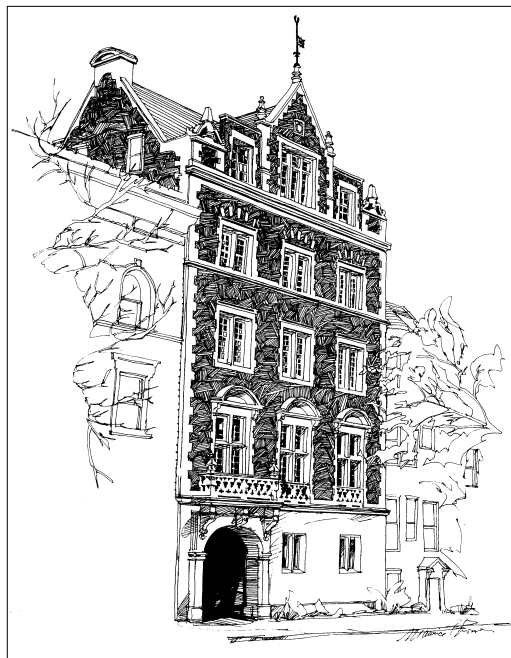
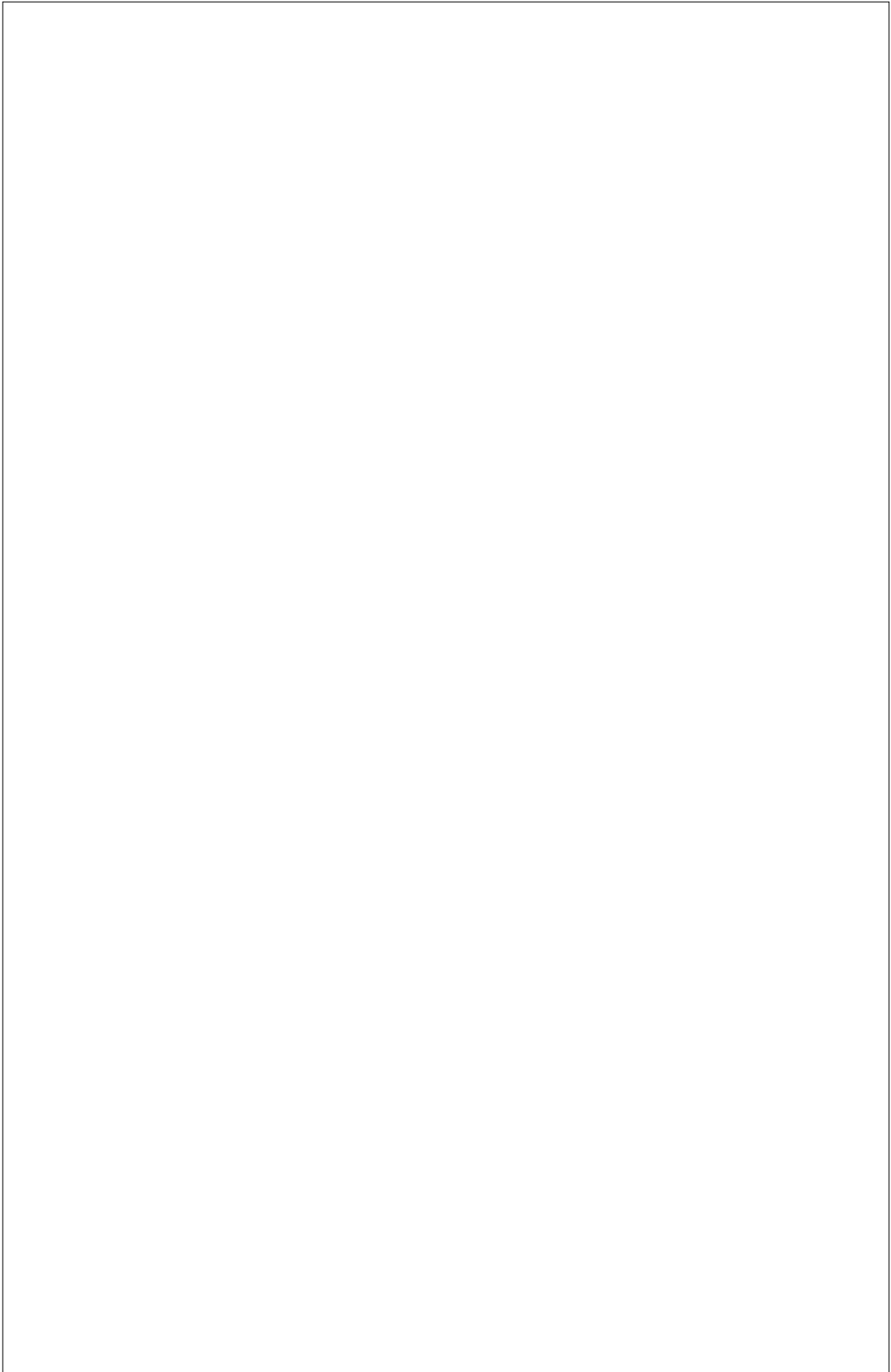


