Fanning the Flames of Economic Progress: Igniting Greater Rochester's Entrepreneurial Economy

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Executive Summary

Greater Rochester has the assets necessary to develop a strong entrepreneurial economy. Indeed, the Rochester area surpasses most regions in the United States on many dimensions relevant to supporting innovation and entrepreneurship. However, to date, the region has not become an entrepreneurial success story.

To understand why, an analogy to building a fire is useful. To successfully construct a fire, one must have kindling, oxygen, and a spark. The kindling must be organized in a way so that the various pieces are linked to support the spread of a nascent fire. Sparks, either intentional or coincidental, must contact the fuel to start a flame. For the flame to spread, there must be a consistent flow of oxygen throughout the process.

While the elements necessary to build an entrepreneurial fire exist in Greater Rochester, these elements are not always linked or structured in a way that is conducive to innovation. The region has idea-generating companies and universities, a strong corps of scientists and engineers, skilled technicians, trained managers, strong educational institutions at secondary and post-secondary levels, financial capital, and community leaders dedicated to making the region succeed. While there are many innovators, their efforts are typically not pursued within start-up companies. Innovations stay "locked" in companies or universities. While there is capital, it is rarely organized into angel groups or venture firms. While there is a supportive set of government agencies, too often their focus has been on internal disputes rather than collaborative promotion of the region.

A fundamental challenge is cultural -- the region lacks a strong entrepreneurial environment. Put another way, the "entrepreneurial oxygen" layer is thin. Unlike successful innovation regions such as Austin and Silicon Valley, there is not a pervasive risk-taking culture when it comes to new ventures. Instead, Rochester area business people tend to be conservative, both in their investment strategies and personal willingness to pursue entrepreneurial careers.

This is understandable. The region is, in many ways, a victim of its own success. Hosting large established companies like Kodak, Xerox, and Bausch and Lomb has allowed the region to enjoy impressive economic stability over the last century. The success of these companies has allowed employees to generate significant personal wealth without having to face the risks associated with changing jobs or starting a new company.

Over the past decade, the decline of Rochester's industrial giants has created significant economic turmoil for the region. Unemployment has risen and wages stagnated as traditional manufacturing jobs have disappeared. Outward migration, particularly among younger people, has increased as employment options decline.

The silver lining of this decline is that the business culture is changing. Slowly, regional residents are recognizing that it is no longer possible to expect lifetime employment and that even the "big boys" may not bounce back. Starting in the mid 1990s, the region began to see significant growth of local firms in the telecom industry. With companies like Frontier, Choice One, and Paetec, it seemed possible that the region could establish itself as a leader in a booming industry, creating a number of firms that could serve as well-known examples of entrepreneurial success. However, the industry conditions internationally took a drastic downward turn in the tech bust. To continue the analogy, the fire was doused with water.

But the embers still burn. Some of the telecom companies survived and are growing again. Driven by the need to find work and a strong desire to stay in the region, local entrepreneurs remain in the area. Investors, while disappointed by their experience with telecom investments, are still willing to consider new opportunities. Government and economic development leaders are realizing that supporting local firms, including start-ups and small firms, must be a major part of any economic revitalization. A new spirit of collaboration between economic development entities is manifesting itself in new coordinated efforts. Discussions about entrepreneurship are frequently overheard at business gatherings and referenced in the local business press. The oxygen flow is increasing.

In addition, many institutions have been developing programs aimed at strengthening the assets necessary to support innovation-based development and ensuring these assets are well networked. In the past few years, venture capital firms have formed, angel networks organized, and incubators launched. Cluster organizations around optics, life sciences and information technology have been formalized. Business schools and community colleges have developed new programs and curricula aimed at teaching entrepreneurship. The region, led by large firms and universities, and supported by state government funds, has created a new center for research and commercialization of photonics and microsystems.

The entrepreneurial economy in Greater Rochester seems to be on the verge of igniting again. The ingredients for success are there, but there are still challenges to address and ongoing efforts to support. These include: strengthening the entrepreneurial culture, forming more risk capital investment groups, educating the business and political community about the relevance of innovation-based growth, expanding the cluster concept, and improving Rochester's image outside of the region. This report describes these challenges and offers recommendations to address them.

Introduction: Regional Prosperity and Regional Innovation

Improving the standard of living for community residents is the ultimate goal of all economic development efforts. Thus, the first step in examining a regional economy is assessing metrics of prosperity, as these are the ultimate output of any economic development strategy. Prosperity is both a tangible and intangible indicator. Real measures of financial success exist and include indicators such as poverty, per capita income, and unemployment. However, to capture the fuller meaning of prosperity it is also critical to gauge residents' self-assessment of their quality of life.

Underlying this economic performance is the innovation performance of a region. Global economic integration has fundamentally changed the competitiveness equation for the United States and all of its regions. US regions can no longer rely on low wage, low-tech economies to drive job growth and wealth generation. Instead, continual innovation -- the ability to transform new ideas and new knowledge into advanced, high-quality products or services – is the only sustainable mechanism by which regions can succeed.

To measure innovation in a region we look at a variety of measures that track the innovation process from idea generation to idea development through commercialization. For the idea generation phase, measures like invention disclosures and patenting by regional institutions are evaluated. Moving through the process, university licensing and spin-out formation are examined. For commercialization, the assessment considers the amount of venture capital investment as well as the number of firm births and fast growth firms.

Assessing the Regional Innovation Environment

The regional innovation environment provides the arena in which firms and support institutions operate. Firms utilize the regional innovation assets available in their operations. Strong assets allow firms the widest set of strategic options and support more productive execution of operational plans. Weak assets limit strategic choice and can lead to inefficient implementation. While a strong regional innovation environment does not guarantee a prosperous regional economy, a weak innovation environment almost always ensures an under-performing one. In assessing the innovation environment, a variety of assets and conditions that support innovative operations are considered. These include.

- Human Capital
- Legal and Regulatory Environment
- Transportation and Communications Infrastructure
- Financial Capital
- Research and Development Institutions
- Quality of Life
- Existing Industrial Base

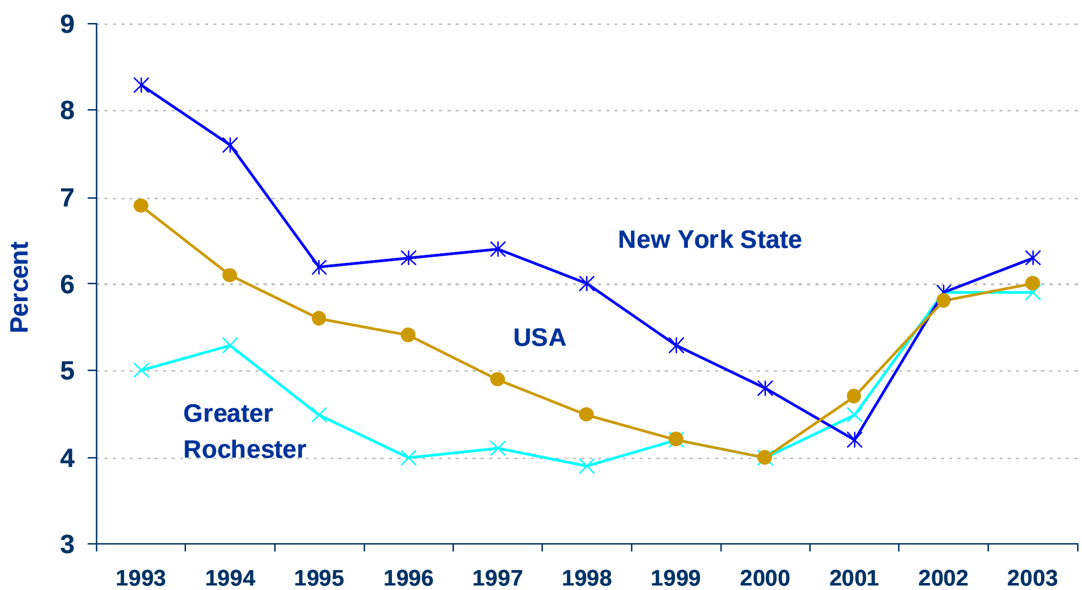
To be effectively utilized, the actors that influence these assets must work together. Often regions with strong innovation assets falter because they do not enjoy strong linkages between the people and institutions that could support innovation. In a common example, major research universities generate many ideas; however there is no strong linkage with the local entrepreneurial community who could transform those ideas into products and services. Well-linked regions are also more likely to foster clusters of related and supporting industries

Underlying the level of connectedness are leaders' attitudes toward collaboration and risk-taking. Cultural norms about innovation and entrepreneurship are a critical facet of a regional innovation system. Regions where business failure is seen as acceptable and where industry participants are willing to share non-proprietary information tend to support innovation. Further, regions that welcome people from diverse backgrounds and experiences are more likely to develop a strong innovation environment. The project survey and interview process were designed to offer insight into the networks and linkages that support innovation in a community as well as into the regional attitudes that bolster or retard innovation.

Greater Rochester Economic Performance and Regional Prosperity

Overall economic performance in the Greater Rochester Region has been flat or declining in the past five years. Over the past decade, the Rochester region has fallen behind New York State and U.S. performance in key areas like unemployment rates and average wages.

