

ECONOMIC RENAISSANCE: THE MASSACHUSETTS EXPERIENCE

James M. Howell
Bank of Boston

Massachusetts has recently gained worldwide attention as an example of successful economic revitalization through technological development. The core of this technological revolution has been the remarkable explosion of entrepreneurial activity in the state.

The Massachusetts Experience

By 1975 Massachusetts had experienced nearly twenty-five years of industrial stagnation resulting from the out-migration of older industries to the more rapidly growing U.S. South. During the seven year period ending in 1975, 112,000 manufacturing jobs had been lost—roughly one job out of five.

State and local taxes were pushed to levels that made them the highest of all the states. The unemployment rate jumped to more than 11 percent. Welfare rolls reflected the pervasive nature of our dilemma; of the 5.7 million persons living in Massachusetts in 1975, 1.25 million were receiving some form of state welfare assistance.

During the second half of the 1970s, however, there was a dramatic turnabout in Massachusetts as nearly 100,000 new manufacturing jobs were created. The microcomputer and computer peripheral industries engineered drastic reductions in the size and cost of their products that, together with advances in technical and software design, generated an explosion in private sector applications.

By the early 1980s the Massachusetts unemployment rate had fallen below 4 percent—the lowest of all industrial states. Sharp state revenue growth led to lower taxes and the vigorous demand for labor virtually eliminated the welfare problem.

To many of us this dramatic revitalization was the second most significant step in market capitalism—the first was the Industrial Revolution that took place in northern England—and the confirmation that an industrially mature and stagnant area can be revital-

ized through a rebirth of manufacturing activity utilizing technology and the vigorous growth of sophisticated services.

As we review the Massachusetts revitalization, three key factors appear to have played a dominant role: high levels of entrepreneurship, a rapid process of technology transfer and aggressive capital financing.

High Levels of Entrepreneurship

The revitalization process in Massachusetts was shaped and driven by individuals—not by organizations. The business development environment in Massachusetts is one in which innovation and new enterprises are actively encouraged and expected.

Indeed, Dr. Frank Newman, president of the Education Commission of the States, has remarked that what distinguishes Massachusetts from other parts of the United States is the presence of an “opportunistic” environment that favors innovation and that, in turn, attracts “risk lovers”—the very type of individuals who are likely to pursue a new technical idea with tenacity and determination to become successful entrepreneurs (Rogers and Shoemaker; Allen).

For many years, individual entrepreneurial behavior was poorly understood. While five decades ago the early works of Joseph Schumpeter underscored the importance of individual effort in the process of innovation, it was not until the mid-1960s that we were able to develop a more complete picture of the entrepreneur. Based on research undertaken by Professor Edward Roberts of the Massachusetts Institute of Technology (MIT) we now know that entrepreneurs usually share similar family backgrounds, motivations and educational attainment. Not surprisingly, entrepreneurs have a high level of goal orientation and motivation. A large part of this has been demonstrated to have grown out of the day-to-day activities of their families during their “growing up” years. Goal orientation and family relationships in turn affect the level of education, especially of the technical entrepreneur who generally has at least an undergraduate degree and, more likely, advanced degrees in both management and engineering. Further, 50 to 60 percent of entrepreneurs come from families in which the father was self-employed. Finally, the new enterprise founder is usually in his thirties at the start of the new business development venture, and new venture starts fall off dramatically as age increases.

Those personal characteristics are interesting, but perhaps more interesting is why entrepreneurs tend to be clustered in selected areas rather than randomly distributed through society. A large part of the answer appears to be related to the presence of outstanding colleges and universities—particularly engineering and medical schools (Lipset).

Massachusetts institutions of higher education—sixty-five in the greater Boston area alone—with their internationally-recognized scientists, engineers and research labs have played a critical role in attracting the “best and brightest” from all over the United States and the world. Further, having attended these academic institutions, graduates tend to stay in the area. For example, more than 90 percent of the electrical engineers who received their final schooling in New England remained in the region for employment.

Universities can also influence an entrepreneur’s decision to start a new technology firm. This has particularly been the case in certain technical universities such as MIT in which senior university administrators have encouraged entrepreneurial behavior among faculty. This “outer directedness” stands in sharp contrast to the more traditional academic emphasis on research and publication as the means to advancement and tenure. In this connection, senior faculty can become significant agents of change as well as “role models” for junior faculty and students.

It is here that we are able to make two specific observations about entrepreneurial energies and rural development. The first is obvious: the agglomeration of educational and research facilities has played a dominant role in attracting, keeping and producing the “agents” of technological innovation. One can hardly imagine how this could be replicated in rural areas, although the land grant colleges have certainly done a respectable job in a limited number of areas. The point is that rural areas should concentrate on attracting and exploiting new ideas that have already become part of the existing stream of technology rather than attempting to become a major player in the generation of new ideas.

