BUILDING A NEW FOUNDATION

THE UNIVERSITY OF ROCHESTER MEDICAL CENTER IN THE REGIONAL ECONOMY

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September, 2002
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SUMMARY

Catalyzed by the University of Rochester Medical Center (URMC), Rochester has an opportunity to capitalize on explosive growth in the bioscience market. New discoveries have expanded the horizons of clinical care services; an aging, but prosperous baby boom generation marries need to resource to create effective demand for bioscience research and manufacturing.

The Medical Center already makes a significant contribution to the regional economy:

- The **direct payroll** of the medical center and its affiliates exceeds **half of a billion dollars** (one third of all health services payroll); another quarter of a billion dollars in indirect payroll is stimulated by URMC and affiliates.
- The **direct & indirect payroll** of the medical center and its affiliates is nearly **$800 million**, about **5% of total estimated 2002 payroll** in the Rochester Metropolitan Statistical Area.
- About **20,000 jobs** can be attributed either directly or indirectly to URMC and its affiliates.
- Health services now contributes **almost as much** to direct RMSA **payroll as Eastman Kodak**.
- Health services is ***half again*** **the size of the finance, insurance and real estate** sector.
- URMC and its affiliates are **approaching the size of the construction industry.**

Through its research efforts and provision of sophisticated medical services not otherwise available in the community, URMC acts as an "exporter," bringing money into the economy from

outside sources and preventing Rochester dollars from leaking to Cleveland or New York City. CGR estimates that this kind of activity at the medical center is equivalent to a manufacturing firm with nearly 3,000 employees generating one-quarter of a billion dollars in direct and indirect payroll.

The challenge to Rochester is to build on the achievements of the medical center for the benefit of the entire regional economy.

Contributing Staff

Sarah Boyce, Senior Research Associate, assisted with the conceptualization and execution of this report.

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THE UNIVERSITY MEDICAL CENTER & ROCHESTER'S FUTURE

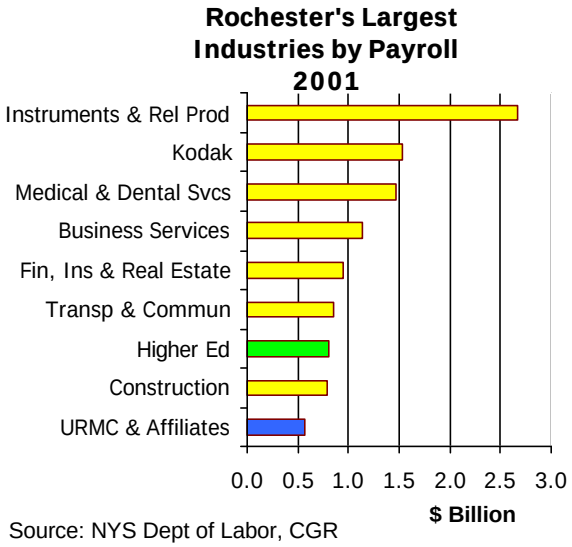
The economic role played by health services and the bioscience sector has been transformed over the last twenty years, both globally and in Rochester. Goods-producing sectors of the economy have traditionally been considered the "engines" of metropolitan growth. Rochester's early economy was built on flour milling and Erie Canal commerce; flowers and nursery products followed as milling moved West; film, photocopiers, auto parts and contact lenses drove growth through the late 20th century.

Service providers only mattered to the extent that they enabled the community to attract and retain firms selling physical products to the world's markets. Health and educational services, for example, were needed to keep workers healthy and to educate the new generation of goods-producers.