# A FRAMEWORK FOR CLUSTER-BASED ECONOMIC DEVELOPMENT POLICIES



**Robert C. Turner**  
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The  
Nelson A.  
Rockefeller  
Institute  
of  
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CLUSTER-BASED ECONOMIC  
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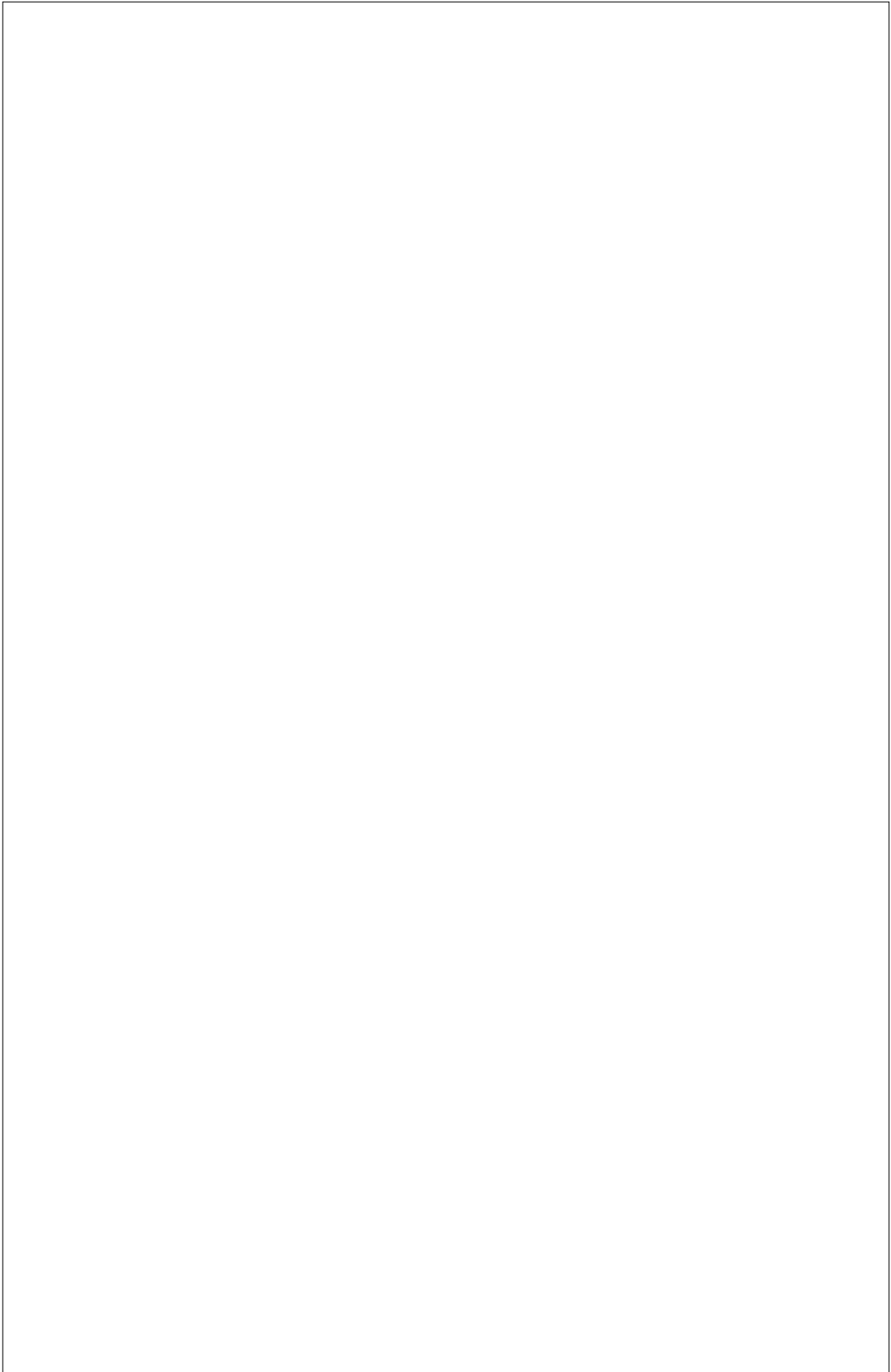
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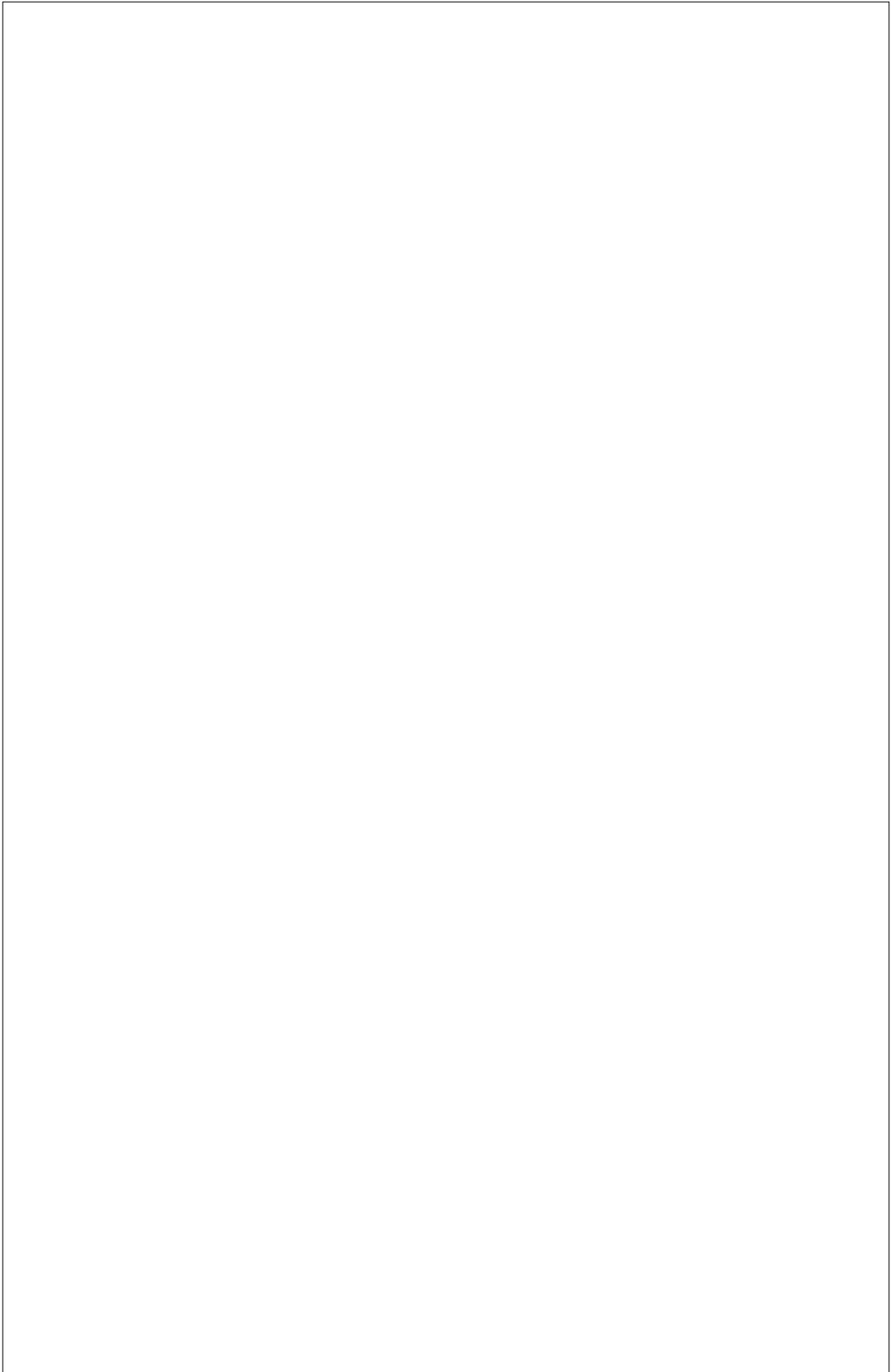
## Foreword

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**T**his paper examining the importance of clusters in economic development policy grew out of a panel discussion at the December 2000 New York State Network for Economic Research (NYSNER) meeting. The paper was written by Robert C. Turner in consultation with David J. Wright, Richard P. Nathan, and Donald J. Boyd of the Rockefeller Institute of Government, and John Bacheller of New York Empire State Development. It was prepared for a panel meeting at the December 5, 2001, NYSNER meeting.

Robert Turner is an assistant professor in the government department at Skidmore College. He received his Ph.D. in political science from the University of Wisconsin - Madison in 1999. His research specialty is state and local economic development policy and state level manufacturing extension policy. He lives in Saratoga Springs, New York. We thank him for his effective, hard work on this important topic, and particularly for his suggestions of ways to deepen policymakers' understanding of how efforts to promote clustering can enhance regional economic development efforts and initiatives. We also thank David J. Wright for his close involvement with Turner in this work.

