopkins University in Baltimore to become export centers of innovations. In order to "link the basic research conducted at the university with a knowledge of the market and the

⁶ PricewaterhouseCoopers Moneytree Report, <http://www.pwcmoneytree.com>, March 2000.

⁷ A.U.T.M. Report, 1997.

commercial potential of any scientific discovery, an infrastructure to support innovation must be developed in that area.”⁸

Policy Recommendation: Incubation

For innovations born at the University of Pittsburgh and Carnegie Mellon University to become fully recognized by the local economy, Pittsburgh’s universities and regional leaders must pursue a more active process of incubating these ideas so that they may be commercialized. A business incubator as suggested by this recommendation (as opposed to those more traditional and, arguable, less effective incubators) is defined as “an economic development tool designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services.”⁹ In many of the benchmark cities, incubators are directing ‘pet’ companies toward the goal of accelerating successful entrepreneurial development through on-site and external contact assistance.

A largely hidden entrepreneurial impulse on the Carnegie Mellon campus was uncovered when Carnegie Mellon University students in the business, computer science and engineering departments were surveyed. About half of respondents wanted to start their own company. Many of these students, however, preferred more supportive locations such as California or Boston for their future startups.¹⁰ Such support feeds into the cyclical nature of the New Economy process model, in which our region could improve and reinforce the cultivation of startup companies, retain the talent to fill new job opportunities, bring in further venture capital investments to enhance commercial viability and attract more technology firms.

Case Study: Austin Technology Incubator

Since Austin consistently ranked at or near the top in New Economy growth factors, the project team examined their practices more closely. The Austin Technology Incubator (ATI) focuses on high-technology business ventures and is sponsored in conjunction with the City of Austin and the Greater Austin Chamber of Commerce. Since its inception in 1989, ATI has:

- ✓ Graduated 56 companies, 5 of which have gone public
- ✓ Added 2000 jobs to Austin’s local economy
- ✓ Raised almost \$200 million in capital
- ✓ Amassed total revenues exceeding \$900 million

Companies that apply must undergo a month-long assessment of their commercial appeal and viability. Only marketable, well-organized business ideas with strong profit potential receive incubation. In order to be incubated, companies must have 6 months of working capital, clear profit potential within five to seven years as demonstrated in financial projections and the ability to bring a product or service to market within 18 months.

Companies accepted as program tenants pay a monthly fee for incubator space and services equal to market-rate rent for equivalent office space. For its clients, ATI offers a very extensive support network, providing strategy, human resources, financing, marketing, public relations and access to space. Their professional staff consults and mentors new companies while providing assistance in recruiting qualified professionals and interns from the local student populations. Ventures that are accepted into the program receive office space outfitted with conference rooms, high-speed Internet access, and support workers. Tenants earn membership into The Capital Network, where they can make contact with venture capitalists and other appropriate funding

⁸ Feldman, Maryann, “The University and Economic Development: The Case of Johns Hopkins University and Baltimore.” 1994.

⁹ National Business Incubation Association (<http://www.nbia.org/prinprac.html>)

¹⁰ Survey of 104 students pursuing degrees in Business, Engineering, and Computer Science at Carnegie Mellon University, Pittsburgh, PA. Fall, 1999.

sources. Assistance with marketing research is provided so that entrepreneurs may more efficiently grow and find an appropriate niche.¹¹

Based on average/median numbers provided by the National Association of Business Incubators, a potential incubator project may be designed within the Pittsburgh, PA region.

- ✓ **Physical Space/Shared Resources:** A well-conceived incubator should include at the minimum several offices and physical space (the amount depends upon the size of the incubator) in relatively close distance to a major research university. It should also include but not be limited to mail pickup/delivery, copy and fax machines and secretarial services. An ideal location for this incubator would be in the Oakland area of Pittsburgh. It is within walking distance to two of the region's top research universities: Carnegie Mellon University, and the University of Pittsburgh. On average, business incubators supply 36, 657sq. ft. of occupiable space. Overall, incubators housed an average 20 firms in 1997.¹² A Pittsburgh-based incubator should strive to meet or exceed these numbers.
- ✓ **Counseling on Aspects of Business:** According to a national survey of business incubators, 96% of incubators supply assistance with business basics to their companies, and 89% provide marketing assistance.¹³ Support services should be provided in conjunction with university resources, such as professors and key university staff. These individuals could offer advice on business plans and marketing strategy. Professors specifically could lend their accumulated knowledge in the fields of software, electronic commerce and information technology. Students, another university resource, could be recruited as temporary workers, thus building connections between the university's student population and potentially successful high-tech companies.
- ✓ **Networking Opportunities:** A successful Pittsburgh-based incubator will leverage the power of the university to bring regional actors together. Through lectures, conferences and special events, the incubator should seek to build connections between start-up companies, leading researchers and established businesses within the region. Several events at Carnegie Mellon University, such as the Technology Opportunities Conference (TOC), can be used or expanded to include such activities.