Greater Rochester, State and National Unemployment Rates, 1993-2003



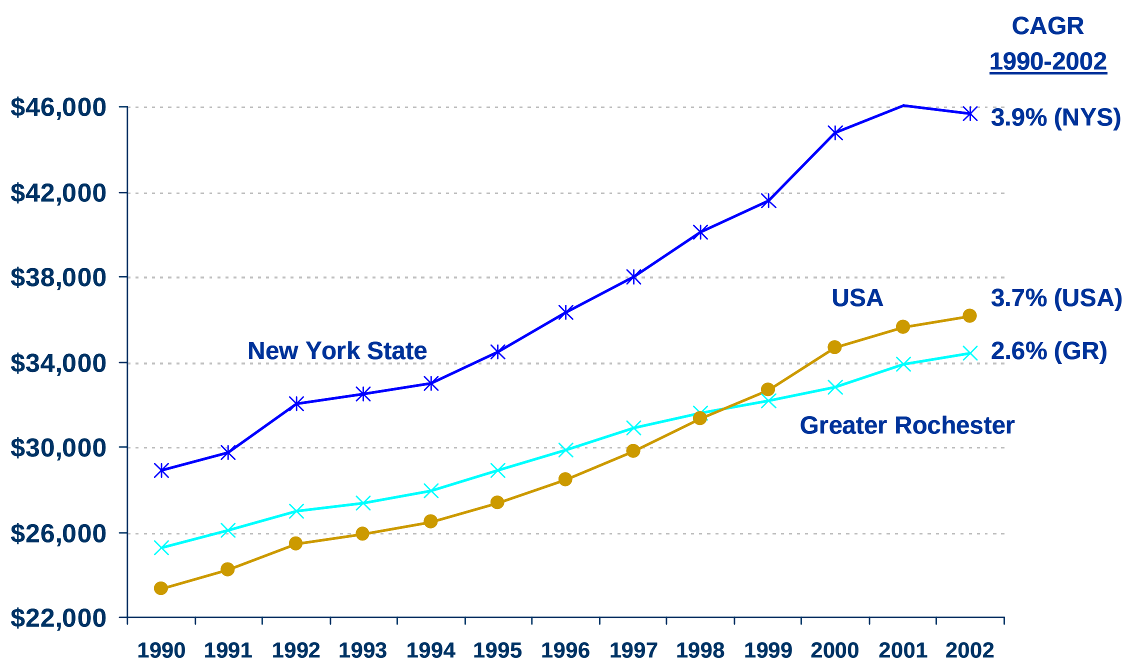
Source: US Bureau of Labor Statistics
Note: Average annual unemployment, not seasonally adjusted

In 2003 the Rochester metro area averaged an unemployment rate of 5.9%, above the national average of 5.7%. In January of 2004, the rate hit 6.9%, the highest levels of unemployment of any month in the past decade.

The Rochester MSA average wage of $34,423 in 2002 was below US and New York State averages of $36.167 and $45,667 respectively. Rochester had outpaced the US average until 1998 when US wages first surpassed those of the Rochester MSA. In 1990, Rochester's average wage was 105% of the US average and 84% of the New York State average. In 2002 those numbers had dropped to 95% and 75% respectively.[1] (See chart below)

Another measure of wealth generation, per capita income, shows similar weakness vis-à-vis state and US averages. In 2001, the Rochester MSA per capita income was $29,870, and trailed both the state and US averages. From 1990 to 2001, the compound average growth rate of per capita income in Rochester was only 2.1% a year, while in the US it was 5.9% and New York State, 5.0%.

Greater Rochester, New York, and United States Average Wages, 1990-2002



Source: U.S. Bureau of Economic Analysis
Note: Dollars in Nominal Terms

On a positive note, the historical strength of the Rochester economy (along with some out-migration) has allowed the region to maintain a median household income level above the United States average and a poverty level below the norm.[2] The relatively low cost of living

[1] US Bureau of Economic Analysis
[2] US Census Bureau and Economy.com data

and low housing prices allow regional residents to have a higher quality of life on a lower income.

The economic downturn has been driven in large part by the decline in the region's traditional manufacturing sector, led by job cuts at many of the largest private sector employers. According to the *Wall Street Journal*, Kodak, Xerox, and Bausch and Lomb alone eliminated 22,000 jobs in the area from 1993 to 2003.[3] Early this year, Kodak announced job cuts of approximately 4500 additional jobs in the region.[4] Other smaller manufacturers are also feeling the pressure and many have gone out of business or increased operations in other places. In the mid to late 1990s, the telecommunications sector saw a significant increase in new firm growth and expansion of existing firms. However, the international decline of the Internet and communications industries in the early 2000s wiped out many of these firms and dealt the regional economy another setback. Today, the communications firms that survived the telecom bust are hiring again and firms in the optics and imaging industries are growing. Other areas of growth include information technology, life sciences and higher education.

Innovation Performance

The innovation performance of a region is a critical contributor to its overall economic prosperity. In the increasingly global economy, US firms must innovate in order to compete as traditional advantages related to low cost labor and access to raw materials decline. Regions that are unable to support innovative firms will lose the single most important source of long-term growth potential.

Innovation is defined as a process by which new ideas are transformed into new or improved products or services. It is important to emphasize that invention – the creation of a new concept or thing – does not necessarily mean innovation has occurred. For the invention to be relevant it must have a specific application that is appreciated by some customer. To reflect the innovation process, we divide our assessment into idea generation, idea development, and commercialization.

Idea Generation

The Rochester region scores very highly on patenting, one of the key first stages of developing a commercializable innovation. Regional organizations patent at close to six times the national average (2.33 patents/1000 workers vs. .40 patents/1000 workers in 1998). However, patents are highly concentrated in the hands of two large companies: Eastman Kodak and Xerox. According to the US Patent and Trademark Office, fully 80% of all regional patents granted from 1995 to 1999 (most recent data available) were to those

[3] "Job Seekers Face Uphill Fight In Distressed Company Towns. " Wall Street Journal, Jan 27 2004, Page B8. Kembra J Dunham
[4] "Kodak to Reduce Its Work Force by Up to 15,000, " New York Times, January 23, 2004, David Cay Johnston.

two firms. The University of Rochester, the only educational institution listed as having any patents, had only 32 over that five-year period.

The University of Rochester scored in the middle range on the productivity of its inventions and patenting. Over the 1996 to 2000 time period, the U of R ranked 65th among 117 reporting US educational institutions in number of inventions disclosed per $1m in spending on research. According to the Chronicle of Higher Education, the region ranked 73rd among 117 reporting US institutions in number of patent applications filed per $1m in spending on research. (See table below)

Regional University Tech Transfer Rankings, 1996-2000

	University of Rochester	Cornell	Syracuse	Columbia University
Inventions Disclosed per $1M spent on Research	65	37	95	22
Patents Applications per $1M spent on Research	73	27	100	31
Licenses/Options Executed	102	16	59	13
Average Income per License	12	78	99	5
Licensing Income per Dollar Spent on Research	18	49	84	2
Start-ups formed per $10M spent on Research	100	69	59	32
Most Start-ups Formed	85	27	92	14

Source: Chronicle of Higher Education based on Association of University Technology Managers Data, Rank of 117 institutions reporting

Idea Development and Commercialization

In terms of technology licensing, the next step in the process of moving ideas to products and services, the University of Rochester ranked only 102nd of 117 in terms of the number of licenses executed relative to number of inventions disclosed. On a more positive note, those licenses that were executed were more profitable than those of most of their university peers. The U of R ranked 18th in licensing income per dollar of research spending and 12th in average income per license.

However, the University did not succeed in spinning out companies at a rate comparable to its university peers. The University formed only 3 start-ups over the five-year period, placing it 85th on the list. That level of start-ups placed it 100th on the list when normalized to the amount of research funding.

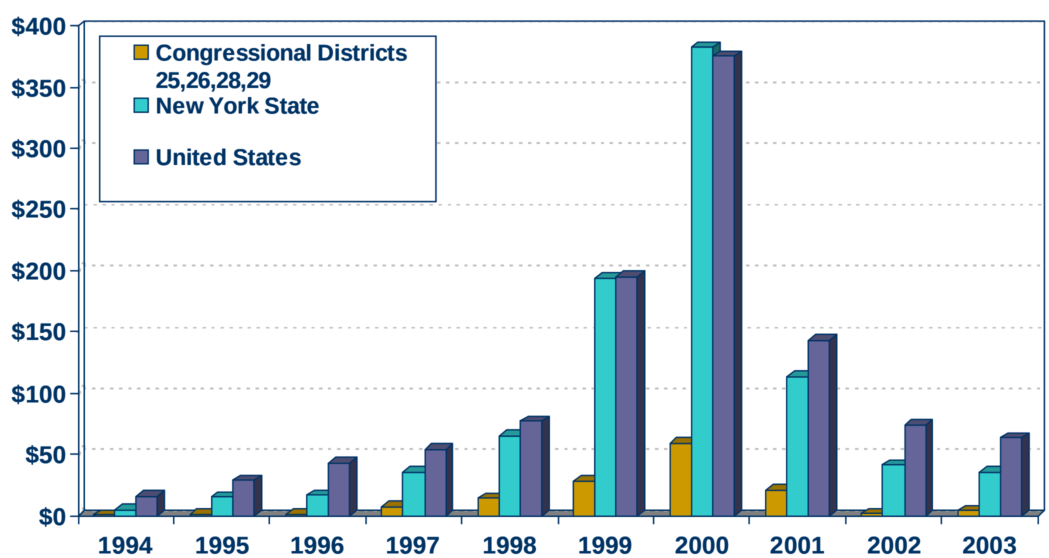
Corporate Spin Outs and Firm Development

On the corporate side, there is little tradition of firm spinouts from the large companies in the region. While Kodak has made a few attempts to foster spinouts, there have not been many success stories. Lumetrics, an analytical instruments company founded on Kodak technology, is a recent start-up firm that some regional experts believe has the potential to grow into a major regional employer. An opportunity exists for regional entrepreneurs to follow the Lumetrics example by pursing additional development of the large number of patents controlled by Kodak and Xerox. Many times larger firms choose not to pursue projects based on technologies they have developed because they feel the size of the market opportunity is too small. However, smaller firms and entrepreneurs often have lower market size thresholds and are willing to take additional market risks with "orphaned" technology from larger firms. High Technology of Rochester has been pursuing a project to promote firms based on orphan technology.