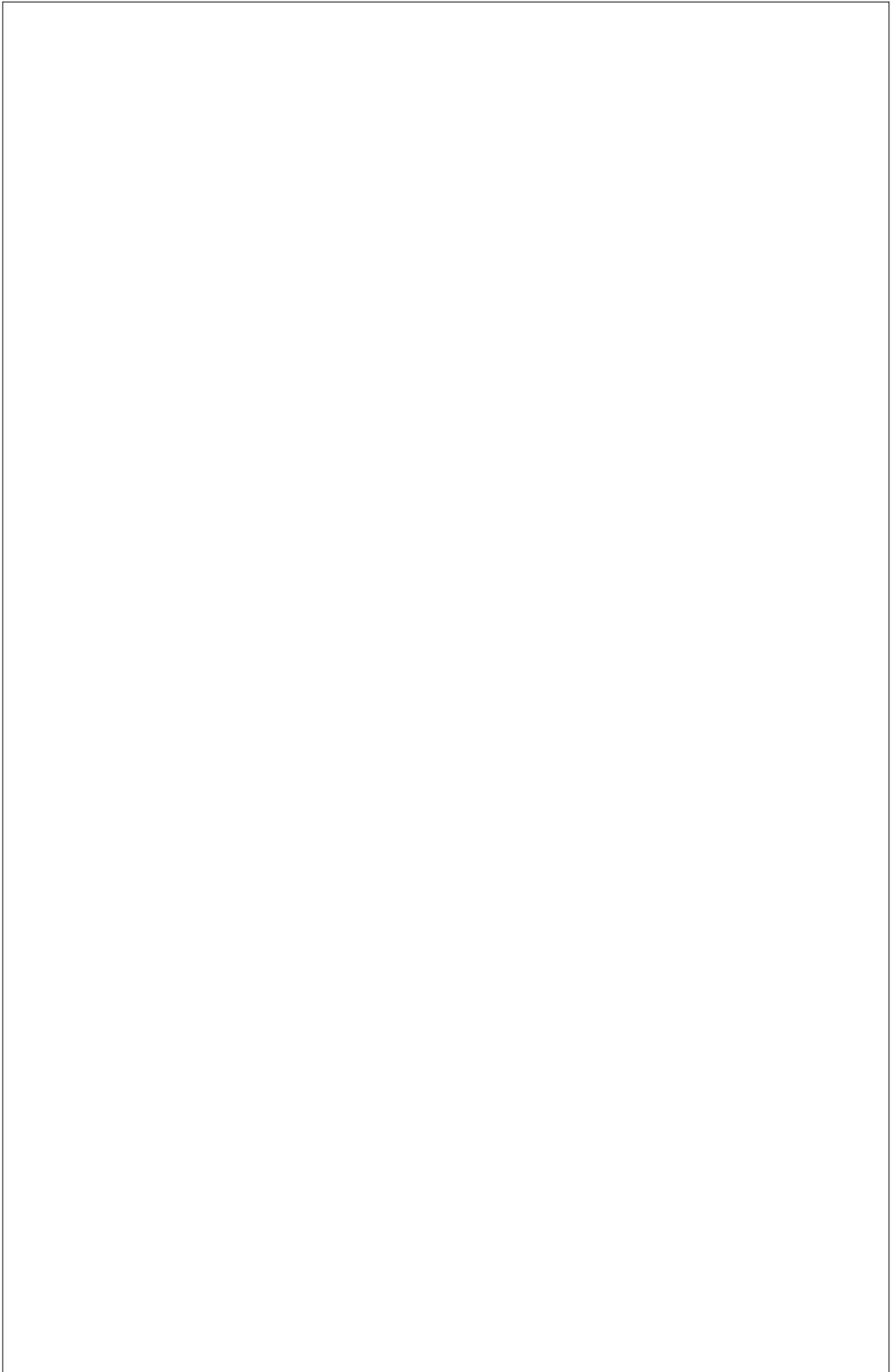
**Donald J. Boyd**  
*Deputy Director*  
*Rockefeller Institute of Government*



## Abstract

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Clusters are at the forefront of economic development theory and practice. Instead of focusing on individual companies, clusters encourage practitioners and scholars to think about regional economies in terms of groupings of related firms and supporting infrastructure. Government, corporate, and other decision makers require a new analytical framework for understanding how clusters enable them to positively affect a large number of firms at a relatively low cost. This paper examines how state and local policy makers in New York identify the members and boundaries of a cluster and promote the regional technological dynamism associated with Silicon Valley. Next, the paper identifies three sets of specific recommendations for how policy-makers can use the cluster concept: to understand a regional economy and the sources of its competitiveness; to promote greater collaboration among regional firms; and to maximize the impact of government services to private industry. Finally, it concludes with a pilot proposal to identify successful examples of cluster policies at the regional level which other policy makers around the state can emulate as well as identify new opportunities for public action.



# A FRAMEWORK FOR CLUSTER-BASED ECONOMIC DEVELOPMENT POLICIES

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**C**lusters are at the forefront of economic development theory and practice. Clusters encourage practitioners and scholars to think about regional economies in terms of groupings of related firms and supporting infrastructure, rather than individual companies. Cluster-based policy offers a comprehensive approach for understanding regional economic conditions and trends, as well as the policy challenges and opportunities those conditions and trends portend. Such policies offer the potential to positively affect a large number of firms at a relatively low cost to government, but require new roles for government, corporate, and other decision makers. The distinction between achieving and underachieving clusters depends on the degree of identity or awareness of commonality of interests among member firms, the extent of cluster-specific services and infrastructure available to firms, and the synergy between participants. Sophisticated qualitative and quantitative analyses are critically needed in order to develop deeper understanding of these relationships, to determine how regional public and private institutions contribute to the collective and individual competitiveness of the firms in the cluster, and to provide the empirical foundation for public policies designed to strengthen local and state economies.

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Acknowledgements I am very grateful for the comments and assistance of John Bacheller, Kent Gardner, David Wright, Ann Davis, Christine DeLucia, Beau Breslin, and Dick Nathan.

At the 2000 New York State Network for Economic Research (NYSNER) Conference organized by the Nelson A. Rockefeller Institute of Government, a panel of papers was presented on industry cluster analysis and economic development in New York. Together, these papers illustrate how cluster theory is driving changes in New York economic development policy as well as what the implications of clusters are for revitalizing older industrial regions like Rochester and the Hudson Valley. The NYSNER panel reflected a continuing interest among researchers at the Rockefeller Institute in examining how clusters can be used to improve economic development policy making; notable previous work includes a briefing paper and presentation by Brian Bosworth on *Economic Development as Inter-firm Cooperation: Networks, Sectors, and Clusters*. The purpose of this briefing paper is to analyze and draw from the findings of the NYSNER cluster panel and present a framework for policymakers interested in using clusters as an economic development strategy.

Although some economic development agencies may have recently discovered the value of economic clusters, clusters are not a new economic phenomenon. The British economist Alfred Marshall, in his 1919 study of the Lancashire cutlery industry and Sheffield steel industry, noted the tendency of firms to locate near their key suppliers, customers, and competitors. The regional clustering of firms produced an innovative environment in which the secrets of the industry were “in the air” according to Marshall. However, interest in clusters has risen dramatically since Michael Porter’s *The Competitive Advantage of Nations*<sup>1</sup> Porter argued that the high wages of advanced industrialized countries could only be maintained in the face of increasing economic global competition by sustained innovation. His analysis echoed Marshall’s analysis almost 100 years earlier that the most competitive and innovative industries were not individual companies or even single industries, but regional clusters of related industries. Porter’s

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1 Alfred Marshall, *Industry and Trade* (1919).

findings have had a profound impact on economic development policy.

Porter's analysis encourages the practitioner to understand regional competitiveness in terms of the linkages, complementarities, and spillovers in technology, skills, customers, and information that cut across individual firms, industries, and sectors, instead of in terms of individual companies or industries. For example, the Northeast Ohio Clusters Project defines a cluster as "a geographic concentration of competitive firms or establishments in the same industry that either have close buy-sell relationships with other industries in the region, use common technologies, or share a specialized labor pool that provides firms with a competitive advantage over the same industry in other places."<sup>2</sup> Stuart Rosenfeld, president of Regional Technology Strategies and an early proponent of cluster policies, defines clusters as a "geographically bounded concentration of similar, related, or complementary businesses, with active channels for business transactions, communications and dialogue, that share specialized infrastructure, labor markets and services, and that are faced with common opportunities and threats."<sup>3</sup> Both cluster definitions suggest that to understand and affect the competitiveness of individual or regional groupings of firms, we need to examine its industrial environment of suppliers, customers, and public institutions. The key insight of clusters is that the classic "industry" definition, typically aimed at common products or services, doesn't acknowledge the important synergies that occur among firms with different products but similar processes.

What makes a cluster successful? Most analyses stress the importance of intangible factors like relationships, trust, or networks of firms. Regions that possess these intangible factors are more internationally competitive and technologically dynamic than their

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2 E. W. Hill and J. Brennan, "A Methodology for Identifying the Drivers of Industrial Clusters" (2000), p. 67.