Policy Recommendation: Targeted Marketing

As the region moves to a more technologically based economy, it must also enhance and coordinate its marketing strategy accordingly. Much of Pittsburgh's current marketing campaigns have focused on the city's 'livability' and the presence of amenities. While such efforts have attracted increased attention and tourism, this region's economy will truly grow with the presence of a vibrant business sector.

Regional marketing efforts can help spread awareness of business cultivation and related opportunities for workers and investors. Furthermore, strengthening local networks will require aggressively marketing various elements of the local economy to each other. Although Pittsburgh cannot lay claim to an industry titan like Microsoft or Cisco Systems, Pittsburgh must promote and celebrate the increasing number of prominent technology companies with local ties:

- ✓ *FreeMarkets* is a company that has created real-time online auction for industries. Their worldwide headquarters is in downtown Pittsburgh & they recently expanded their office space. The company posted a record \$10.8 million in revenues for the first quarter of 2000.¹⁴

¹¹ Austin Technology Incubator, <http://www.ic2-ati.org>

¹² National Association of Business Incubators.

¹³ National Association of Business Incubators.

¹⁴ Freemarkets, <http://www.freemarkets.com>

- ✓ *Marconi* is billed as a leader of global network communications solutions, providing enhanced speed and capability for Internet activity¹⁵. Their North American headquarters is located in Warrendale, PA.
- ✓ *Seagate* is the world's largest maker of computer disk drives. Based in California, the computer giant has decided to expand some of its operations to Pittsburgh. They plan to build a 40,000 square foot facility along the Allegheny River in the Strip District in order to capitalize on Carnegie Mellon's engineering expertise¹⁶.

The local real estate market must play a role in this coordination because the facilities exist to propel an even greater expansion. The Post Gazette reported earlier this month that office vacancies downtown and across the region increased during 1999, while companies absorbed less office space than the year before. In our region, the supply of commercial space is outpacing demand, so those professionals responsible for technology incubation and startup cultivation have the potential space in which to work. The only question is whether partnerships can be formed to invest in and work towards such goals and attract the necessary capital and talent to make this happen.

Attracting and Retaining Talent

The Pittsburgh region is not fully realizing the world-class research of its universities. The region does not possess the "critical mass" of agglomeration believed necessary to experience the substantial local economic effects of academics. Simulations of university knowledge effects suggest that pure university based economic development policies are not effective enough to upgrade a region such as Pittsburgh to a higher tier of innovative activities, (e.g. Austin, Boston.).¹⁷ A region's ability to attract and retain knowledge workers (human capital) is crucial in determining its ability to generate and sustain a high technology industry. In the New Economy, regions prosper if they are able to develop a human infrastructure of knowledge workers who can apply their managerial, technical, and intellectual skills in the production process.¹⁸ Knowledge-intensive and information-based jobs are driving this unprecedented economic expansion. Consequently, formal education and training systems have emerged as the *sine qua non* condition to succeed in this knowledge-intensive economy.

In the process model, the university acts as the primary source of technological innovation, knowledge creation and talent formation. Another critical and often neglected role of the university is "a collector of talent."¹⁹ A prestigious university with a 1) solid and steadily growing research and development base, 2) prominent professors and research scientists, and 3) a proven track record of commercializing innovation, presumably attracts an increasing number of smart and energetic students. The percentage of students who remain in the region will increase the regional pool of knowledge workers or possibly create new start-up companies that invigorate the regional economy.

The Pittsburgh region's talent attraction and retention efforts are experiencing mixed results. Carnegie Mellon University, the University of Pittsburgh, and other regional universities are doing an increasingly better job of attracting talent to the region.²⁰ Conversely, the Pittsburgh MSA struggles to attract a younger employment base and retain its graduates. A closer analysis of migration patterns indicates that Pittsburgh the lowest out-migration figures when compared to the 25 largest MSAs. Out-migration rates show the percent of population leaving the region in

¹⁵ Marconi, <http://www.marconi.com>

¹⁶ Seagate, <http://www.seagate.com>

¹⁷ Varga, Attila, "Universities and Regional Economic Development: Does Agglomeration Matter?"