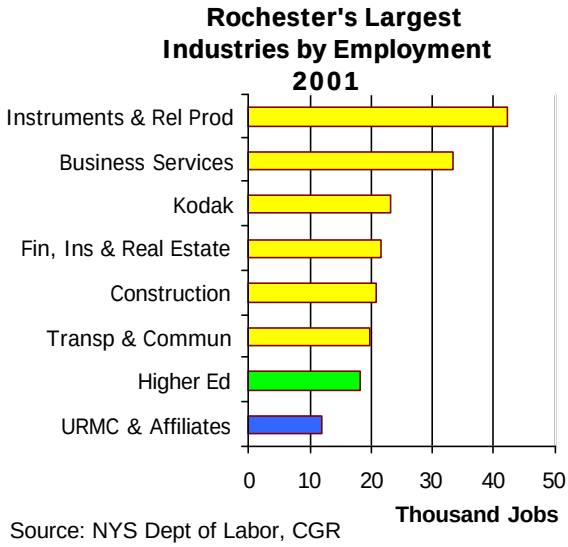
The Knowledge Sector: Linchpin of Rochester's 21st Century Economy

The economy of the 21st century is different in two respects:

- The growth products of the Information Economy involve the creation and transformation of knowledge, not steel or chemicals.
- The increasing importance of knowledge to the economy has created vast industries that can be located virtually anywhere, dramatically increasing the importance of quality of life to



Source: NYS Dept of Labor, CGR



Source: NYS Dept of Labor, CGR

individual and corporate decisions about location.

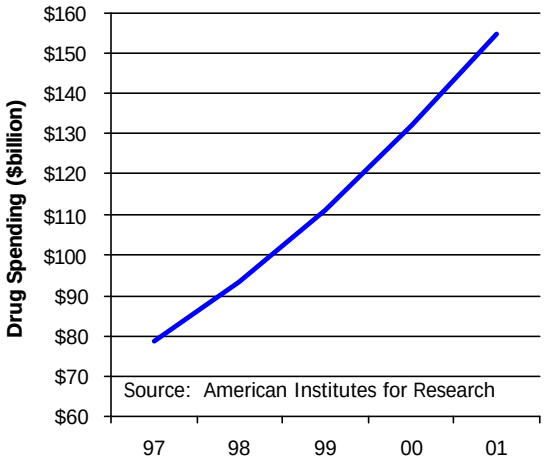
Higher education is the key to Rochester's future. No longer are manufacturers like Kodak or Xerox the economy's "center of gravity." For their contributions both to economic growth *and* quality of life, Rochester's colleges and universities are replacing manufacturing at the center of the regional economy.

The three largest "industries[1]" in Rochester are Educational Services, Medical & Dental Services and Instruments & Related Products, the industrial category that includes Eastman Kodak, Xerox and Bausch & Lomb.

Explosive Growth in Health & Bioscience Sector

With the first stage of a human genome "map" completed, the bioscience industry is poised for a period of spectacular growth. The aging of the population, the proliferation of new drugs and the newly-bestowed right to advertise have spurred dramatic growth in prescription drug sales. Prescription drug sales doubled between 1997 and 2001.

U.S. Prescription Drug Sales Soar



Currently, 130 drugs on the market were developed through biotechnology. More than 350 are in clinical trials, fully one third of all drugs in clinical trials in the United States. Biotechnology firms spend intensely on R&D, a total of $15.6 billion in 2001. The five largest firms spent nearly $90,000 per employee on R&D in 2000.[2]

Increasing prosperity also fuels increased health care spending. The Baby Boom generation has both the need and the means to purchase unprecedented levels of health care services.

URMC Drives New Industry & Enhances Quality of Life

The University of Rochester Medical Center (URMC) is perfectly positioned to take advantage of new opportunities offered by the increasing economic importance of the knowledge sector and the growth of bioscience and health services. Market opportunity joins with academic excellence to spur new products and economic growth for the Rochester community.

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[1] Defined at the 2 digit SIC code level. "Educational Services" includes all levels, including local public education. Higher education alone accounts for $800m in payroll and 18,000 jobs.

[2] Biotechnology Industry Association.

The presence of an academic medical center also adds immeasurably to the quality of life of Rochester's residents. Access to the best medical knowledge and state-of-the-art facilities improves the health and well-being of the entire community.