3 Stuart A. Rosenfeld, "Industrial Strength Strategies" (1995), p. 13.

less fortunate counterparts. Michael Enright of Harvard Business School has suggested that regional clusters can be arrayed on a scale from: working, or “overachieving” clusters that are aware of their interdependence and produce more than the sum of their parts such as Silicon Valley; latent, or “underachieving” clusters where opportunities exist but the potential synergies are not yet realized; and “potential” clusters where some of the requirements are in place but critical mass and/or key conditions or inputs are missing.<sup>4</sup> The difference between the three is the degree of identity or awareness of commonality of interests, the extent of cluster-specific services and infrastructure available to firms, and the synergy among firms. What these findings suggest is that cluster policies should not be aimed at helping individual firms, but rather at building relationships among cluster firms to promote the elusive synergy of overachieving clusters.

Thus, the two main questions for policymakers seeking to use clusters are 1) how to identify the members and boundaries of a cluster; and 2) how to build synergy-producing relationships among cluster members. The next section of this paper examines how New York identifies its high-tech clusters, drawing from two New York State’s Empire State Development Corporation white papers presented at the NYSNER conference: James Held’s *Recent Trends in Information Technologies Employment in New York* and Sheri Lippowitsch’s *New York’s Technology Driven Industries: Biotechnology and Pharmaceuticals*. Two additional papers from the NYSNER conference — *Globalization in a Specialized Economy: The Rochester Case* by Susan Christopherson and Jennifer Clark, and *Historical Development of Industry Clusters in the Hudson Valley* by Ann Davis are reviewed in a subsequent section as illustrative case studies of how local policymakers are attempting to promote relationships among cluster members as a strategy for regional economic renewal. The final section presents a three-pronged strategy for how policymakers can use the cluster concept to change their economic development policies and revitalize a regional economy.

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4 M. J. Enright. “Regional Clusters and Economic Development (1996).

Specifically, the paper examines how policymakers can use clusters to understand their regional economy and the sources of its competitiveness; to promote greater collaboration among regional firms; and to maximize the impact of government services to private industry.

### **Identifying Clusters: Empire State Development Technology-Driven Industries Reports**

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Empire State Development (ESD), New York's economic development agency, has decided to use cluster analysis as "an organizing concept to guide its marketing, business assistance, and infrastructure development efforts."<sup>5</sup> As part of this reorientation, ESD's Policy and Research Division has recently published a series of papers on the status of New York's technology-driven industries within the state, including reports on high-tech clusters such as electronics manufacturing, pharmaceuticals, software, and others. At the NYSNER meeting, James Held and Sheri Lippowitsch from the ESD Policy and Research Division gave presentations on *Recent Trends in Information Technologies Employment* and *Biotechnology and Pharmaceuticals in New York*, respectively.<sup>6</sup> Their presentations emphasized how these reports are intended to give state and regional policymakers a better understanding of New York's position in various high-technology industries and as promotional material for marketing New York as a place to do business.<sup>7</sup>

The ESD reports presented at the conference provide data on the number of establishments, average wages, leading firms, and

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5 Bacheller, "Commentary on State Level Economic Development in New York" (2000), p. 5.

6 James Held's NYSNER presentation, *Recent Trends in Information Technologies Employment in New York*, was based on two Empire State Development reports, *New York State's Technology Driven Industries: Software and Related Services* and *New York State's Technology Driven Industries: Electronics Manufacturing*. For the purposes of this paper, I am referring to the two reports that provide greater detail about the status of those sectors in New York.

related university research and development spending, both in the state as a whole and by economic region, to demonstrate the relative importance and success of certain high technology sectors in New York. These reports suggest New York has made significant progress in developing these emerging fields of high technology. The basic findings of the two presentations are summarized in Table 1. As we can see, New York has a significant number of establishments, employment, and public investment in these three high-paying, high-technology sectors. The reports also note that New York is home to a number of leading companies such as Johnson & Johnson, Pfizer, Bristol-Meyers Squibb, Bayer, Bausch and Lomb, and Novartis in the bio/pharma sector as well as IBM, Toshiba Display Devices, and Phillips Broadband Networks, as well as a large number of smaller, more specialized manufacturers in electronics manufacturing. A 1999 National Science Foundation Study found that New York is a major center of university research in each of these three sectors. New York's universities and colleges spent \$1.17 billion in biological research in 1997, second in the nation only to California. Moreover, New York has three colleges (New York City's Rockefeller University with \$97.1 million, New York City's Columbia University with \$62.3 million, and SUNY Albany with \$52.8 million) in the top twenty in overall biological research and development spending among colleges and universities. New York also is a major center of university research with ten universities in the top one hundred in physical science research spending, nine in computer sciences spending, and six in electrical engineering and mathematics according to the same NSF study.

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7 Originally, the intended audience for the papers was businesses and site selectors who often seek to find out the industry presence within an area being considered, because industry presence indicates the availability of potential labor force and appropriate infrastructure and market access. Given these papers use as a marketing device, a conscious decision was made to avoid discussions of weaknesses in New York's regions as potential locations for businesses within particular industry clusters. However, the papers are also used by policymakers.

	<i>Establishments</i>	<i>Employment</i>	<i>Average Wages</i>	<i>Public R&amp;D \$</i>
Bio/pharma	20	40,000	Not available	\$1.177 billion
Electronics Manufacturing	1,096	95,271	\$39-60,000	\$260 million
Software Services	7,904	82,072	\$43-92,000	\$78 million

Source: ESD Technology Driven Industries reports on Biotechnology and Pharmaceuticals, Software and Related Services, and Electronics Manufacturing in New York

While useful as an industry status report, in order to guide public policy and have practical impact, additional detail is needed beyond what is included in these reports on how New York firms have a competitive advantage over the same industry in other places by virtue of cluster-like behavior among its firms. More discussion is needed about whether any of the three sectors is characterized by buy-sell relationships, use of common technology, or the sharing of a specialized labor pool among regional or the state firms, among other topics, in order to provide the necessary empirical framework for guiding economic development policymakers seeking to assist these clusters.

Each of the three high-technology industries discussed in this first group of ESD papers operates in very different ways that have important implications for understanding the origins of their competitive advantages. Table 2 illustrates several of the differences among the three industries. For example, the differences in the number of employees per firm and in public R&D spending between the three sectors suggests the software services sector is driven more by entrepreneurship and small start-up firms than university research. By contrast, the higher levels of public R&D university spending on bio/pharma

research (both in absolute and relative per job terms) suggests that the bio/pharma sector is more reliant on public investment than the other two industries.

Moreover, statewide statistics on total high-tech employment or number of high-tech enterprises within a sector obscure the geographic concentration of these industries. Over two-thirds of all employment in each sector is located in three of the ten economic regions in New York. Aggregate employment levels also obscure important variations inside different sectors within each industry. For example, within the electronics manufacturing industry, employment in the search, detection, and navigation equipment cluster dropped by 30 percent or almost 5,000 jobs, largely because of military defense cutbacks, whereas the electronics components cluster increased employment by 12.9 percent or 4,000 jobs. The regional and sectoral differences among and within the clusters are probably more important than the aggregate statistics in understanding the competitive advantage of each sector, a point I return to at greater length below in the discussion of standard industrial classification (SIC) codes.

**Table 2**  
**Key Differences Among Three High-Technology Sectors**  
**in New York in 1997**

	<i># of Employees per firm</i>	<i>Public R&amp;D \$s per job</i>	<i>Geographic Concentration</i>	<i>Intrasectoral Change in Employment Since 1994</i>
Bio/pharma	55.6	\$29.43	65%	-26% to 69%
Electronics Manufacturing	86.9	\$2.73	66%	-29 to 20.8%
Software Services	10.4	\$0.95	72%	21-72%

Source: Author's calculations based on statistics reported in ESD Technology Driven Industries reports.