¹⁸ Florida, Richard, "Toward the Learning Region," *Futures* 27, 5 (June 1995): 527-536.

¹⁹ Florida, Richard, "The Role of the University: Leveraging Talent, Not Technology," *Issues in Science and Technology*, Summer 1999: 67-73.

²⁰ C.E.D. Migration Data

relation to the base population at risk of out-migrating. The Pittsburgh region also has the third lowest in-migration rate (23rd of the 25 MSAs). In-migration rates show the percent of population entering the region in relation to the base population. The problem clearly lies in the region's inability to attract new residents.²¹ While local universities play a critical role in attracting talented students from a wide geographic base, the region's ability to remain attractive to outside talent in the long run will depend upon two major factors: *employment opportunities* and *amenities*. Despite improved student attraction efforts made by local universities, if the region lacks well-publicized and promising employment opportunities and amenities, the region can expect continuing outward migration trends and high technology employment figures.

Since the younger population is the most likely to undertake the risks associated with an entrepreneurial venture, the region's ability to generate startup companies is greatly diminished by its inability to retain adequate levels of talent. The lack of substantial startup activity, in turn, does not allow the region to achieve significant gains in both the size and the strength of its technology and overall job market.

Testing the Model

Data analysis has shown that the growth of technology clusters in a region is strongly correlated to a number of factors. Among them, overall population growth, young population growth, and educated population growth show a significant relationship with the region's ability to realize high technology cluster growth.

In particular, there appears to be a significant positive correlation between overall population growth and the total number of high technology establishments in a region. The Pearson

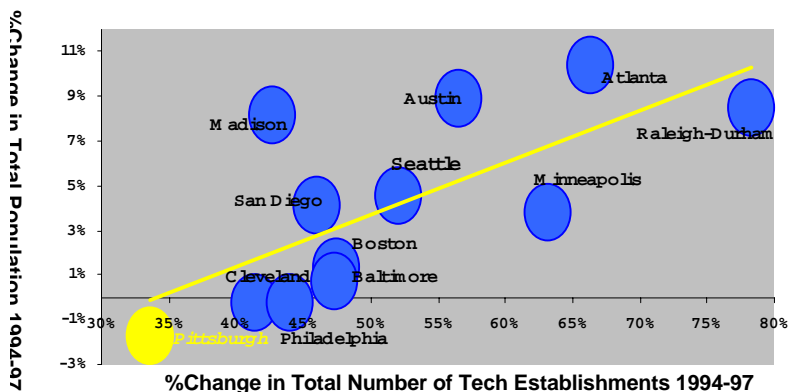


Figure F. Population Growth vs. Tech Establishment Growth, 1994-97.

Correlation of 0.703 does not however explain the causality between population growth and high technology establishments. As shown in Figure F, Pittsburgh ranks last among our benchmark regions in growth of both overall population and high technology establishments from 1994 to 1997. Similar disappointing results were obtained when overall population was

separated into its three critical components: natural increase, domestic migration, and international migration. Pittsburgh's natural increase, domestic migration, and international migration from 1990-1998 were 0.5%, -2.4% and 0.4% respectively.²²

A positive relationship also exists between the percentage of the population in the 20–29 age cohort and the percentage of establishments in high technology sectors in a region. As stated earlier, this segment of the population is the most likely to undertake the risks associated with an entrepreneurial venture.

²¹ Bob Gradeck, "Are young people really fleeing the Pittsburgh region in droves?", Center for Economic Development, Carnegie Mellon University. <http://www.heinz.cmu.edu/ced/topics/T1Migration/pittsburgh.html>

²² U.S. Census, 1998.