Overall, Rochester ranked 49th among the 50 largest US MSAs in the creation of new firms in 2000. The most recent data on fast growth firms was also not particularly impressive. Rochester had approximately 8.4% of its 1999 jobs in "gazelle" or fast growing companies. This was 40th of the 50 largest metro areas.[5]

Venture Capital Funding

Venture Capital Investment Per Capita, Greater Rochester, New York State and US



Source: PriceWaterhouseCoopers MoneyTree Survey

Congressional Districts 25, 26, 28, 29 consists of Allegany, Erie, Cattaraugus, Chemling, Erie, Genesee, Livingston, Monroe, Niagara, Onondaga, Ontario, Orleans, Schulyer, Steuben, Wyoming and Yates counties

[5] Public Policy Institute, Metropolitan New Economy Index, 2001

According to Price Waterhouse Coopers, Rochester and the rest of Upstate New York (defined as all of New York State excluding the New York City metro area) are small players in the US Venture Capital market. From 1995 to 2003 there were 221 total venture capital deals for a total of $1.43 billion in investment. The dollar amount represented only .6% of the US venture market. On a per capita basis, the region significantly trails the US average. In the US, approximately $1,050 of venture funds was invested per person over the eight-year period while only $290 was invested per person in Upstate New York. If one examines VC data from the four congressional districts that include parts of the Greater Rochester area, the funding situation is more dire. VC funding, even in the best year for the area, did not rise above $60 per person. (See chart above)

The situation continues to be troublesome when we focus on the seed and early stage investments in the broader region. Only 22% of venture funding received by upstate firms was received during the critical early stages of company growth, while nationally 28% of total funding was received early on. This signals that it is relatively harder for regional start-up firms to get funding that more established companies.

Regional Innovation Platform

Despite the recently weak economic and innovation performance in Rochester, the area has significant strengths that bode well for future innovation-based economic growth. In particular, the human capital infrastructure – both the training institutions and skilled workforce base – positions the region to succeed. While the region also has some weaknesses to confront, in the past five years regional leaders have made major investments in institutions that can propel knowledge-based firms and are already addressing many of the challenges. The regional innovation platform is strong and getting stronger.

Regional Strengths

Academic Institutions

One of the Rochester region's greatest strengths is its academic institutions, both at the secondary and post-secondary levels. Ninety-seven percent of regional high school students graduate and 83% of graduates attend college. Both of these rates are significantly higher than state and national averages. The region is home to some of the finest public schools in the country. According to *Newsweek*, five Rochester area public high schools are ranked in the top 100 in the country.

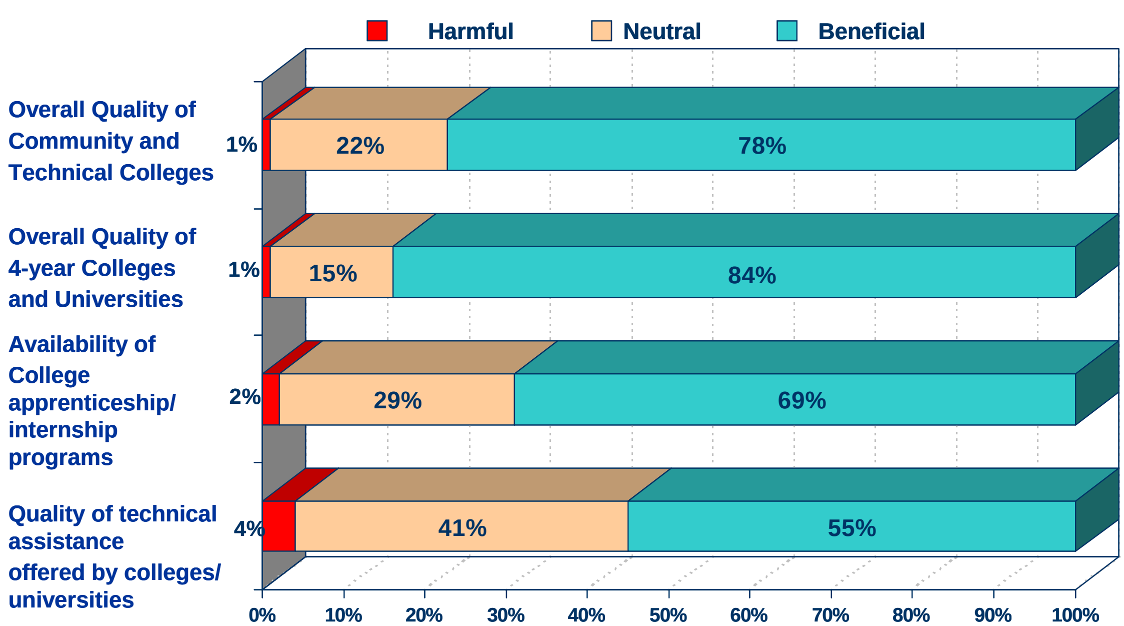
Local community colleges are praised by Greater Rochester business executives for their flexibility and expertise in producing workers with skills needed by local industries. Monroe County Community College was singled out by a number of the respondents for its speed in developing customized programs and overall quality in providing courses relevant to the local economic base. Regional executives who took our business environment survey showed higher satisfaction with local community colleges than their colleagues in Wilmington, Albuquerque, and Northeast Ohio.

At the higher education level, the region offers 18 colleges and universities, which presently serve approximately 75,000 students. Approximately 13,000 degrees are conferred each year, and a high concentration of those are in math and sciences. According to the *Places Rated Almanac*, the region ranks in the top 5 nationally in terms of the total numbers of annual math, physical science, biology, and engineering graduates.

The region's flagship research university, the University of Rochester, has over 8,300 students and is consistently ranked as one of the top 50 comprehensive universities in the United States by *US News and World Report*. According to the *Wall Street Journal*, the Simon Business School at the University of Rochester is the 18th best in the nation. The Rochester Institute of Technology has recently initiated new facilities to support research in biotechnology and nanotechnology as it grows both in size and national stature. In addition, the two major universities and Monroe County Community College have increasingly embraced entrepreneurial education. Earlier this year the University of Rochester was one of only eight universities in the US to win a highly competitive multi-million dollar grant from the Kauffman Foundation to support entrepreneurial education efforts across the entire campus.

As the chart below shows, regional business leaders are highly satisfied with all aspects of their relationship with local four-year colleges and universities. On all four questions, the satisfaction of Rochester area business people was the highest of the four regions studied as part of the Council on Competitiveness regional innovation initiative. (See chart below)

Regional Assessment of Higher Educational Institutions Impact on Business



Source: Council on Competitiveness Regional Survey, N= 153 to 162
Note: non-respondents and "not applicable" responses have been excluded

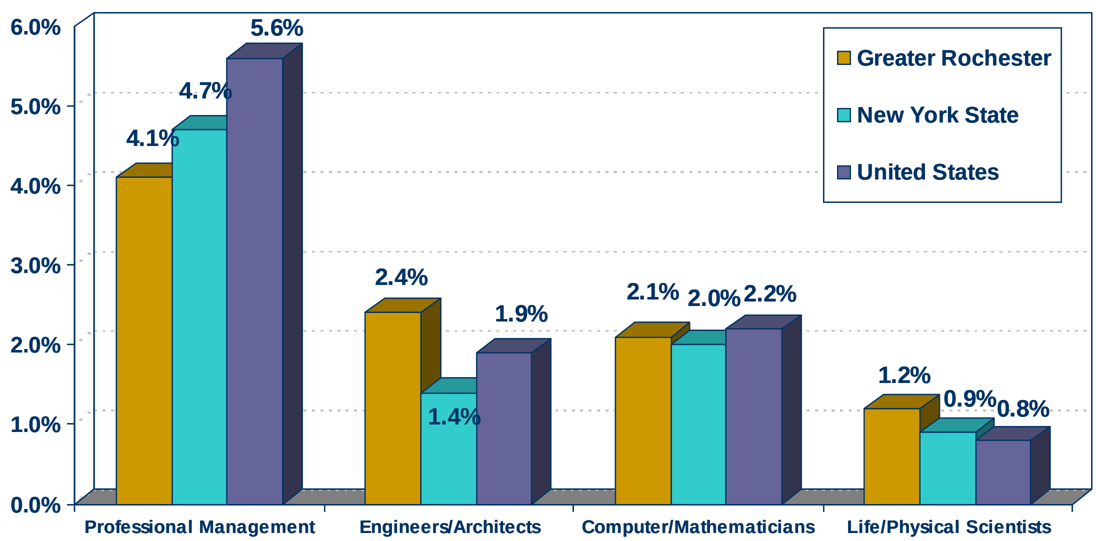
The higher education sector also continues to grow as an economic engine in and of itself. According to analysis by the Center for Government Research, in 2002, the higher education sector accounted for $787 million of total regional payroll and supported 16,700 jobs. The sector grew at 14% from 2000 to 2002 and indications are that it continues to grow.[6]

Skilled Workforce

Thanks to the historical size of the regional manufacturing industry and the strength of regional academic institutions, the Greater Rochester area boasts a very strong workforce.