The second observation concerns the market forces that shape the activities of the scientific entrepreneur in Massachusetts. From the very beginning of the entrepreneur’s creation of the new technology-driven firm, future growth and indeed ultimate survival will be determined by the discipline of the market mechanism. In other words, in order to survive, the new firm must maximize profitability in a market in which there are competitively adjusting prices and great uncertainty.

This market environment seems quite different from the one in which the American or European farmer seems to operate. Specifically, it is not necessarily, nor solely, profitability that must be maximized by the farmer. Rather, in an environment—at least historically—in which prices are set by the support program, the farmer’s goal becomes more one of maximizing output at prevailing market prices.

To me this distinction is considerably more than subtle. We can all agree that U.S. agriculture needs fundamental structural reform and that reform should introduce greater market discipline in determin-

ing output levels. But as these adjustments take place, one must be concerned about the adaptiveness of these two radically different types of entrepreneurial experience—one of maximizing profitability (for example, the Massachusetts technological entrepreneur) or maximizing output (the farmer).

High Levels of Technology Transfer

Once the process of technology-driven revitalization has started, it becomes strongly reinforcing. Successful high-tech companies in Massachusetts produced spin-offs as ambitious employees and researchers assumed an entrepreneurial role and ventured out on their own. Each new company, in turn, provided a role model for another. The magnitude of this process is truly significant.

Between 1965–75 roughly one half of the new computer company products were the result of direct technology transfer from previous employers. Roberts' analysis here is particularly insightful. He identified thirty-nine new business enterprises started by forty-four former employees of one large Boston-based electronics company. Only a short time later, the thirty-two surviving firms had aggregate sales double that of the "parent company" from which the entrepreneurs had spun off (Roberts). Thus one of the most conspicuous advantages of having many small technology-driven firms has been the acceleration of other new firms in related technologies. A small number of these firms have grown to become major manufacturing companies, thus contributing significantly to new job growth.

Further, Massachusetts has also benefited from the tendency of some entrepreneurs to start multiple enterprises—leaving one established successful venture to found another. Among the better known examples are Philippe Villers who cofounded Computervision, Inc., of Bedford, founded Billerica-based Automatix, Inc., and recently started Cognition, Inc., in Billerica; J. William Poduska, a cofounder of Prime Computer, Inc., of Natick, founder of Apollo Computer, Inc., of Chelmsford, who recently launched Stellar Computer, Inc., of Newton; and Henry E. Kloss, who successively founded Acoustic Research, KLH, Advent and Kloss Video. This again underscores the self-reinforcing nature of the technology transfer process.

In addition, while this corporate spin-off process was an integral part of the Massachusetts economic revitalization process, academic, government and not-for-profit research labs also played a critical role. In one MIT study, more than 200 new technical ventures were founded by ex-employees of MIT labs and academic departments and government labs during the late 1950s to the mid-1960s. Moreover, follow-up studies have shown that four out of five of these firms have survived¹ (Roberts, p. 252). If documentation from the experiences of other Boston-Cambridge-based academic institutions were added, the full economic impact could be more accurately judged, but the

current level of prosperity in Massachusetts tells us that it has been significant.

Before turning to the role of aggressive capital financing, it is important to note that the process of technology transfer in Massachusetts was facilitated by the presence of a substantial regional manufacturing and business infrastructure that provided support to the area's newly-created technologically-based industries. Massachusetts, especially the greater Boston area, contains a strong technological infrastructure or network of support firms in manufacturing and services as well as a large pool of skilled labor. Historically, this technological base grew out of the late 19th and first half of the 20th centuries. As the electronics industry grew, this infrastructure adjusted and expanded to meet new needs. Today, this network also includes sophisticated business services—accounting, new business development services, patent protection and complex technical product licensing sensitive to the specialized needs of technology start-ups.

High-Tech Facility Siting

For quite some time, I have been especially interested in the spatial dynamics of new facility investments. Contrary to common perception, high-growth, high-tech firms have consistently preferred to site new production facilities in suburban and rural areas, choosing to quit their city locations as soon as financial dynamics permit. The point is that these firms, when younger, very much need to be near a university or research lab, but as production becomes the central issue, a suburban or rural area is the preferred choice. These facility investments have already had a significant impact on land use in Massachusetts and New England.

Aggressive Capital Financing

Quite often, the financing needs of high-tech companies are discussed in terms of their access to venture capital. Equity, in the form of venture capital, is the major source of financing for new enterprises. Venture capital provides the bulk of the early or development stage funding for high-tech firms. While the role of venture capital is critical and should not be minimized, I would like to concentrate on how banks, at the proper stage of development, have helped put together the overall financing packages that have allowed “coming companies” to become “going and growing” concerns.