The research also reveals a positive correlation between the growth of high technology employment and growth in the number of educated people with Bachelors and Masters degrees in a region (Pearson Correlation = 0.708, P-Value = 0.007).²³ Pittsburgh experienced solid growth in both areas between 1994 and 1997. Yet in spite of the growth, Pittsburgh was still behind many of our comparable benchmark regions in 1997, with only 2.49% of establishments categorized as high tech, 5.79% of employees considered high tech, and 9.5% of the population falling into the 20-29-age cohort. The benchmark averages for these three measures were 3.66%, 8.28% and 14.20% respectively.²⁴

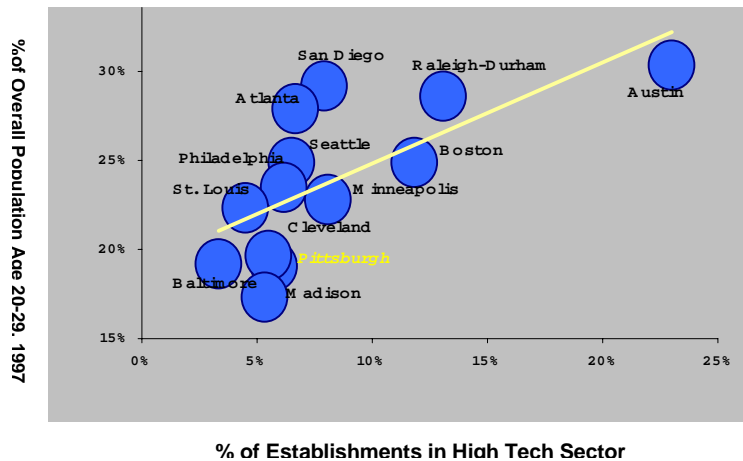


Figure G. Young Population vs. High Tech Establishments, 1997.

Benchmarking Pittsburgh

Pittsburgh performs poorly on relevant population and high technology employment measures when compared to our benchmark regions. Furthermore, these results are strongly related to the region's most problematic issues of population attrition, youth exodus, and brain drain. It has been well established and documented that the Pittsburgh MSA has suffered for a number of years from a substantial loss of population. In fact, Pittsburgh was the only region among our benchmarks (which included comparable cities such as Baltimore, St. Louis, Cleveland, and Philadelphia) to experience overall population attrition from 1990 to 1998.²⁵ Substantial net migration loss has taken place despite out-migration rates that are among the lowest of all other large metropolitan areas. Similarly, the percentage of all establishments in the high technology sector is below our benchmark averages.

The relationship between a strong high technology business sector and young, talented and risk-averse workforce is cyclical and certainly more complex than a linear correlation model. However, our data illustrates that the formation of a high technology business sector proves onerous without a sufficient number of knowledge workers to staff the industry. The data analysis paints a clear picture of where Pittsburgh can focus its efforts in order to succeed in the new economy. The following policy recommendations emphasize the roles of research universities, local companies, entrepreneurs and public officials in: 1) attracting the brightest young students and middle management, and 2) building the commercial infrastructure to retain them.

Policy Recommendation: Regional Job Market Improvement

In order to capture talent, regional efforts and funds must be focused on improving the local job market. The strong statistical correlation between job market factors and talent location decisions indicates that the key to attracting young educated people rests in providing them with ample career opportunities. Survey results suggest that *amenities may in fact only become relevant when career considerations are on an even playing field*. A strong majority of graduating Carnegie Mellon seniors studying computer science, engineering and business has stated that

²³ U.S. Census 1997

²⁴ U.S. Census, County Business Patterns 1997 & U.S. Census, Current Population Survey 1997

²⁵ U.S. Census, 1998.

“job market factors” are the most important variable when deciding on employment locations.²⁶ The Pittsburgh region has made substantial gains in improving the amenities of the region, including two new stadiums, a new convention center, and the pending construction of a downtown retail mecca. Furthermore, favorable cost of living and quality of life measures indicate that Pittsburgh can afford to redirect its efforts towards building a high technology business sector.

Policy Recommendation: Loan Forgiveness Program

The Pennsylvania Higher Education Assistance Agency last October established two New Economy scholarship programs that focus on improving the Commonwealth’s technical workforce. In order to qualify for either scholarship, students must agree to work full-time in Pennsylvania for one year for each year they receive a scholarship. “The idea behind offering both of these scholarships is that they will create a pool of highly trained technical workers who live and work in Pennsylvania. This resident workforce will improve the state’s ability to attract new high-tech companies and help slow the migration of highly trained workers out of Pennsylvania,” says State Rep. Rosita Youngblood, D-Phila.²⁷

The Sci-Tech scholarship is available to residents enrolled in full-time science or technology bachelor’s degree programs.²⁸ Students must apply during their sophomore, junior or senior year and must maintain a minimum of a 3.0 grade point average. Sci-Tech recipients must also complete an internship or relevant work experience in a science or technology related field with a Pennsylvania company before receiving their degree. Grants can reach a maximum amount of \$3,000 per year.