To assess the regional ability to support innovation-based companies, we examine the availability and quality of the workforce in four key areas: management, engineers and architects, computer programmers and mathematicians, and life, physical, and social scientists. According to the US Bureau of Labor Statistics, in 2002 Greater Rochester had approximately 12,600 engineers, 10,600 computer or math specialists and 6,100 life, physical, or social scientists. Based on these statistics, Rochester surpassed US and New York State in terms of its concentration of engineers and life/physical scientists and was just barely below the average in terms of computer and math employment. (See chart below)

Greater Rochester Occupational Employment Distribution, 2002



Source: US Bureau of Labor Statistics

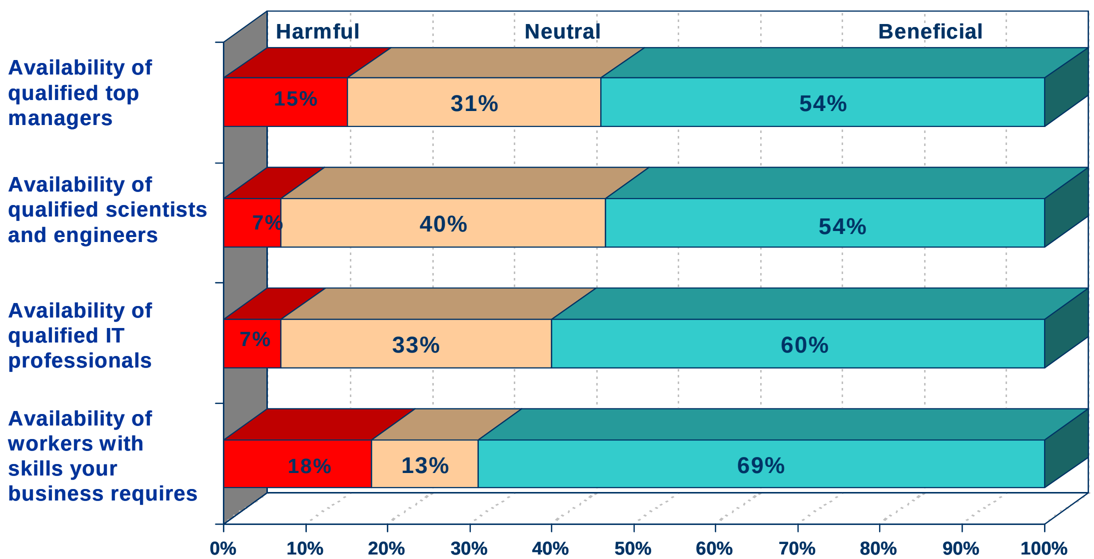
One area where Greater Rochester seems to lag is in management level employment. The 21,000 managers in the region represented only 4.1% of the regional (non-self employed) workforce while the State of New York had 4.7% in managerial positions and the US had 5.6%. This relative shortage is consistent with survey results and interviews that suggested

[6] Update on Rochester Economy, March 10th , 2004, Kent Gardner, Director of Economic Analysis, Center for Government Research

regional business leaders found it relatively difficult to find top-level managers compared to other skill sets. Venture capitalists and start-up CEOs also lamented the lack of experienced managers who had run start-up businesses or with entrepreneurial experience.

On a more positive note, Rochester business leaders were quite satisfied with the overall quality and availability of skilled workers. Indeed, of the four regions studied, Rochester business leaders were the most satisfied with their region's workforce, with 69% believing that access to skilled labor had a beneficial impact on their business success. Many leaders interviewed praised the dedication and work ethic of line employees and claimed that finding skill sets was not difficult for key industries. (See chart below)

Greater Rochester Business Survey Results: Access to Skilled Labor



Source: Council on Competitiveness Regional Survey, N= 153 to 162
Note: non-respondents and "not applicable" responses have been excluded

A significant challenge going forward is that many of the top graduates from the local universities are leaving due to the economic downturn. Regional managers have noted increased "brain drain", both from local students who leave for college and increased numbers of local college graduates who are leaving. Rochester saw a net decline of over 5,000 college educated 25-39 year olds from 1995 to 2000, ranking it nearly last among 276 metropolitan areas studied. (See table below)

The local engineering talent base of all ages has also been declining. While Rochester still has a higher concentration of engineers than the US average, the absolute number of engineers and architects in the region fell by over 3,000, or 20%, from 2000 to 2002.

Brain Drain: Migration of 25-39 Year Old, College Educated Adults, 1995-2000

	Total Net Migration, 1995-2000	Rank (Net Migration) Among 276 MSAs	Rank (Percent of Population lost) Among 276 MSAs
Albany- Schenectady -Troy MSA	-4,059	260	185
Rochester MSA	-5,122	268	191
Syracuse MSA	-5,861	272	229
Buffalo-Niagara Falls MSA	-6,270	273	200
State of New York	-6,611	43rd of 51 states	20th of 51 states

Source: US Census Bureau, 2003

As Economy.com concluded in a recent regional assessment, "Rochester's economy benefits from a well-educated workforce, an essential ingredient for the area to develop the technology industries it hopes will drive future growth.[7]" However, this resource is increasingly at risk.

Quality of Life

Despite economic downturns and harsh winters, many Rochesterians choose to stay in the region because of its highly desirable quality of life.

The region boasts a wide range and high quality of cultural, natural and athletic amenities, including 35 museums, dozens of lakes and scenic waterways, and recreational activities for every season. The region is home to professional sports franchises in every major sport and has a particular focus on golf, as it is home to nearly 80 golf courses and hosts an annual LPGA Tournament.

The region offers residents a low cost of living – 91% of the US average according to Economy.com -- and very low crime rates relative to its national and regional peers. In 2000, its violent crime rate was approximately 1/4th that of New York City.

External evaluators like *Forbes*, *Expansion Management Magazine* and *the Places Rated Almanac* praise the region for its quality of cultural and recreational amenities and close-in vacation opportunities. Perhaps more importantly, the residents of the region are very happy with their choice of location. Seventy one percent of the regional survey respondents believed that the regional quality of life had a beneficial impact on their businesses success in the region while only 6% considered it a negative factor.

A common refrain is that "it's hard to get people to move to Rochester, but it's even harder to get them to leave." Indeed, given the tens of thousands of job cuts over the past five

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[7] Economy.com, *Precis Metro Report*, Rochester, New York, September 2003.

years, it is surprising and impressive that the region continues to have positive overall population growth.

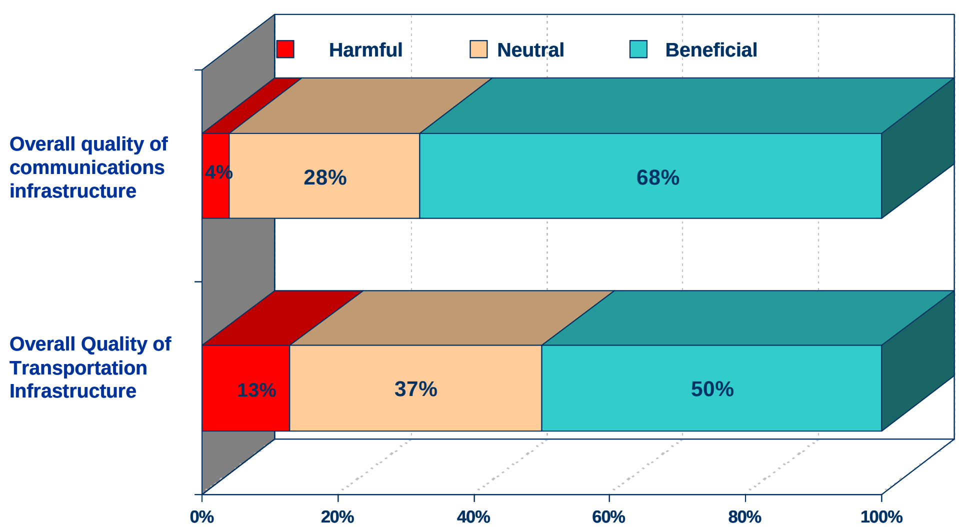
Some of the satisfaction stems from the natural, recreational, and cultural activities. Additionally, many respondents mentioned the high level of community participation and volunteerism that typifies the region which created the United Way. As one Rochester resident summarized, "If you can handle the cold, it doesn't get any better than this."