The Unmeasurable Catalytic Impact

This report estimates the tangible economic impact of the University of Rochester Medical Center on the Rochester economy. Yet the intangible and unmeasurable impacts of the medical center are, perhaps, even more important. Growth is partly driven by community spirit; motivation and a sense of expectation about the future. These influence day-to-day decisions of individuals and firms in countless ways. A community that is pervaded by pessimism will, more likely than not, fail to seize opportunity and forgo risk. A negative community spirit is self-fulfilling.

By providing the community with tangible signs of growth driven by the will to succeed, the University of Rochester Medical Center has become a catalyst for renewed optimism. While unmeasurable, this catalytic impact could be more significant to Rochester's future than the direct and indirect financial flows documented in this report.

A Summary of the Tangible Impact

Combined, the University of Rochester Medical Center and Strong Health Affiliates' annual contribution to the total regional output of the Rochester Metropolitan Statistical Area is about $1.9 billion. URMC includes Strong Memorial Hospital, the School of Medicine and Dentistry, the School of Nursing, the University of Rochester Medical Faculty Group and the Eastman Dental Center. Strong Health Affiliates (subsidiary corporations of the University) includes Highland Hospital and its affiliates, The Highlands at Brighton and the Visiting Nurse Service.

Collectively, these institutions spent $1.1 billion during the 2001 fiscal year, about $700 million in the form of salary and benefits flowing directly to Rochester residents. One third of all health

services paychecks in the Rochester Metropolitan Statistical Area in 2001 were drawn on a University of Rochester account.[3]

Health Services (including URMC and its affiliates) have become significant contributors to the Rochester metro economy.

- The direct payroll of the medical center and its affiliates exceeds half of a billion dollars (one third of all health services payroll); another quarter of a billion dollars in indirect payroll is stimulated by URMC and affiliates.
- The direct & indirect payroll of the medical center and its affiliates is nearly $800 million, about 5% of total estimated 2002 payroll in the Rochester Metropolitan Statistical Area.
- About 20,000 jobs can be attributed either directly or indirectly to URMC and its affiliates.
- Health services now contributes almost as much to direct RMSA payroll as Eastman Kodak.
- Health services is *half again* the size of the finance, insurance and real estate sector.
- URMC and its affiliates are approaching the size of the construction industry.

Employment at the Medical Center and affiliates (both full time and part time) total over **15,600** positions. On a full-time equivalent basis, the total is just over **12,000** jobs. CGR estimates that another **7,300 jobs** in the Rochester area can be attributed to the spending of URMC and its employees[4].

"Traded Sector" Significance of URMC

Economists distinguish between those economic activities that bring income into the economy from other regions and those that serve wholly local demand for goods and services. A new dry cleaning establishment must either persuade local residents to spend more money on dry cleaning or steal business from an established firm. In this instance, the distribution of income within the economy may change, but the total amount of income remains the same. In contrast, most of Kodak's film is sold

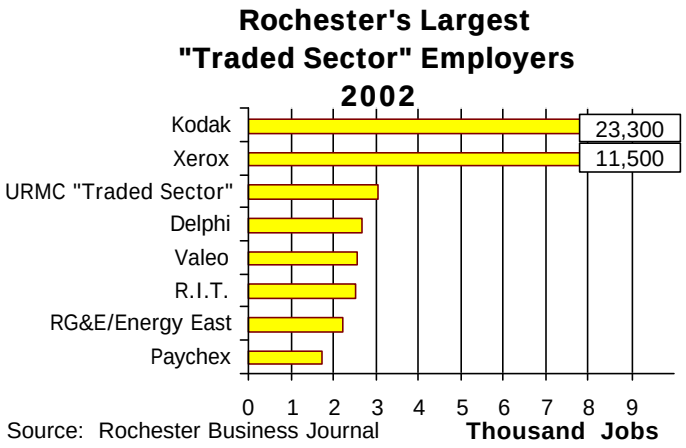
[3] The NYS Department of Labor reports total payroll in SIC code 80 (all health services, including hospitals, medical and dental offices, nursing facilities and home care agencies) as $1.66 billion (2001 Q1-Q3, annualized).