Without doubt, the creation and growth of new high-technology firms have required new bank financing strategies. Traditionally,

¹The role of defense spending for long-term research and development should not be minimized as an additional causative factor in technology transfer from defense to nondefense products.

banks have waited until emerging firms achieve the following: a sustained level of commercial activity; a history of profitable operations; an accumulation of business assets such as accounts receivable, inventory, plant and equipment; and a large capitalization in order to fully support the bank's commitment to lend at the time the commitment is extended to the company. This financing strategy, while appropriate in many cases, does give rise to the often quoted customer complaint that banks "are only willing to lend me money when I don't need it."

High-tech financing has required a shift in the timing of these fundamentals. The Bank of Boston lending experience in the 1960s and 1970s with these industries traces out what we like to regard as a new and innovative banking pattern.

First, target the bank loan commitment to the best entrepreneurial talent—not necessarily to the established company or the developed product. It is the entrepreneur who drives growth and who will capitalize on new product ideas in the face of difficulties. It is the entrepreneur who has identified the market opportunity and new technology; who has attracted a sufficient level of venture capital to underwrite the development stage, which may last two to three years or more; and who has assembled a team of managers and directors capable of developing and implementing the firm's business plan. These elements are—first and foremost—essential for any successful venture.

Second, as this development stage process unfolds, the entrepreneur and the venture capitalists will look to the banks to make an initial commitment to fund the future levels of business activity once the firm becomes self-sustaining. Banks in New England have learned to make commitments at the earliest stage of business creation—to complement, but not compete with, the role of the venture capitalist's equity investment—not after the business has become established in the market.

Banks in other regions and other countries will undoubtedly find that, as in the case of Massachusetts, entrepreneurs given the proper flow of venture capital do not need to draw heavily upon these banks' commitments. Yet these bank loan commitments to high-tech firms serve as a signal of endorsement to investors, thereby enabling the entrepreneur to raise private capital on favorable terms. Often, a bank's own venture capital arm may invest in the early-stage rounds of equity financing, and even a modest level of asset-based financing for plant and equipment is now commonplace during the development stage.

Third, just as the venture capital support must be continued, if not increased, during the high-growth periods of the firm's development, it is particularly important that the entrepreneur be able to rely on the bank's loan commitment at that very time of above-average lever-

age. High-tech companies typically operate within short-term windows of opportunity and, at times, startling growth rates, even in an environment of a national economic downturn. It is during such times that the confidence and fortitude of the banker is often put to the greatest test.

In short, the prerequisites must come full circle; i.e., the entrepreneurial spirit of a region's manufacturing base must eventually extend into what are usually regarded as the most conservative business institutions, mainly banks.

The Massachusetts Miracle and the Role of Partnerships

Over the past decade, there has been much discussion about partnerships as a tool to stimulate economic growth. Partnerships between business and government, government and labor or among all three have been put forth as solutions to the problems of stagnant and declining economies. In the 1980s partnerships have become panaceas. I, too, have held that view and, in 1976, when we founded the Council for Economic Action—a Boston-based nonprofit economic development organization that I chair—we were convinced that by bringing together disparate groups, by creating unlikely alliances or partnerships, we could generate the spark that would once again ignite the region's economy. Events and the history we have just touched upon would seem to have borne out this view. Looking back and seriously considering these events, we no longer believe that this vision represents reality.

Consider with me for a moment three major partnership models frequently cited by economic development specialists: commercial partnerships, industrial partnerships and job retention partnerships.² These models have proved to be somewhat effective in shaping the location and pace of existing growth momentum. However, they have shown themselves to be most effective in a situation of strongest growth, and even then one must recognize that they operate effectively only when they lag—that is, are preceded by actual business investment and growth. Where partnerships invariably fail is where they attempt to be the “leading” force—that is, acting on the assumption that they can create growth.

The history of economic growth and development shows clearly that we live in a demand-side world. The overwhelming preponderance of evidence suggests that rearranging supply factors will not create a willingness to invest where it does not otherwise exist. Thus we do not believe that partnerships can be successful in attempting to initiate growth.

Now let us consider each of these models in greater detail to see if we can draw some conclusions that will be useful to those interested

²I have omitted housing partnerships from this list inasmuch as my central thrust is economic regeneration.

in creating and managing new growth as well as guiding economic revitalization.

Commercial Partnerships

Commercial partnerships are perhaps the most prevalent. They come together to facilitate the development of office, retail and other commercial facilities. In large cities throughout the United States, such as Boston, San Francisco, San Antonio, and in Europe there are numerous successful examples of cities and developers working together—each giving and gaining for a common benefit. In strong real estate markets, it has even become possible to institute “linkage” programs in which a developer—in order to obtain planning permission to develop a prime downtown site—must agree to establish payments to a fund for low-income housing or agree to develop simultaneously a less desirable “neighborhood” parcel. This has become fairly common in Boston and the ongoing Heritage on the Common is merely one example of linkage at work.