Unfortunately, many people outside of the region only know about the cold. The regional image among the general public, national business leaders, and site selection specialists is one of a cold, rust-belt city. Efforts are underway, embodied primarily in the Made for Living Campaign, to redefine and promote Rochester. However, many community leaders feel that locals are not sufficiently positive about the region when queried by business and personal colleagues in other regions. "We are too quick to demean and talk bad about the area, " said one native-born leader, "and too slow to point out our positive attributes."

Transportation and Communications Infrastructure

Rochester's transportation and communications infrastructure is sufficient to support an innovation-based economy, though it does not distinguish it substantially from other regions. Strengths include relatively high levels of broadband infrastructure and a road and rail infrastructure that permits the region to enjoy low levels of traffic congestion. The new fast ferry to Toronto provides opportunities for both residential and commercial traffic.

Satisfaction with Regional Transportation and Communications Infrastructure



Source: Council on Competitiveness Regional Survey, N= 153 to 162
Note: non-respondents and "not applicable" responses have been excluded

Limited air service and high fares pose a challenge to businesses in the region, though the growth of low fare carriers AirTran, Independence Air, and JetBlue has served to improve the situation recently.

Business leaders expressed their satisfaction with both the communications and transportation infrastructure. (See chart above)

Research and Development Institutions

Rochester's two leading universities provide the region with access to a wide variety of research expertise and facilities, many of which are directly relevant to leading local business sectors. Both institutions actively seek private sector involvement in their research efforts and have, in recent years, increased their emphasis on technology transfer.

RIT is home to a number of academic departments and research centers that focus on areas important to the local economy. Among the research centers are the:

- Center for Digital Media
- Center for Electronics Manufacturing and Assembly
- Center for Excellence in Lean Enterprise
- Center for Integrated Manufacturing Sciences

The new RIT Printing Industry Center, supported by the Sloan Foundation and fourteen leading printing industry firms, helps integrate the universities expertise in printing technology with business and industry research.

The University of Rochester has a particular research focus on engineering related to imaging and optical processes that supports the local optics and telecommunications clusters. It is home to a variety of research centers including the Center for Electronic Imaging Systems and the Center for Optics Manufacturing.

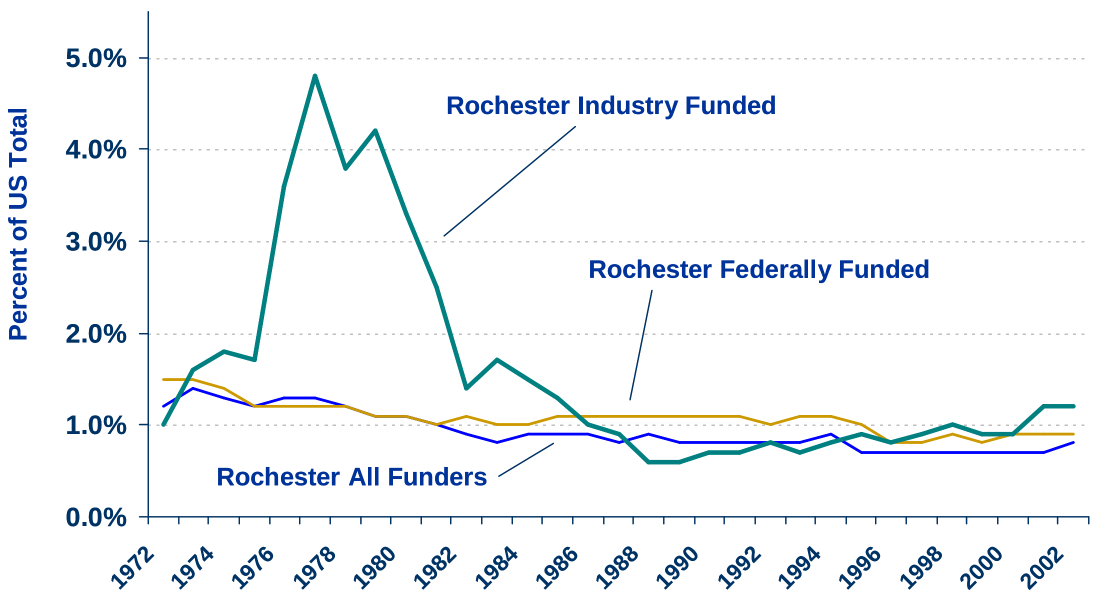
Both RIT and the University of Rochester are partners in the Infotonics Technology Center Inc. (Infotonics), a not-for-profit corporation formed in 2001 to operate New York State's Center of Excellence in Photonics and Microsystems. Led by a $45 million dollar commitment from industry partners Kodak, Corning, and Xerox, a $43 million State of New York commitment, and $23 million in federal funding, the public-private-university consortium is building a state-of-the-art prototype and pilot fabrication facility. Infotonics has three primary areas of competency: device research and engineering, packaging and assembly, and prototype/pilot fabrication.

The region has been significantly ramping up activities in the life sciences. In 1996, The University of Rochester Medical Center (URMC) embarked on a 10-year $500 million research effort. NIH funding rose from $70 million in 1997 to more than $122 million in 2002, with 352 NIH-funded projects and eleven departments in the top twenty for NIH grants funding. In addition, URMC receives $57 million in grants from other sources. To help spur commercialization, the University of Rochester established a separate office of Technology Transfer for the medical center in 2001.

RIT has also been active in developing resources to support the growing biotechnology cluster in the region. The Center for Biotechnology Education and Training was launched with $8 million in state funding to help develop a talented biotechnology workforce.

In 2002, the University of Rochester supported $261 million in research expenditures and RIT had $13.5 million. While these figures represent increases over previous years, the regional percentage of national academic research expenditures has actually declined over the past 20 years and has remained flat from 1997 to 2002. (See chart below) With the increases in the past two years related to the new research centers, the universities have the capacity for additional federal and industry sponsored research.

Greater Rochester Academic Research Expenditures
Percent of National Expenditures by Category, 1972-2002



Source: NSF WebCASPAR
Note: Includes RIT and University of Rochester

Regional Weaknesses

Risk Capital

Greater Rochester has no lack of money, but it does wont for risk capital. Despite significant financial assets and large numbers of wealthy residents, there is little regional venture capital or angel investment. Instead, there is a continued reservation to branch out beyond traditional investments in real estate and blue chip stocks. This conservative approach stems at least in part from the region's recent heritage of being dominated by large firms. Investments in the big three, Xerox, Kodak, and Bausch and Lomb, have created many a millionaire and little incentive to explore alternative investment options. And unfortunately, first time investors in who dipped their toes in the local private equity market for telecommunications start-ups were singed by the telecom bust.

Times seem to be changing. In the past few years, the region has seen the establishment of one major venture capital firm focused on the area, Trillium Group, and at least two angel groups. The buzz is that more are underway. If Trillium has one or two big hits with its local investments, many expect local and outside VCs to set up shop in the region. Said one VC from outside the region who is assessing possible investments, " We've been close to investing in Rochester companies a number of times, but we're still looking for a clear success to establish the region. We'd rather not compete in the crowded Boston region."

For now, however, the local risk capital providers seem to be focused on the least risky opportunities. Trillium, for example, has not traditionally invested in seed stage or early stage opportunities, favoring companies with well-established sales. Also, according to a number of entrepreneurs who have sought funds locally, most of the established risk capital investors provide little more than capital as opposed to the full range of benefits that established risk capital institutions can offer, including access to talented management, connections to investment bankers, and general business advice. In addition, entrepreneurs interviewed typically commented on the lack of mentors available to assist them.

The community is responding. The University Technology Seed Fund, managed by Trillium, has raised over $6 million and has invested in two local companies. Incubators supported by the University of Rochester and High Tech Rochester are trying to fill this void in linking entrepreneurs to necessary services, advisors and potential clients. Greater Rochester Enterprise and the Greater Rochester Venture Capital Group are also trying to help link entrepreneurs with regional assets.