The GI Bill for the New Economy is another Commonwealth scholarship initiative that is “awarded to Pennsylvania high school graduates who are not pursuing four-year university degree but who desire training in the technology-based economy. The scholarships are available for a maximum of two years, or three in limited cases. To qualify, students must be a full-time resident of Pennsylvania enrolled in a science or technology program at a community college, two-year college or technical school. Students must have had a 3.0 grade point average in high school and must maintain that average during their studies or training.”²⁹ The GI bill will grant up to \$1,000 per year to the recipient.

Statewide programs such as Sci-Tech and the GI Bill for New Economy will certainly benefit Southwestern Pennsylvania over the next five years. Adopting similar scholarship programs specific to Pittsburgh will have a more concentrated impact on the region. Furthermore, a more prominent, highly selective and substantial scholarship program that promotes both the academic excellence of Pittsburgh’s universities and the region’s business opportunities will attract talent capable of catapulting Pittsburgh into the next tier of New Economy cities. Funding for such scholarships should be a joint effort between the universities, local technology companies and private foundations. Coordination between regional stakeholders in either the organization or financial development of such a scholarship program will enhance cross-sector relationships.

Regional Student Tracking Database

Our data analysis indicates that Pittsburgh is struggling to attract the young technical professionals necessary to emerge as a leading region of the New Economy. Pittsburgh universities are able to attract bright students from all areas of the United States and several foreign nations. The ability to accurately track students from matriculation to graduation will strengthen the region’s ability to retain the universities’ brightest. Current university data offers overall in and out migration of the incoming and graduating class. Although this allows for time

²⁶ University Migration figures

²⁷ <http://www.pahouse.com/youngblood/pr/198102199>

²⁸ PHEAA www.pheaa.org

²⁹ *Ibid.*

series analysis, it does not enable university administrators and regional policy makers to monitor students' progression and geographic movement. The implementation of a regional database will require orchestrated coordination between admission and alumni/development offices. Although regional universities are technologically equipped to implement such a system, internal administrative impediments suggest the need for an outside third party to initiate the preliminary stages.

Best Practice

Georgia Institute of Technology's Office of Institutional Research and Planning is responsible for the development and maintenance of data resources to support the strategic planning and policy-making processes at Georgia Tech. IRP facilitates the flow of accurate, timely information and assists all levels of management in defining issues, selecting research designs, obtaining information and interpreting results.³⁰ The IRP's Annual Factbook is a valuable source of information on students and alumni. Their tracking efforts have become more comprehensive over the last five years and have expanded to include:

- ✓ numbers of incoming students by Georgia county of residence
- ✓ number of incoming students by state
- ✓ total alumni by GA county of residence
- ✓ total alumni by state and country

Networking & Recruiting Strategy

Career development offices and smaller *local* technology companies must continue to improve communications during the recruiting process. The universities' primary concern is to offer graduating students the best possible employment opportunities based on student preferences. Although career development offices cannot actively steer students towards Pittsburgh companies, networking events involving Pittsburgh firms can be emphasized and scheduled to take advantage of opportunities that benefit both parties. Recent events such as Carnegie Mellon's T3 Conference³¹ and the Enterprize: The Pittsburgh Business Plan Competition³² provide venues for the business community, venture capitalists and the talents students to interact. Reaching qualified and talented students at the *earliest stages* of the recruiting process is essential in attracting the best and brightest. Many of our country's big players (IBM, Hewlett-Packard, Cisco) "pour millions into their intern programs, recognizing that the payoff will come in easier recruiting and a good reputation. But even small companies can attract highly skilled interns by emulating successful programs already in place at other companies."³³ Successful programs provide interns with more than experience and a paycheck. In addition such programs offer:

- ✓ Mentoring programs
- ✓ The opportunity to participate on teams working on live projects
- ✓ Access to upper-level management and outside activities
- ✓ Monitoring of intern's satisfaction with the program

When students weigh internships, they look for projects using some cutting-edge technology that will augment their classroom experiences and give them opportunities to grow," says Judith Mancuso, Carnegie Mellon's assistant director of employer relations and recruiting."³⁴