A related challenge involves defining the boundaries of high-technology clusters, which is an important element in illustrating how the different components relate to one another and contribute to the overall economic and technological dynamism of each cluster. Like many cluster studies, the papers presented at the NYSNER conference define a cluster to include all industry sectors in certain industry classification codes. For example, Held defines the electronics manufacturing cluster as including all firms in the eight sectors of computer and office equipment (SIC 357), audio and video equipment (SIC 365), communications equipment (SIC 366), magnetic and optical recording equipment (SIC 3695), electronic components and accessories (SIC 367), search and navigation equipment (SIC 381), process control equipment (SIC 3823), and instruments to measure electricity (SIC 3825).

However, because Federal SIC codes were not designed to measure or include other actors and institutions as well as linkages between industries, they rarely capture cluster boundaries adequately. For example, the bio/pharma report notes:

“The biotech field itself is unique in that the industry is not defined by its products, but by the technology used to make those products. Those technologies have been used primarily by the pharmaceutical industry but are increasingly being used by other industries such as agriculture, mining, waste treatment, food processing and others.”<sup>8</sup>

In other words, a significant and growing portion of the bio/pharma cluster’s customers are outside of the traditional pharmaceutical industry defined by SIC codes. Similarly, the bio/pharma report notes that the many bio/pharma supplier firms also provide goods for other sectors. The report estimates that 67 percent of employment in laboratory analytical instruments, 33 percent of employment in noncommercial research organizations, and 15 percent of employment in testing laboratories fall within the bio/pharma cluster.<sup>9</sup> Describing the bio/pharma cluster by SIC

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8 Held, James. *New York State’s Technology Driven Industries* (September 2000), p. 5.

9 Lippowitsch, Sheri. “New York’s Technology Driven Industries” (December 6, 2000), p. 6.

code ignores the connections with other industries and institutions outside of the industry that are crucial to the competitiveness of the bio/pharma cluster. To understand how the New York bio/pharma cluster operates, we need to understand the relationships between the various producers, end users, and suppliers of the product. Similar problems exist in defining the software and electronics manufacturing cluster by SIC codes.

The key insight of clusters is that the classic “industry” definition, typically aimed at common products or services, doesn’t acknowledge the important synergies that occur among firms with different products but similar processes. In many ways the cluster should be defined by the glue that holds it together — the technology, the skills base, or the market. Unfortunately, all of our standard data sources are firmly rooted in traditional product definitions (whether SIC or NAICS based). Thus the cluster concept is very freeing and flexible in theory, but it is enormously difficult to avoid falling into a traditional industry definition like with the identification of the bio/pharma cluster.

This first group of NYSNER papers also attempts to document the existence of sub-state regional clusters by examining the number of enterprises, the change in employment from 1994-98, significant regional companies, and a list of academic institutions in the region offering relevant academic programs for each of the ten economic regions in New York.<sup>10</sup> For example, the papers suggest the Mid-Hudson region has both a regional bio/pharma cluster and electronics manufacturing cluster. According to the analysis, the Mid-Hudson bio/pharma cluster has 106 businesses employing more than 8,000 workers; several prominent bio/pharma companies such as Bayer Diagnostics, Cultor Food Science, Novartis, Wyeth Ayerst, and Regeneron; and approximately twenty universities, colleges, and community colleges offering related academic degrees, including New York Medical College, one

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10 The ten regions are the Capital Region, Central New York, Finger Lakes, Long Island, Mid-Hudson, Mohawk Valley, New York City, North Country, Southern Tier, and Western New York.

of the nation's largest private health sciences universities.<sup>11</sup> The papers also observe that the regional electronics manufacturing cluster has approximately 23,000 employees as of 1998 and is the home of IBM's headquarters, research, and manufacturing facilities. The region also has 23 higher education institutions offering relevant academic programs.<sup>12</sup>

Treating all firms in the same SIC code and as a regional cluster runs into the same identification problems described above with the bio/pharma cluster and obscures the influence of local geographical conditions on the operation of the firms. Clusters differ in the extent to which companies' key technological and financial networks are national or global rather than regional. For example, of the significant bio/pharma companies listed in the Mid-Hudson Region: Bayer Diagnostics is a unit of Germany's Bayer Group AG; Cultor Food Science, Inc, is part of the Finland-based Cultor; Novartis and Wyeth Ayerst's headquarters are elsewhere in the United States; and Regeneron has a significant link with Amgen Inc and Procter & Gamble Pharmaceuticals. Similarly, all of these companies are in very different markets. Bayer Diagnostics focuses on diagnostics. Cultor is a leading company in high-performance nutrition products, particularly animal and fish feed. Novartis focuses on pharmaceuticals; Wyeth Ayerest focuses on research in women's health care, immunology, and infectious diseases. Regeneron develops protein-based and small molecule drugs. At the same time, the main state-supported resources for electronics manufacturing — the Center for Advanced Technology for Ultrafast Photonic Materials and Applications at CUNY and the Center for Advanced Thin Film Technology at the State University at Albany, to name but two — are outside of the region's boundaries. Understanding these relationships is essential for policymakers seeking to promote policies to help the cluster.

What policymakers need to know is how regional public and private institutions contribute to the collective and individual

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11 Lippowitsch, 2000.

12 Held, 2000.

competitiveness of the firms in the cluster. Do the firms share a common labor pool? Do their employees have a common set of skills that area educational institutions could provide? If so, then perhaps designing community college curricula to train the future workforce or develop career ladders within the industry make sense. Do the significant regional companies share regional suppliers, such as laboratory analytical instruments, noncommercial research organizations, and testing laboratories within the bio/pharma cluster? If so, then improving the quality and technological sophistication of their suppliers would help promote the dissemination of best practices as well as opportunities for experimentation. Finally, how important is the regional university R&D research to the companies in each of these clusters? Are academic institutions able to collaborate with companies in these sectors? Are they an important source of research, fuel for innovation, or start-ups? These relationships are at the heart of the policy challenges facing policymakers seeking to create technologically innovative and economically dynamic clusters through public actions. Understanding these relationships is best done by a qualitative analysis of regional economies and clusters.

Clusters offer economic development practitioners and policymakers the advantage of being able to visualize the sources of competitive advantage within the region better than studies of a single sector. To understand a cluster, policymakers need a better picture of the relationships among public and private institutions. The New York State's Technology Driven Industries reports provide a good starting point for state and regional economic development policymakers interested in finding out about the employment levels, significant companies, and related academic institutions at both the state and regional level. The listing of high-tech companies by region using the Corptech database in the appendices of the reports is particularly helpful for regional policymakers looking to identify who the key corporate players are in their regional cluster. However, more detailed, in-depth qualitative and quantitative research is necessary to truly understand the dynamics of a cluster, and to form the empirical foundation for public policy. The final section of this paper details specific

recommendations for how policymakers can use clusters as a tool for understanding and strengthening regional and state economies.

### **Revitalizing Industrial Clusters in New York: Clusters in Rochester and the Hudson Valley**

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The second set of NYSNER papers share a common theme, the challenge of old industrial cities in remaking their economies from company town to industrial cluster. In *Globalization in a Specialized Economy: The Rochester Case* by Susan Christopherson and Jennifer Clark, and in *Historical Development of Industry Clusters in the Hudson Valley* by Ann Davis, we learn how increasing international competition has forced vaunted corporate giants like Kodak and IBM to downsize production and employees and, in turn, undermine the manufacturing base of Rochester and the Hudson Valley. While these declines have caused much economic pain in the short term, both papers are optimistic about the potential for resurgence in these communities, while noting the challenges for corporate, government, and other regional actors. What is significant about these papers for policymakers is the importance of regional actors and institutions, as opposed to national or state actors, in reshaping the regional industrial cluster.