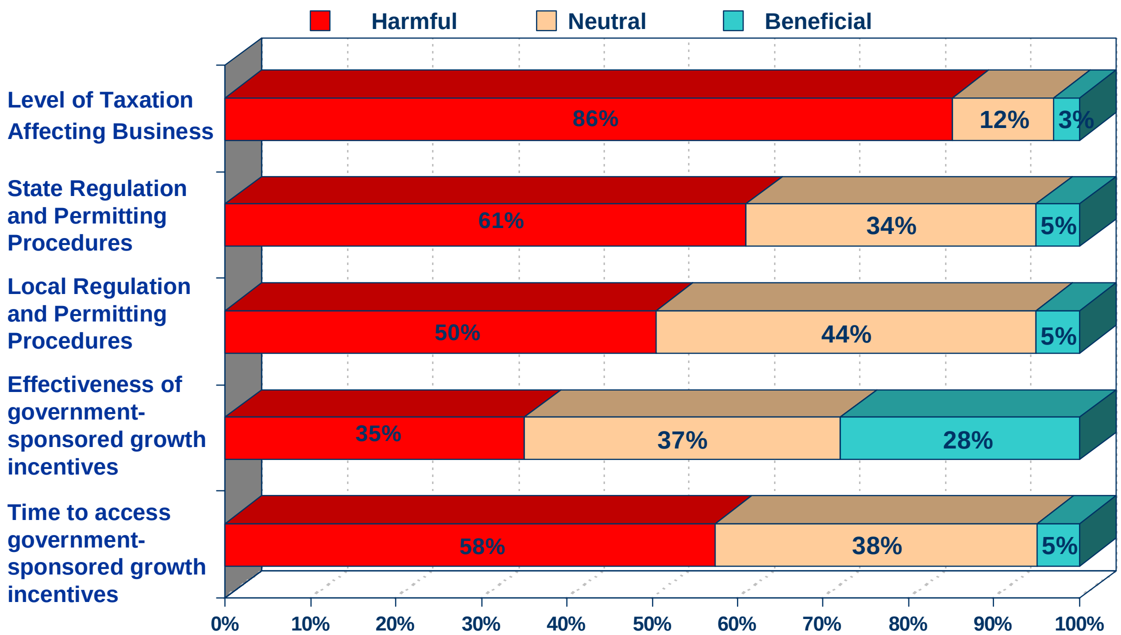
Taxation and Regulation

Greater Rochester business leaders voiced significant concerns about level of taxation, liability and workman's compensation insurance costs, and permitting requirements in the region. (See chart below) When asked to identify the most critical issues to address related to state and local government, over 75% of respondents mentioned high taxes of one sort or another. A common refrain is that taxes on businesses (and individual income) are excessive and should be reduced or offset by tax incentives. Others expressed deep concern with high property taxes.

Survey respondents' dissatisfaction with government related issues offers a strong counterpoint to the generally high level of satisfaction with quality of life and educational resources.

The comparative data does provide some support to the complaints of business people. Most of the challenges come from the state level policies. At a state level, New York offers the seventh worst business tax climate among US states according to the non-partisan Tax Foundation. The Tax Foundation bases its assessment on an index of five subcomponents including corporate income tax rates, individual income tax rates, sales and gross receipts tax rates, state fiscal balance and tax base conformity.

Greater Rochester Perceptions of Local and State Government Impact on Business



Source: Council on Competitiveness Regional Survey, N= 162
Note: non-respondents and "not applicable" responses have been excluded

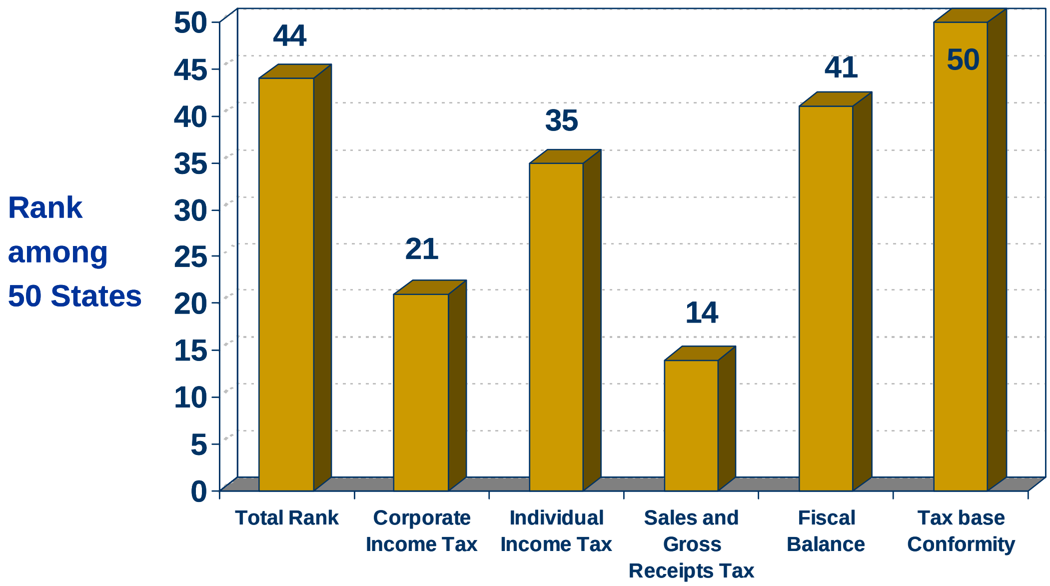
New York scores particularly poorly due to its personal income tax levies, weak fiscal condition, and especially its low tax conformity. (See chart below) New York's business tax system is one of the least consistent with the federal system, in that it does not allow consolidated state-federal tax filings, or follow the federal internal revenue code (IRC) as the starting point for its tax system, and only offers limited recognition of LLC and S corporations.[8]

This latter ranking is consistent with the complaints of Rochester leaders who mentioned that both the level of taxation and difficulty in accessing the tax credits and incentives that do exist. Additionally, respondents believe that the high costs of workman's compensation, state Medicaid costs, and stringent permitting requirements further inhibit business growth. As one leader explained, " its not that any one tax is a deal breaker, but together it puts our regional businesses at a disadvantage and makes it difficult to attract new firms." The

[8] Tax Foundation, State Business Tax Climate Index, May 2003, p.21.

Rochester Business Alliance and others are attempting to address many of these concerns at the state level.

State Business Tax Climate Index
New York State Rankings on Component Indices, 2002



Source: Tax Foundation, 2003 Report
Note: The lower the rank, the more favorable the climate o

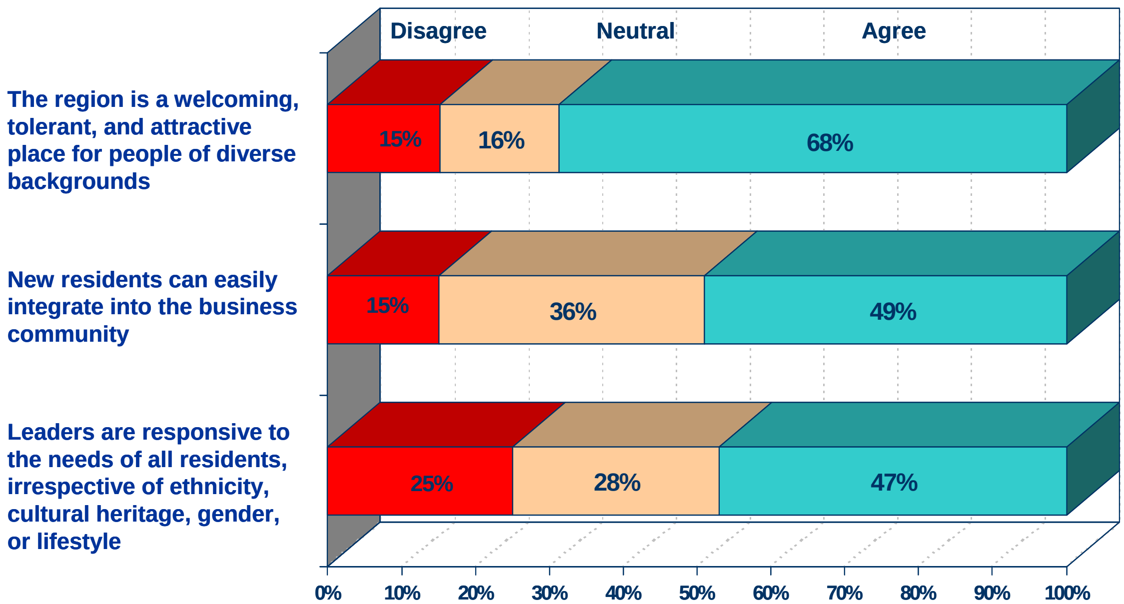
Despite the high tax burden and other regulatory costs, the cost of doing business in Rochester (including taxation) is only 10% higher than the US average region according to Economy.com. Taxation and regulations are barriers to building a strong innovation-based economy, and should be addressed. However, government impositions do not represent the most important obstacles to Rochester's growth – the most critical challenges are a lack of collaboration and a weak entrepreneurial culture.

Lack of Entrepreneurial Culture

One important explanation for the relative lack of recent entrepreneurial success is that Greater Rochester business leaders do not fully embrace attitudes that support entrepreneurship. On the positive side, the survey of Rochester leaders indicates leaders have a true appreciation for the value of diversity and believe the community is open and welcoming to new residents. (See chart below)

Some newcomers to the region are not so sure. As one recent transplant from Boston commented, "This is a very closed, clubby town. If you didn't go to high school with the power business leaders in town, you have no chance to break into the club and to do business with their compan[ies]."

Greater Rochester Regional Attitudes Toward Diversity



Source: Council on Competitiveness Regional Survey, N= 160-208
Note: non-respondents and "not applicable" responses have been excluded

Still, most of the leaders contacted felt that non-natives can thrive. There are many examples of outsiders who have run the large and important local companies. This generally welcoming perspective provides a basis for supporting entrepreneurs as it means the community will not exclude new ideas and companies simply because they are held by outsiders or those with non-traditional backgrounds. However, this tolerance and openness to individuals has not been fully translated into a full-fledged appreciation for entrepreneurial businesses.