The point, however, is that this partnership works only in a situation in which there is already dynamic growth. The partnerships are created *in response* to a rapid acceleration of demand caused by technological innovation and/or growth in population and income. It is the dynamic process of urban agglomeration that provides the critical impetus. The partnerships—and for that matter the urban renewal investment project—in themselves are not the creative force.

Industrial Partnerships

Industrial partnerships in which various groups within a community unite to attract, finance and provide a location for manufacturing facilities have a long history. In the state of Mississippi as early as 1936, the creation of the Industrial Revenue Bond financing programs established the pattern of much that would follow. Over the past five decades, many new and imaginative industrial partnerships have followed. The highly successful Urban Development Action Grant program would have to be considered as the grandchild of the original Mississippi program.

Here again, as in the case of commercial partnerships, these efforts succeed when growth is already underway—when, for example, high-tech manufacturing has a strong appetite to invest in new equipment or in new or renovated facilities to satisfy a strong demand for production or when new applications of existing technologies have already stimulated demand. Partnerships formed in the absence of growth have not been successful. The experience of the Economic Development Administration in constructing speculative industrial parks in the 1960s offers dramatic evidence that supply does not create its own demand. Many New England cities have unfilled industrial parks that are left over from an era when urban and city

planners did not understand this spatial dynamic of the business investment equation. And when one couples this with the outsourcing of high-tech production in the Pacific Rim countries, there can be even greater concern about the longer-term economic potential of rural areas in the United States as investment sites.

Job Retention Partnerships

Job retention partnerships have been one of the ways in which older, previously industrialized cities have addressed specialized development problems. For example, the Boston Economic Development Industrial Corporation (EDIC) has been able to maintain blue collar job opportunities in the City of Boston, specifically in the apparel industry. The partnerships—put together through the leadership of Mayor Raymond Flynn and Marily Schwartz-Lloyd, director of Boston's EDIC—have been successful in retaining a targeted group of jobs in the central city. Again, this took place in what was already a dynamically growing economy among established industries that could survive only by utilizing cheap labor in the city through deeply subsidized production space. Such partnerships have been successful in retaining jobs in the central city, but they have not in themselves created economic growth.

A Few Caveats

In conclusion, although one will readily acknowledge that partnerships have many advantages and can be effective in building supportive community attitudes toward growth, one must be mindful of their limitations and not seek to create for them tasks that are inappropriate to their nature.

In reinforcing growth, in expanding an existing growth dynamic, even in marginally shifting the geographical focus of growth, partnerships are often successful. But when it comes to *creating* growth I am led back once again to the economic fundamentals. Growth derives from technological innovation and increases in population and income. The economic revitalization of Massachusetts was essentially the work of a wide number of talented individuals who, clustered around our academic institutions, developed entirely new technologies and moved into production to satisfy extraordinary demand for their products. In the process they created the wealth and business investment that has made Massachusetts the envy of the country.

The central thrust of my line of reasoning is that economic development through technology requires a new set of fundamentals; namely, technical or engineering entrepreneurship, technology transfer and aggressive capital financing. Without question, these are factors that are almost solely concentrated in a few large urban areas and cannot be easily replicated in other urban areas, let alone

rural ones. This implies that the Massachusetts experience of revitalization through technology has a very limited applicability to the rest of the country.

It would be wrong to end my remarks on such a negative note. We must not lose sight of the fact that roughly one-third of the U.S. population chooses to live in small cities and rural areas. Given that this reality will most likely continue to prevail for some time, the challenge is to find new public policies that address the rural, often left behind, areas.

I am increasingly persuaded that the most direct path to achieving self-sustaining development in small cities and rural areas is through a strategy based on import-replacement industries; that is, by the creation of new business enterprises in local areas as a substitute for goods and services heretofore imported from the larger, nearby urban places. The broad-based creation of firms in these industries will permit small cities and rural areas to achieve a new level of economic independence from surrounding urban areas.

Through the Council for Economic Action mentioned earlier we are now in the process of beginning to undertake an import replacement industry project in three rural areas in the United States. At this time, I know of no other such project in the country and, as our activities evolve over the next several years, I would welcome the opportunity to discuss our results with your organization.

Thus we can conclude that there is a basis for optimism for rural areas. The economic future of these communities can be improved through a broader understanding of the spatial dynamics of our economy, targeting import replacement industries and encouraging the creation in rural areas of new firms in these industries.

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OPPORTUNITIES, POLICY
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