Both papers use Ann Saxenian's *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* as their implicit theoretical structure in accounting for the region's decline and as a prescription for regional renewal. Saxenian attempts to explain why Silicon Valley's computer industry has flourished while the computer industry around Massachusetts's Route 128 has stagnated when both regions seemed so evenly matched in terms of economic vitality, growth, and entrepreneurship in the 1970s. Saxenian contends Silicon Valley's computer industry was based on a decentralized regional network of small and large firms. Extensive outsourcing to highly specialized regional supplier firms, mobility of employees among firms, and close relationships characterized the connection among firms in the network. This fertile

and supportive environment for entrepreneurs resulted in very high rates of innovation and economic dynamism. The linkages among firms via supplier firms and mobile employees helped diffuse technological advances and know-how within the regional network of firms more rapidly than in the large, vertically integrated corporations of Route 128. Because of this diffusion, the decline of a single firm, such as Apple Computers, did not affect the overall economic and technological vitality of the regional networks of firms.

By contrast, the Route 128 computer industry was characterized by large, autonomous, firms who utilized the mass production arrangements pioneered by Ford. These firms' inward focus left them less adept at perceiving and responding to the increasingly rapid changes in technological or economic markets. Moreover, by performing all the research and development, manufacturing, marketing, and finance themselves, they limited the development of a sophisticated local supplier infrastructure which nourished entrepreneurs in Silicon Valley. As a result, when the corporate giants faltered, the entire region was vulnerable.

The implication of Saxenian's analysis for policymakers is that economically and technologically dynamic clusters do not naturally emerge from a regional agglomeration of large firms. Rather, they emerge in settings where experimentation and learning are diffused through a network of firms rather than confined to individual companies. This coordination among firms and the public sector does not occur naturally through market competition; it requires local leaders who promote collective action and institutions that transcend the interests of individual firms.

The Rochester and the Hudson Valley economies, as described in the two NYSNER papers, bear some resemblance to the Route 128 computer industry in Massachusetts. Both Kodak in Rochester and IBM in the Hudson Valley are similar to the large, autonomous firms that characterized the Route 128 computer industry. Moreover, both firms have struggled in the face of increased international competition, rapidly changing technologies,

and investors' demands for increased profitability. Both firms have outsourced component production and business services and dramatically downsized their workforces. Since 1982, Kodak has reduced its Rochester workforce by 36,000.<sup>13</sup> Similarly in 1993, IBM had the first layoffs in its history, with 15,000 layoffs in its corporate headquarters and production operations in the Hudson Valley alone.<sup>14</sup> These changes signaled a dramatic departure from the company's historically paternalistic role as community patron and employer.

Each corporation's restructuring has had a fairly dramatic impact on the regional economy. According to the New York State Labor Department, between 1992 and 1998, the photographic equipment and supplies sector in the Finger Lakes Region, which includes Rochester, the so-called "Kodak" sector, lost 11,500 jobs with an average annual wage in 1998 of \$64,000. The Hudson Valley economy has been similarly affected by IBM's restructuring. The computer and office equipment sectors (SIC 357) lost approximately 10,500 jobs, or approximately 47 percent of the total employment in this sector. Moreover, the electronic components and accessories sector (SIC 367) lost nearly 4,700 jobs, or about 33 percent of employment. The average wage in these two sectors was \$109,000 and \$58,000, respectively.

Despite these dramatic declines in the economic fortunes of Kodak and IBM and their regional economies, both papers are optimistic about their region's ability to rebuild on the basis of the impressive array of public and private regional institutions that can contribute to the economic resurgence and technological dynamism of an emergent high-tech cluster. First and foremost is the continued presence of Kodak and IBM as well as other well-established, large corporations and their research facilities. Christopherson and Clark note that even after downsizing, Kodak

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13 Suan Christopherson and Jennifer Clark, "Globalization in a Specialized Economy" (2000).

14 Ann Davis, "Historical Development of Industry Clusters in the Hudson Valley" (2000).

employs almost 25,000 people in Rochester, and that Xerox and Bausch and Lomb join Eastman Kodak as significant regional employers. Similarly, Davis' analysis notes the Hudson Valley region is centrally located at the axis of the IBM headquarters in Armonk, its major R&D facility in Yorktown Heights, as well as a chip fabrication plant in Burlington, Vermont, and a new \$2.5 billion chip fabrication facility in Dutchess County, New York.

This concentration of premier research facilities makes both regions attractive to other firms. For example, in the Hudson Valley region, a consortium of Siemens, Toshiba, Infineon, and IBM have invested in a leading-edge research facility in East Fishkill. Similarly, other high-tech firms like Matsushita Electric Inc. and Phillips have been eager to invest in the region and have recently purchased the IBM spin-off Plasmaco and MiCRUS, formerly a joint venture with IBM and Cirrus Logic. Businesses in the region also benefit from the geographic proximity of such key customers as the financial service firms of Wall Street and the multimedia/Internet firms of New York City's Silicon Alley.

With some note of irony, both papers find the combination of downsizing of experienced engineers and outsourcing of production has significantly increased the regional supplier base. Interpolation of national data by Christopherson and Clark leads them to estimate there were 1,270 supplier firms within a two-hour drive of Kodak in 1997. Similarly, Davis found the number of computer and software firms in the Hudson Valley has increased by 484 between 1993 and 1997. Her preliminary analysis also suggests there has been an increase in the number of start-ups by former IBM employees since 1993. These findings are supported by the New York State Labor Department's sectoral analysis of regional economies. Employment in computers and data processing services (SIC 737) has grown dramatically between 1992-99, with a 134 percent increase in the Finger Lakes Region and an 88 percent increase in the Hudson Valley region.<sup>15</sup> Together, these data suggest that both regions are starting to see the emergence of a highly developed supplier

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<sup>15</sup> James Parrott et al., *The State of Working New York* (1999) pp. 50, 52.

network and increasing rates of entrepreneurship that are consistent with Saxenian's analysis of the Silicon Valley cluster of a high-tech/information technology firms.

In addition to a strong private sector base, both regions have an assortment of public institutions to support a high-tech cluster. Although the Christopherson and Clark paper focuses more on the development of alternative institutions to address skill issues, Rochester has an impressive array of academic institutions and educational resources as Gardner<sup>16</sup> noted. Rochester is ranked seventh in the nation among metropolitan areas in terms of the overall number of degrees per capita, and is ranked fifth in the nation in engineering degrees, third in mathematics, physical sciences, and biological sciences degrees, and twelfth in computer and information services degrees. Similarly, the Metropolitan New Economy Index ranked the Rochester area fifth among the top fifty metropolitan areas in aggregate innovation capacity, by virtue of the number of science and engineering degrees granted, public and private investment in R&D at academic institutions, and the amount of venture capital and high-tech jobs.<sup>17</sup>

By contrast, the Hudson Valley does not have as many supportive public institutions, although this is changing. In part, IBM's significant internal resources reduced the need for supporting public institutions. However, some have speculated that the absence of significant university resources in this field may be one reason why the region did not see the growth of a large number of companies in the region sharing competencies with IBM until IBM laid off large numbers of workers in the early 1990s. Given New York State's recent investments at the University at Albany and Rensselaer Polytechnic Institute, it will be interesting to see whether the increase in public support helps with the development of this cluster. Early evidence suggests that there are some nascent electronics firms developing in the Capital Region from the publicly funded research centers.