Regional entrepreneurs interviewed commonly expressed a view that the local business community was conservative and was not yet ready to support local start-ups. One particularly critical local serial entrepreneur commented, "Investors here are too hard to convince. I don't even try to get my companies funded here.[9]"

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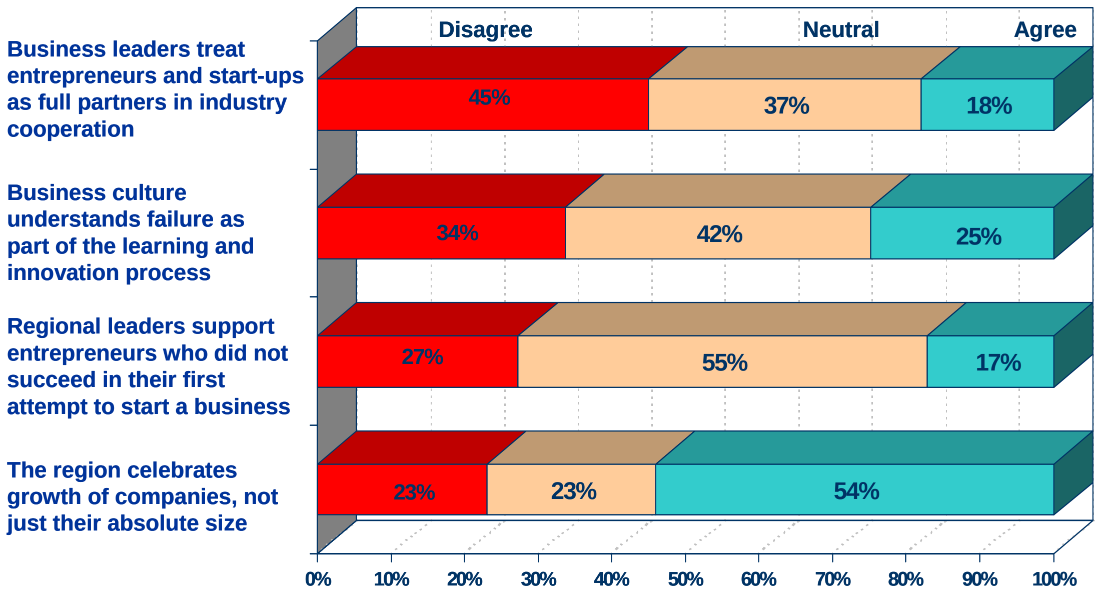
[9] Ironically, this person was, in fact, able to raise funds locally for his firm after a colleague convinced him to let him approach some local investors.

According to the survey results, business leaders do not recognize failure as part of the learning and innovation process and are hesitant to give a second chance to entrepreneurs who have failed. Further, entrepreneurs are not always treated as full partners in industry cooperative efforts like industry associations.

Greater Rochester Regional Attitudes Toward Risk and Collaboration

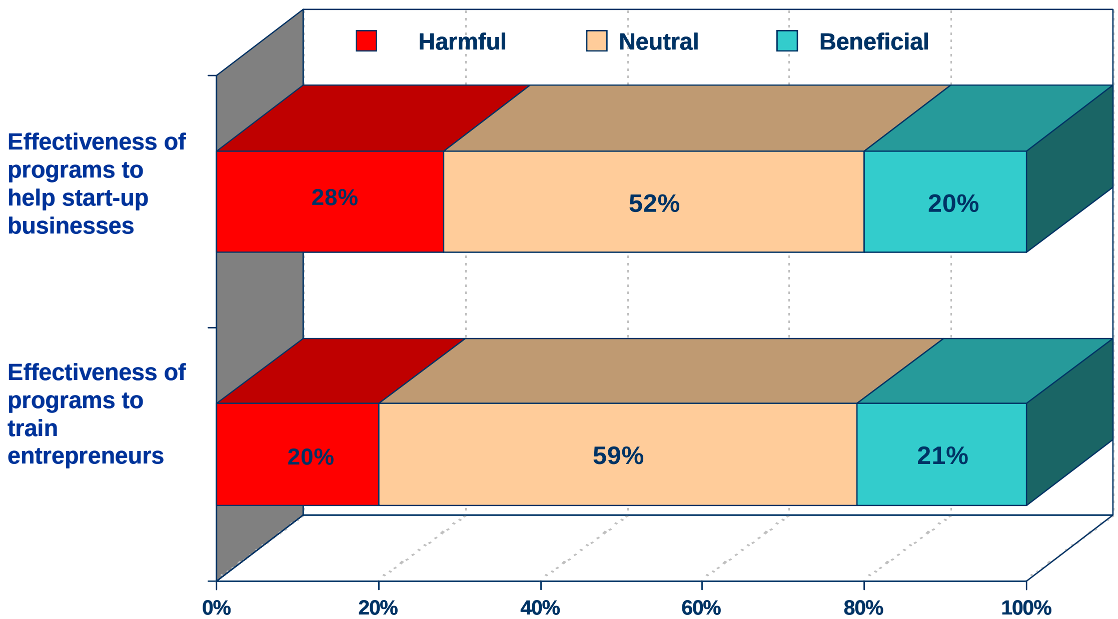


Source: Council on Competitiveness Regional Survey, N= 153 to 162
Note: non-respondents and "not applicable" responses have been excluded

However, it should be noted that on each of these cultural issues, the Greater Rochester area was more entrepreneurially "friendly" than the other three regions we have studied. While these areas are not known for their entrepreneurial environments, it is still a positive sign. Moreover, it seems that these attitudes are evolving for the better. One indicator of this is the clear consensus that the business community and business press celebrate the growth of companies, not just their absolute size.

Despite recent efforts to strengthen entrepreneurial assistance, business leaders believe that programs to aid start-ups or train entrepreneurs can be significantly improved. (See chart below)

Effectiveness of Greater Rochester Programs to Support Entrepreneurs



Source: Council on Competitiveness Regional Survey, N=153 to 162
Note: non-respondents and "not applicable" responses have been excluded

Regional Collaboration

Economic Development /Innovation Support Organizations

In Greater Rochester, there has been a history of addressing economic development challenges with the formation of new organizations, rather than coalitions. As a result the region has developed a "high institutional density" of economic development organizations. These organizations often have overlapping missions and compete for funding from similar sources.

While this challenge still exists, Rochester economic development leaders have clearly chosen collaboration as the path forward. The creation and funding of Greater Rochester Enterprise as an overarching regional economic development coalition and the merger of IMC and the Chamber of Commerce into the Rochester Business Alliance reflect this choice. The creation of the Infotonics Technology Center, a private-public partnership, is another example of recent cross-sector and cross-region collaboration that was spearheaded by private sector leaders. The regional business leadership has chosen to take a lead role in economic development and look to government as partners, rather than arbiters of the regional economic strategies.

Business Linkages

One sort of organization that should be encouraged is cluster-specific institutions for collaboration. The Rochester region has only three cluster organizations: Information Technology, Life Sciences, and Optics-Photonics. The first of these, the Rochester Regional Photonics Cluster, was established in 1999. The others are still incipient. The idea of fostering collaboration and shared innovation through cluster-based organizations has been around now for nearly fifteen years and has become a common strategy employed by successful innovation regions.

One of the positive impacts of these organizations is that they help facilitate direct interaction between firms in related and supporting industries. In short, they help promote the information sharing that can lead to faster innovation. These organizations can become cultural change agents that promote greater appreciation for entrepreneurship.

There are a growing number of groups that have formed to foster interaction and innovation. Leadership Rochester helps build community ties through its programs and includes an economic development focus. RIPN, the Regional Innovators Participation Network, is explicitly focused on bringing together innovators and those who can support them. RATS, Rochester Area Twenty Somethings, has a broader goal of making the region more attractive to young people, including young business leaders.

Business-University Linkages

Formal research and training relationships between business and universities exist, but they have traditionally been the domain of only the largest local companies. For small and medium firms, there seems to be little interaction with the two large universities. Tech transfer programs with universities seem to be underutilized by local businesses and business people do not perceive the universities as frequently working together with business. Most survey respondents did not see universities as important partners in supporting their innovation processes.

Government Collaboration

As mentioned earlier, survey respondents voiced significant concerns about historical antagonism between regional government bodies, particularly the City of Rochester and Monroe County. As one disaffected business executive commented, "Local and state politicians seem more interested in fighting with themselves and getting reelected than actually doing anything about true economic development."

While changes in officeholders portend an improved relationship, business leaders are still concerned about the structural nature of the government conflict. Many believe that there are simply too many governmental entities involved in economic development. Still, many others recognized the increased willingness for collaboration by regional public officials with each other and with the regional business community.

Greater Rochester faces a fundamental challenge of linking its idea generators—people who are either still in big companies or independent thinkers -- with its capital providers, service providers, and business support organizations. As described above, the region has no lack of smart people or good ideas, however people with ideas do not always interact. As one leader said, "We need to change the dynamic from "smart people, not talking" to "smart people, interacting." As the traditional economic structure changes and entrepreneurial endeavors become more common, this dynamic is evolving in a positive direction.

Summary

In sum, the Greater Rochester region has the assets necessary to support a vibrant innovation-based economy. Outside evaluations by respected institutions recognize the region's high capacity for innovation. The Progressive Policy Institute' Metropolitan New Economy Index ranked Rochester 5th of the largest 50 US metro areas in innovation capacity. Huggins Associates World Knowledge Competitiveness Index ranked Rochester 4th or 125 worldwide regions on its overall ranking for "regional capacity and ability to create new ideas, thoughts, processes and products and to translate them into economic value and wealth."