[4] This includes direct and indirect employment.

outside of Rochester and grows the economy by trading film for money.

Michael Porter of the Harvard Business School makes this point by distinguishing between products that are "traded" with other regional economies and those that are not. Only these "traded sectors" actually grow a region. Nontraded goods and services—most food retailing, personal services, nursing homes, etc—depend on earnings from the traded sector for their support.

URMC and its affiliates are a mixture of traded and untraded services. Clearly the School of Medicine and Dentistry "grows" the regional economy. Unlike dry cleaners, every city does not need a medical school. The medical school attracts clinicians with specialized skills that enable Strong Memorial Hospital to provide certain types of medical care that would likely be provided elsewhere were the medical school not located in Rochester. Were these services provided elsewhere to Rochester residents, some income would "leak" from the economy.[5]



When only URMC's traded services are included, URMC still contributes over **$550 million** to the local economy and employs about **2,800** (measured as full-time equivalents, or "FTEs"). Including the impact of an additional **300** graduate students who are not already employed as residents and researchers, this places URMC as the third largest entity among Rochester's "basic" firms, defined as institutions that draw income into the region from outside sources.

In addition to its direct contribution to employment, this "traded sector" component of the Medical Center stimulates an additional **3,000** indirect and induced jobs elsewhere in the economy, earning

[5] This distinction is defined and discussed in greater detail below.

$84 million in total compensation.[6] When added to the **$181 million** earned by URMC traded sector workers, the total contribution of the "traded sector" portion to personal income in the RMSA is about **$264 million.**

URMC Economic Impact: Summary

		Jobs				Labor Income ($M)		
	Output ($M)	Direct (FTE)	Indirect	Induced	Total (FTE)	Direct	Indirect	Total
Annual Impact								
URMC & Affiliates	$1,924	12,049	6,338	994	19,381	$572	$220	$791
"Traded Sector" URMC	*$550*	*2,790*	*1,970*	*994*	*5,754*	*$181*	*$84*	*$264*
Final Hiring Phase	$23	182	92	49	323	$11	$4	$16
One Time Impact								
Construction: Through FY2002	n/a	1,117	494	n/a	1,611	$44	$18	$62
Construction: Final Buildout	n/a	196	90	n/a	286	$8	$3	$12

This "basic" component of URMC has greater impact on the Rochester economy than a number of firms that have been considered pillars of the local economy, including Delphi Automotive Systems, Valeo, Bausch & Lomb and Paychex.

URMC's significance to the region will grow even further as its second research building is completed, adding nearly 300 additional jobs to the local economy.

URMC Invests in Its Future—and Rochester's

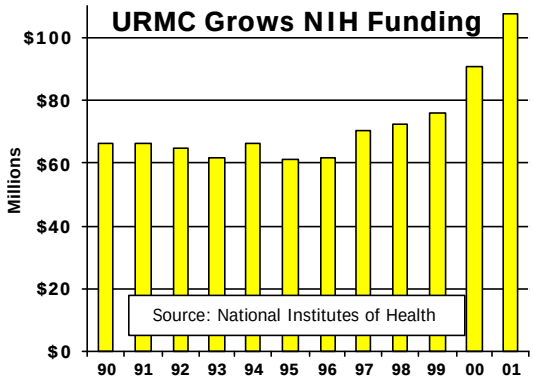
In a market economy, success is driven by individuals and firms that assume risk in hope of future reward. Rochester's history is replete with risk takers—Nathaniel Rochester, Patrick Berry, George Eastman, Jeremiah Hickey, Jacob Bausch, Chester Carlson, William Gleason, more recently Tom Golisano—whose gambles left an indelible mark on their industry and the

[6] Traded sector estimates include direct, indirect and induced impacts; both proprietors income and labor compensation are added to equal total personal compensation.

community. Information technology has sped up the economy in countless ways, including the pace of industry birth and death. In a fast-paced economy, success flows to those willing and able to respond to changing market forces, to those willing to make a calculated gamble on emerging opportunities.