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16 Kent Gardner, "Industry Cluster Analysis & Economic Development" (2000).

17 Progressive Policy Institute, "The Metropolitan New Economy Index" (2000).

As Saxenian's analysis of Route 128 shows, however, having a critical mass of high-tech firms and educational institutions is not enough to promote a dynamic high-tech cluster. What matters is how the capital, resources, and skills of the region are combined to promote innovation. The general analysis of both papers is that while both regions have a very strong institutional base and critical mass for developing a high-tech cluster, both regions have yet to achieve that level of dynamism. These analyses are consistent with other studies of the regions. For example, Rochester was ranked fifth in the nation in innovation capacity by the Metropolitan New Economy index, but only 49th in economic dynamism. What Rochester is missing compared to other metropolitan areas is the presence of a dynamic group of start-up companies or so called "gazelle companies" (companies with annual sales revenue growth 20 percent or more for four straight years).

The challenge for policymakers is to promote the regional institutions and relationships to encourage collective action and help diffuse experimentation and learning through the network rather than confining them to individual firms. As both papers note, building relationships between the leading firms, public institutions, and the emerging smaller firms is a daunting challenge for policymakers. Complicating this dynamic is the dominant role that large corporations such as Kodak and IBM have historically played in defining the local agenda. Although new leadership at Kodak is characterized by a heightened interest in global and competitive issues and a corresponding diminished interest in regional issues, IBM remains very active in regional business organizations, and has recently helped create a Center for Advanced Technology in the Hudson Valley to train technicians for the chip fabrication plants in the region, in cooperation with other regional business groups and area colleges. Promoting new regional institutions requires the guidance and energy of cluster leaders as well as other local actors needed to foster and support these public-private partnerships. The SUNY system, with its credibility, neutrality, and resources, is well positioned to play an active role in creating these public-private partnerships.

Whether Rochester and the Hudson Valley can transform their autonomous large firm industrial system into an industrial system built on regional networks like Silicon Valley remains unclear. While both regions have an impressive array of public and private institutions to support a high-tech cluster, they face the difficult task of changing the regional industrial culture. However, early evidence suggests that IBM and the Hudson Valley are further along in becoming a dynamic cluster. IBM appears to be more open to the idea of collaboration and the presence of other regional firms than Kodak for two reasons. First, IBM has a less vertically integrated production model than Kodak. Secondly, it needs to find partners to share the enormous capital and intellectual investments required to remain a major player in information technology. Thus, while Kodak continues to address challenges to its core business that threaten its future, IBM has successfully diversified its business base, and is no longer on the defensive. Historically, New York's economy has resembled the large, autonomous firm-based economy of Route 128. The challenge is to help remake these regional industrial systems into regional networks. In the next section, I discuss what state and regional policymakers can do to help facilitate such changes.

### **Using Clusters as an Economic Development Tool in New York**

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The growing importance of competitive and cooperative relationships among regional clusters of firms, suppliers, and associated institutions require new roles for government, corporate, and other decision makers. The four NYSNER papers on clusters in New York raise a number of important issues for policymakers seeking to identify and nurture regional industrial clusters. The goal of this final section is to identify a set of specific recommendations for public and private policymakers in New York who wish to use the cluster concept to guide their economic development policies. The cluster concept can be used in three important ways: 1) to understand a regional economy and the sources of its compet-

itiveness; 2) to promote greater collaboration among regional firms; and 3) to maximize the impact of government services to private industry. Each will be reviewed in turn.

### *Clusters as a Tool for Understanding Regional Economies*

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Knowing what clusters are present, who their members are, and how they achieve competitive advantage is an important element in understanding regional economies. But a common problem among cluster studies is that they define the cluster in advance, and without sufficient quantitative and qualitative analysis. Identifying the most important sectors, actors, and interconnections in the region in advance can blind researchers to other key relationships within the region. For example, based on Rochester's historic strengths in optics by virtue of Kodak, Christopherson and Clark focus their qualitative analysis on identifying the clustering tendencies of the emergent photonics and imaging cluster in the region. However, data on employment growth suggests that the emerging computer and data services and telecommunications clusters are more dynamic.<sup>18</sup> These clusters have benefitted from technological spin-offs in fiber optics that are easy for researchers from outside of the industry to overlook. Moreover, researchers cannot rely on elite interviews to identify all the relevant intersectoral relationships that make up a cluster since many often have limited knowledge of other sectors and their relative importance within a regional economy.

Quantitative cluster analyses are also vulnerable to mis-specification. Most quantitative cluster analyses rely on location quotients (LQs) to identify whether there is a cluster in a region. LQs are simply a ratio of an industry's share of regional employment divided by the industry's share of national employment. A ratio over 1.25 is indicative of regional employment specialization in a given sector that is consistent with the existence of a cluster. Unfortunately, LQs are not particularly helpful for policymakers.

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<sup>18</sup> Kent Gardner (2000).

Knowing that New York has a high LQ of 1.29 in the biotechnology/pharmaceutical sector tells us nothing about the degree of spatial or economic interdependence of bio/pharma firms in the state or what competitive advantages these firms have by locating in New York.

To understand a regional cluster as a prerequisite for accurate policy intervention, policymakers must first identify what the most competitive industries in the region are, and secondly identify the different components of a cluster and how the components relate to each other. This analysis requires a mix of quantitative and qualitative analysis.

The first step is to identify the most competitive industries in the region. While quantitative modeling of regional clusters is relatively new, several new methods offer policymakers and analysts a better understanding of what the most competitive industries in the region are and how they interact with other sectors in the region. The Northeast Ohio Clusters Project has developed a method to identify the so-called “driver industries” that give the region its competitive advantage.<sup>19</sup> It first identifies the regional industries with the greatest levels of exports, local employment, regional linkages, and productivity. After identifying these sectors, it uses input-output or value chain analysis to measure the flow of goods and services between final market producers, and first, second, and third tier suppliers that directly and indirectly engage in trade.<sup>20</sup>

While these advanced statistical techniques are significantly complex and time intensive, they offer two main advantages over alternative methods for identifying clusters. Unlike most cluster studies that identify the cluster in advance, the driver industries approach forces regional policymakers to focus on the most competitive industries, rather than which industries are perceived to

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<sup>19</sup> Hill and Brennan, 2000.

<sup>20</sup> See also T. J. A. Roelandt and P. den Hertog, “Cluster Analysis and Cluster-Based Policy Making” (1999), E. M. Bergman et al., *Targeting North Carolina Manufacturing* (1996).

be the most important or have the most political clout. For example, the Northeast Ohio Clusters Project found that the material and specialty chemical industry played a key role in the regional economy, even though both had a low profile previously.

Secondly, input-output analysis can reveal important direct and indirect relationships among buyers and suppliers that were previously unknown or not well recognized. A study of North Carolina's manufacturing sector using value chain analysis revealed that the seemingly unrelated motor vehicle and household vacuum cleaner industries were reliant on a common set of suppliers in the hose and belting industry and mechanical measuring device industry. Understanding this relationship allowed policymakers to understand how they could maximize the impact of their assistance on the two industries as well as how best to diffuse advanced production techniques among businesses.<sup>21</sup>

After identifying what the most competitive industries in the region are, policymakers must rely on qualitative analysis to understand the relationships among cluster participants. Elements of such an analysis are found in the NYSNER papers. The detailed information on regional employment, establishments, payroll, average wages, and leading firms in the ESD Development Technology Driven Industries Reports provides a basic framework for understanding a regional economy. This needs to be supplemented by a historical evolution of the regional cluster, like those of the Rochester and Hudson Valley case studies. However, the most important element of this qualitative analysis is elite interviews with cluster leaders, particularly those in the private sector. The driver industry and input-output analysis may be helpful in identifying what types of firms should be contacted. These interviews should address issues such as:

- ❖ Why are the companies located in the region and what competitive advantages does the region offer?