However, this regional innovation capacity has not yet been fully realized. Strengthening institutional ties between organizations that support innovation is critical to ensure full utilization of the knowledge resources. So too is supporting the informal linkages between diverse groups and participants in different industries. As large industrial companies, the traditional sources of innovation, decline in relative importance, the region must foster a culture that supports risk taking and entrepreneurial ventures. Rochester has the skilled people, institutions, and capital necessary to become a national leader in innovation-based growth. Regional leaders are already acting to embrace this challenge and opportunity. Universities, firms, and government have taken many steps to support a new economic model.

As one venture capitalist explained, "There is an energy in town about the acceptance of building our own future. The environmental ecosystem is getting energized. A start-up today is a lot better off launching than five years ago. Supporting new and innovative firms is becoming more of a priority in the collective community." Or as a local university professor correctly concluded, "Greater Rochester is a success story waiting happen."

Recommendations

There are some actions that can be taken that may speed the success.

- **Strengthen programs to shape a more positive regional attitude toward entrepreneurship and building from within vs. smoke stack chasing**

  GRE, RBA and other regional groups support programs, including awards events and publications, which celebrate entrepreneurial success. The local periodicals that focus on business also seem to recognize the importance of "building from within" and have, according to business leaders, increased coverage of stories related to entrepreneurship. However, more can be done to spread the message to business people, political leaders and the general public. Perhaps the local business organizations could work with the *Rochester Business Journal* to create a special series on entrepreneurship and its potential to drive the regional economy aimed at the traditional investor community. Organizations like RIPN and RATS could also be a good channel to reach the new generation of Rochester business leadership.

- **Develop a strategy for celebrating entrepreneurial success publicly**

  Often, the most important event in impacting a regional entrepreneurial environment is a successful liquidity event (either an initial public offering, merger or sale) for a local start-up. Dell Computer's IPO helped the Austin business community see the value of entrepreneurial ventures, while the sale of Hybritech to Eli Lilly had a similar impact in opening the minds (and wallets) of San Diego's traditionally conservative financial community.

  Working with the successful company, the local economic development community should be ready to publicize the success through local and national media sources. National media channels that are accessed by venture capitalists and other private equity investors should be a primary focus.

  While preparing for a successful liquidity event, the local economic development community could develop and disseminate an ongoing "entrepreneurial watch newsletter" that would highlight success stories and specific institutions that are supporting innovation

- **Develop entrepreneurial mentorship programs**

  Mentorship programs have proven to be highly effective in supporting entrepreneurial success. Particularly in regions without a large number of entrepreneurial businesses, start-up managers have trouble finding guidance from individuals who have been there before. While a region like Rochester certainly has successful entrepreneurs who are willing to offer their advice, there is no organization that links these experienced business people to start-ups. The MITbased Venture Forum should be examined as a model. It is among the most successful programs in the nation, and could be replicated at a regional (or university) level.

- **Organize more angel groups through existing organizations**

  As described in the report, the Rochester region does not lack wealthy investors. However it does lack organized angel capital groups to channel that investment into start-up ventures. An effort to engage traditional organizations to consider forming angel groups may bear fruit. An angel support organization or economic development organization could launch a series of informational sessions aimed at local country clubs or civic organizations. If enough members showed interest, the organizations could offer technical assistance in the formation of angel organizations. The Kauffman Foundation and other pro-entrepreneurship groups provide model agreements and organizational structures.

- **Encourage the local foundation community to dedicate a portion of their annual giving to innovation-based economic development and to invest a small percentage of their assets in regionally based entrepreneurial ventures**

  Local foundations are another underutilized source of capital for entrepreneurial support. In regions throughout the country, local family and community foundations are considering ways to support the entrepreneurial economy. Northeast Ohio foundations, led by the Cleveland Foundation, have recently joined together to announce they will dedicate 10% of their funding to economic development initiatives. More innovatively, they are considering investing a small percentage of their asset base in local private equity deals to support local entrepreneurs. Greater Rochester foundations should consider a similar set of programs.

- **Continue to promote the cluster concept to additional industry groups**

  The region is presently home to three incipient cluster organizations in the IT, Optics, and Life Sciences sectors. These organizations should be promoted and supported by the economic development community as models for other local sectors (potentially food processing). This widely accepted model of organizing related and supporting industries has been shown to promote innovation and ultimately growth in jobs and wage levels throughout the world. This model could also assist in locating local players to pursue orphan technologies.

- **Develop a strong image campaign—with initial focus on local residents**

  It is widely recognized that the Greater Rochester region could do more to improve its image as an attractive region for business development. While national image campaigns can be very expensive, there are less financially intensive options.

The most obvious and important of these is to ensure local residents share their positive feelings about the community when they travel outside the region. While this method of communication does not reach wider audiences, it is still critical as the "personal" perspective is highly valued by potential migrants.

One of the successful aspects of places like Austin, Atlanta, and San Francisco is that their residents are typically vocal advocates in formal and informal settings. Other regions, like Cleveland, Pittsburgh, and Rochester seem to downplay their success or focus on negative aspects despite their legitimate positive attributes. GRE already has "talking points" available about the region. These points and the general message to spread the positive word should be emphasized to local business and civic organizations.

In terms of the broader promotional message, one option to consider is to directly confront the major negative piece of the Rochester image: the cold weather. For some people, Rochester will never be a consideration for relocation simply because of the climate. Many others decline to look beyond the cold because that is the most salient fact they know about the region. However, these people and the businesses they represent, may be convinced to reconsider if one can get them to look beyond the chilly temperatures.

To confront this issue head on, the region should consider a campaign that admits that the region is cold during the winter – and then describes how Rochesterians embrace the cold and love their region anyway. A potential slogan is – "Its cold here – get into it". This kind of message would grab attention due to its direct nature and weed out people and firms who cannot see beyond the snow. Others will be more willing to consider the impressive outdoor, intellectual and cultural assets of the region, including all of the warm weather activities.

- **Develop a "Rochester Homecoming" Campaign**

Greater Rochester has seen one of the largest out-migrations of educated young people in the country. Reversing the brain drain is important to ensuring a strong economic future for the region. One strategy that has been effective in other communities is to focus on re-attracting talented people who have either grown up or studied in the region. It is easier to attract people who have some tie to the region than those who have never been to the area. Drawing on the strength of Greater Rochester as a family-friendly community, a "homecoming" campaign aimed at young families in their 30s would be helpful in promoting "brain gain." It may make sense to specifically target native Rochesterians or college graduates who have had experience in entrepreneurial ventures, as a way of further strengthening the entrepreneurial management base.

Appendix I: Greater Rochester Challenges and Recommendations Summary

Challenge	Key Assets	Potential Strategies
Weak entrepreneurial culture	• Successful entrepreneurs in community (and from Rochester who live elsewhere) • University-based entrepreneurship programs • Incubators	• Public information campaign • Entrepreneurial mentorship programs • Prepare to celebrate success
Lack of risk capital	• Many wealthy families/individuals • Strong philanthropic community	• Foster creation of angel groups • Encourage foundations to invest in entrepreneurial programs and firms
Lack of Collaboration	• Political and business leaders who understand the need to act regionally	• Promote cluster-based programs and other programs to link organizations that support innovation • Consider mechanisms to coordinate government programs in land use and economic development
Brain Drain	• Strong secondary and higher-education system • Outdoor and cultural amenities	• Programs at local colleges and universities to link local students to jobs within region • Homecoming programs
Image/Cold Weather	• Outdoor and cultural amenities • Satisfied residents • Existing regional image efforts	• Encourage local residents to promote region in personal relationships • A regional image/marketing campaign that directly confronts the cold weather
Taxation and Regulation	• Efforts of regional business groups to impact state level public policy	• Continue and broaden support

Appendix II: Methodology

This report was prepared by Randall Kempner, Vice President, Regional Innovation at the Council on Competitiveness. The report findings draw from four major analytical efforts: a review of previous regional economic reports and analyses, quantitative benchmarking of regional innovation metrics, a survey of regional business leaders, and interviews with community leaders.

Literature Review: Over a dozen regional economic development reports, articles, and white papers were reviewed throughout the analytical phase. In particular, work by Professor Susan Christopherson and Jennifer Clark, at Cornell University and reports from Greater Rochester Enterprise provided a strong basis for understanding of the historical economic situation in the region.

Quantitative Benchmarking: The Council utilized an innovation assessment framework in this project that allows us to measure regional innovation capacity and make comparisons to other regions. The assessment model includes: human capital, financial capital, infrastructure, educational institutions, quality of life, fiscal and regulatory policies, and industrial composition.

Innovation Platform Survey: The Council implemented its proprietary innovation platform survey in winter 2004 to business leaders in the six county Greater Rochester region. Respondents were asked to comment on the state of assets, linkages, and cultural attitudes that support innovation within their region. The survey played a critical role in helping identify and describe strengths and weaknesses in the innovation environment that are not revealed by publicly available data. The web-based survey received 153 responses.

Interviews: To complement the survey and benchmarking exercise, the Council interviewed 20 leaders from the Greater Rochester area in the winter and spring of 2004. The leaders represented a broad cross-section of business, political, educational, and economic development groups.

The Council on Competitiveness

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