The University of Rochester Medical Center recognized in 1996 that it was losing ground to competitive academic medical centers across the country. National Institutes of Health (NIH) funding to URMC had been falling since 1990; the Medical Center's share of NIH funds had been dropping even faster. URMC received a total of $62 million from NIH in that year, the 27th highest total among American universities. In 1988 by contrast, the value of URMC's NIH awards ranked it 14th. While overall NIH grant submissions were increasing, the number of URMC's NIH grant applications was declining.

To reverse this trend and move URMC back into the first tier of academic medical centers, the University developed and implemented a new strategic plan. Like a private firm in an increasingly competitive market, URMC concluded that preserving and enhancing its competitive position would only be possible if the University made a massive re-investment in the research function of the medical school.



The new facilities were built in two phases. With Phase I completed and Phase II nearly so, URMC has created a modern research "infrastructure" capable of supporting world-class research and attracting world-class researchers. The new facilities enabled URMC to recruit world-class research staff in a number of key areas.

The entire endeavor cost the University more than $230 million (in 2001 dollars) through fiscal 2002. The bulk of the investment—about $160 million ($2001) when completed in 2003—is devoted to the construction and equipping of two new research facilities.

The economic impact of the capital investment, while only a "one time" impact, is still substantial. When completed, this effort will represent the equivalent of about **1,900 full time jobs** (assumed of

one-year duration) and generated direct and indirect earnings of over **$74 million**.

THE VIRTUOUS CIRCLE: UNIVERSITY & COMMUNITY BENEFIT FROM INNOVATION

High technology business firms are driven by innovation. In a virtuous circle, innovation creates new products and new products bring revenue to support new innovation.

Medical research in the 21st century is looking more and more like other high technology sectors. The high cost of cutting edge research comes from three sources: Public sources, particularly the National Institutes of Health, royalty payments for patented innovation and research partnerships with private firms. In all cases, success stimulates success by attracting new capital.

National Institutes of Health

Total funding from the National Institutes of Health has increased dramatically during the previous five years. Congress decided in 1998 that NIH funding would be increased by 50% over a period of three years. The URMC new initiative has been well-timed to take advantage of this increase in federal funding. FY2001 saw URMC capture $107 million from NIH. Total NIH awards to the University have increased by 19% in each of the previous two fiscal years (2000 and 2001).

Royalties

As a secondary benefit, investments in research also pay off in the form of license revenue and spin-off employment. The University of Rochester has already established itself as a leader in earnings from licensed discoveries, earning $42 million in fiscal 2002. Growing from only $3 million in FY1999, this places Rochester among the top ten U.S. universities in royalty income.

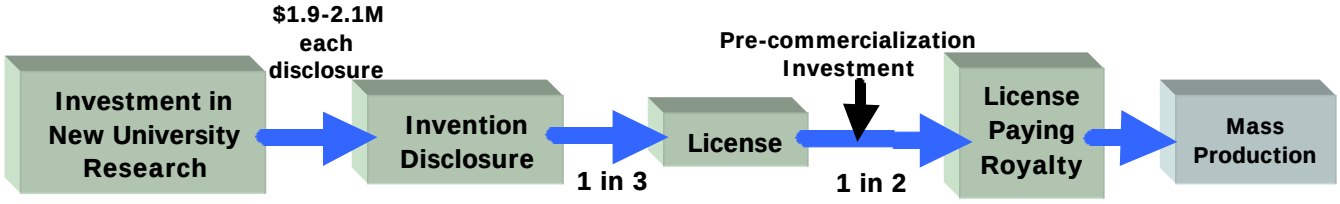
Rochester's royalty revenue depends heavily on the Haemophilus influenzae type b (licensed to Wyeth Lederle Vaccines and Pediatrics, the former Praxis Biologics). Believed to have reduced incidence of bacterial meningitis in children by over 90%, it is now administered to nearly every newborn in the United States and many other countries. More than $78 million in royalty income

was generated by the license by 2002. The Wyeth facility has employed nearly 200 researchers on site since the mid 1990s.[7]