³⁰ <http://www.irp.gatech.edu/>

³¹ <http://www.t3conference.org/>

³² <http://www.enterprizepgh.com/>

³³ Stewart Deck, "6 Degrees of Hire Learning", CIO Magazine, 1 March 2000.

http://www.cio.com/archive/030100_intern_content.html

³⁴ *ibid.*

Policy Recommendation: The Oakland Strategy

The University of Pittsburgh and Carnegie Mellon both lay claim to being top national research universities.³⁵ In addition to having substantial research and development expenditures, our universities possess highly ranked programs in business, computer science, medicine and engineering. However, the region's recent and most prominent capital investment decisions have failed to include Oakland in the equation. Oakland

- ✓ Possesses two of the region's largest employers³⁶
- ✓ Possesses two premiere research universities
- ✓ Holds a concentration of students who will evolve into future entrepreneurs
- ✓ Is the provenance of technological innovation

The process of "incubation" will play an essential role in the future economic development of Oakland. Local officials can directly influence Oakland's amenities. Opportunities such as the Pittsburgh Airborne Shuttle System (PASS) will provide a needed improvement to the transportation infrastructure. Leading technology companies prefer close proximity to our universities' technology and expertise. Tax-free zones also offer strong incentives for technology companies interested in the region.

Conclusion

An economic development strategy that recognizes the importance and strengths of our research universities will further Pittsburgh's attempt to emerge as a leader in the New Economy. The commercialization of university research and technological innovation depends upon a "critical mass of agglomeration" in technology sectors such as information technology, biotechnology and post genomics. Data analysis indicates that technology cluster formation in the Pittsburgh MSA remains below levels necessary to fully appreciate the impact of the universities' research. Incubation and marketing strategies will begin to alleviate this shortfall. Pittsburgh must also continue its efforts of attracting and retaining entrepreneurs. Prestigious technology scholarships, improved communication between smaller Pittsburgh technology companies and university career development offices, and an Oakland that lives and breathes the New Economy are critical to the region's success.

³⁵ National Science Foundation 1997.

³⁶ Pittsburgh Business Times 2000

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Data source for industry and employment trends, demographics of industries, and manufacturer's index. The site contains a Directory of Technology Companies that we utilized to assess progress.

<http://www.corptech.com/ResearchAreas/ResearchAreas.cfm>

CUED

Council for Urban Economic Development. A research resource for economic developers.

<http://www.cued.org/research/>

Edgar-Online

Initial Public Offering Information nationwide and sorted by state and city

<http://www.edgar-online.com/ipoexpress/supersearch.asp>

JCSM – Jay Computer Services

Search engine for regional data by zip code.

<http://www.jcsm.com/>

Langenberg Online

Detailed Zip Code maps and cross referencing tools. Census information by county and city

<http://zip.langenberg.com/>

Lexis-Nexis

Congressional Information Service (CIS) publications for Congressional and academic statistical information.

<http://web.lexis-nexis.com/statuniv>

Massachusetts Institute of Technology - "MIT, the Federal Government and the Biotechnology Industry: A Successful Partnership"

This report discusses one university's myriad influences on the U.S. biotechnology industry.

<http://web.mit.edu/newsoffice/www/BioStudy.html>

Munisource – United States Municipalities

A collection of data and information on counties and cities sorted by state.

<http://www.munisource.org/municipalities/usa/>

National Association of Realtors

Information source for the U.S. real estate market, contains a data bank with metropolitan median housing prices.

<http://nar.realtor.com>

PricewaterhouseCoopers Moneytree Survey

Quarterly Survey of the national venture capital community.

<http://www.pwcmoneytree.com>

Small Business Association - "Small Firm Innovative Success: External Resources and Barriers"

A study that investigates the factors that contribute to small business innovative success.

<http://www.sba.gov/ADVO/research/rs182.html>

U.S. Census Bureau - County Business Patterns

The County Business Patterns is an annual series that provides sub national economic data by industry.

<http://tier2.census.gov/cbp/info.html-ssi>

U.S. Census Bureau - CBP Definitions and Information

Provides definitions and information pertaining to the County Business Patterns.

<http://www.census.gov/pub/epcd/cbp/view/genexpl.html>

US Department of Housing and Urban Development

Contains research and data sets on the fair market values of housing in U.S. cities from 1983 to the present.

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VentureExpert

Online database of venture capital investment information sponsored by Venture Economics, a division of Thompson Financial Securities Data.

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