In 2000, URMC was awarded a patent for a new class of drugs called COX-2 inhibitors. Arthritis drug Celebrex, the most popular of these new pharmaceuticals, earned $1.5 billion on 6.4 million prescriptions during its first year (1999); in 2001, Pharmacia earned $2.4 billion on the drug. Vioxx, a Merck drug based on the same technology, earned $2.0 billion in 2001.[8] The University has filed a patent infringement suit against Pharmacia and Pfizer, the two companies that market Celebrex. If the patent infringement suit is successful, the COX-2 patent could generate very significant royalties for the university and the inventors. Just as the HIB vaccine contributed to the local economy both through the founding of Praxis Biologics (and successor firms) and through contributions to the University's new research initiative, COX-2 patent royalties would also reinforce the contribution of URMC to the local economy.

Job Creation

Forecasting the economic impact of new investments in university research is somewhat speculative. That there will be an economic impact is nearly certain, but the variation in its magnitude across institutions and fields of inquiry remains significant. Precise forecasts of job creation from investments in bioscience R&D are impossible. Nonetheless, there is enough data available to speculate on the employment spin-off potential. Data collected by



the Association of University Technology Managers (AUTM) survey show one invention disclosure is reported for every $1.9 million in sponsored research spending in bioscience (1999 survey).

Studies by MIT and Penn found that firms licensing biotech innovations spend substantial sums in the pre-commercialization

[7] Unfortunately, Wyeth has announced plans to move the facility out of the Rochester area by 2004.

[8] National Institute for Health Care Management.

phase—$2.75 million per licensee in the Penn study and $3.16 million in the MIT study (Pressman *et al.*, Kramer *et al.*).

AUTM survey respondents from hospitals and medical research institutions reported an average royalty of $70,000 in 1999, nearly 40% larger than the average across all technology classes.

CGR estimates that the annual investment in biotech research at URMC (operating expenses plus debt service) will be between $45 and $50 million. Based on information gathered by the AUTM survey and parameters developed MIT and Penn, this investment will stimulate employment outside the university of more than 200 workers in the bioscience industry, earning $8.5 million annually. The indirect impact of this addition to the industry would be an estimated 165 jobs, with payroll of $3.4 million. If we assume that the increase in jobs in the bioscience industry (the direct employment) and the industries supplying the industry (the indirect impact) were fully served by in-migrants to the region, there would also be an induced effect of another 200 jobs and $6.5 million in payroll.

The share of this job creation captured by the Rochester area is impossible to predict. It will depend to a large extent on the capacity of the metro area to create and preserve a climate that is favorable to new business creation and appealing to in-migrants.

CONCLUSION

This report has documented the significance of the University of Rochester Medical Center to the Rochester metro economy. As Eastman Kodak has shed workers over the past twenty years, other institutions and sectors have been expanding, allowing Rochester residents to maintain a high standard of living. The University of Rochester is now the second largest employer in the metropolitan area. When local demand for routine health services is excluded (thus much of Strong Memorial Hospital), the medical center is equivalent to a firm of 3,000 workers, making URMC the third largest "traded sector" entity in the community (after Eastman Kodak and Xerox).

It is incumbent on community leaders to take steps to encourage continued growth and to create a climate in which related businesses can be formed and prosper.[9]

[9] See CGR's companion report *Health & Bioscience as an Engine of Economic Growth: Selected Case Studies, And The Implications For Rochester, NY*.

APPENDIX

IMPLAN Input-Output Modeling System

CGR employs the IMPLAN Input-Output modeling system to develop estimates of the direct, indirect and induced impacts of URMC on the Rochester community. The model is constructed using the six counties of the Rochester Metropolitan Statistical Area (Monroe, Wayne, Ontario, Livingston, Genesee and Orleans counties). Further details can be obtained from CGR.

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