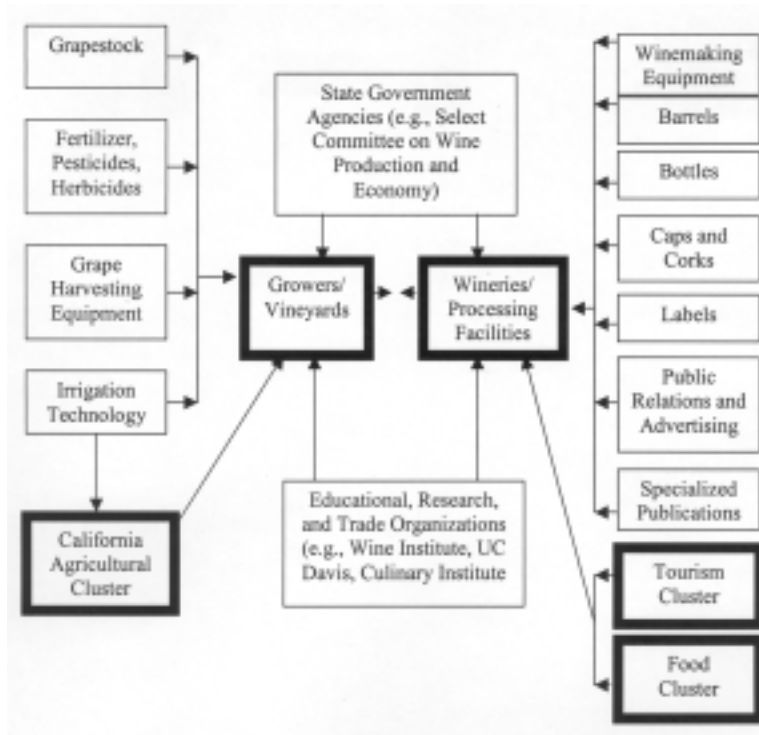
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<sup>21</sup> Bergman et al., 1996.

- ❖ Who are the customers and supplier industries; where are they located; how have they changed over time; and is geographic proximity important?
- ❖ Do companies interact with other regional firms, trade associations, or local universities; what issues seem ripe for collaboration among regional companies?
- ❖ What important regional issues, like workforce development, transportation, telecommunication, or regulatory issues, need to be addressed to promote the growth of the cluster?
- ❖ How is the regional cluster being impacted by changes in technology and the international economy?

Together, this quantitative and qualitative cluster analysis can be used to write a detailed case study report about the sources of competitive advantage, barriers to economic growth, and potential avenues for public intervention. In particular, these case studies should include a cluster map like the diagram of the California Wine Cluster in Figure 1 below. The California wine cluster is exceedingly complex, with 680 commercial wineries, thousands of independent grape growers, hundreds of suppliers firms, specialized service providers, and various public, educational, and trade associations. The cluster map provides a simple blueprint of how the wine cluster operates and the sources of its competitive advantage. On the production side, the highly developed supplier networks for the growers/vineyards and the wineries/processing facilities help disseminate best practices and technological advances and facilitate new business formation. On the demand side, the highly developed tourism and food clusters in California stimulate and reward innovation among wineries. Finally, including the relationships between the private sector and government agencies, universities, research institutes, and trade associations demonstrates how the public sector contributes to the overall success of the cluster.

**Figure 1**  
**The California Wine Cluster**



Source: Michael Porter, *Clusters and Competition: New Agendas for Companies, Governments and Institutions*, Harvard Business School, September 1997.

This stylized depiction of the relationship between firms, suppliers, customers, and other public and private agencies provides a blueprint for both understanding and explaining the sources of competitiveness and dynamism within the region. By demonstrating the origins or potential for synergies within the region, a cluster map can point to new economic development strategies that build on the cluster's strengths and improve competitiveness.

### *Using Clusters to Promote Interfirm Collaboration*

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A second way that policymakers can use clusters is as a tool to encourage firms to act collectively to address their common problems. In a 1996 Rockefeller Institute Policy Briefing paper, Brian Bosworth of Regional Technology Strategies argued that changing economic conditions have made firms' ability to collaborate the cornerstone of achieving competitive advantage. Firms who work closely with customers are more likely to keep abreast of rapidly changing markets. Large firms and suppliers that can collaborate to address changing production technologies, new forms of work organization, and evolving skill requirements are more likely to thrive from the decentralization of production. Firms who can find partners to share the enormous capital and intellectual cost of R&D are more likely to keep pace with changing technologies. These findings are consistent with a recent study by Mt. Auburn Associates, which found that firms' best sources for learning about new markets, technologies, and business practices are their customers, suppliers, and competitors and not government programs.

However, clusters differ, as Saxenian's analysis demonstrates, in the quality and extent of these market and nonmarket relationships, with dramatic consequences for regional economic and technological dynamism. In the case of underachieving clusters, like Route 128, or even Rochester and the Hudson Valley to a lesser degree, they have many of the key public and private institutions, but have not fully developed the collaborative relationships. Moreover, the ability of firms in these regions to collaborate is hindered further by their own lack of awareness: Few see their interdependence or identify themselves as part of a cluster. To work effectively as a cluster, the industries and firms must recognize their role in the larger network, the common problems they face, and the value of collective action. The challenge in this area for policymakers is how to promote a collective identity and framework for joint action.

In recent years, policymakers have experimented with a variety of policies to promote interfirm cooperation, many of which are

described in the earlier Rockefeller Institute policy paper by Bosworth. Some of these efforts are supported by a federal-state initiative, USNet, which was formed to disseminate information about networking practices and interfirm collaboration among firms to state and local policymakers. The majority of these efforts have been initiated by government institutions and focused primarily on creating networks of small and medium-sized manufacturers. Unfortunately, most of these efforts have slowly faded away over time in the face of declining firm interest and government support. The successful efforts, however, reveal some important lessons about creating and sustaining networks of interfirm cooperation. By networks, I mean a loosely organized consortium of firms and other institutions that cooperate in addressing common issues. This variant of network, sometimes referred to as a *soft network*, is different from a so-called *hard network* where the firm members have formal and organized cooperative linkages.

First, creating networks requires a policy entrepreneur or organization committed to getting the ball rolling. While public officials often initiate networks, industry associations and universities start many successful networks. For example, the Arizona Optics Industry Association and the Springfield, Massachusetts's chapter of the National Tooling and Machining Association, with some assistance from state governments, have been very active in organizing and promoting the development of optics and metalworking clusters. Similarly, the Minnesota State Colleges and Universities System has recently initiated a Targeted Industry Partnership Project to work with universities, community colleges, and K-12 school districts to develop curriculum that meets industry standards for the health care, precision manufacturing, printing and graphics, software production, and taconite production industry clusters.

Secondly, while public officials can help initiate a network, these efforts ultimately require the leadership and participation of the private sector, specifically well-respected CEOs or individuals, to succeed. Private sector leadership lends credibility to collaborative activities that may seem foreign to many firms and ensures the

right issues are addressed in a way that government cannot. Finding willing private sector leaders is often difficult, as the discussion of the leadership void caused by the withdrawal of Kodak and IBM in the papers on Rochester and the Hudson Valley point out.

Thirdly, efforts to promote collaboration and obtain private sector leadership are more likely to be successful when the issue is viewed as important to the success of the industry cluster. Not all issues are equally ripe for cooperative efforts. Where cooperative efforts potentially infringe upon a firm's source of comparative advantage, collaboration becomes more difficult. For example, the Michigan Manufacturing Technology Center formed a consortium of auto parts supplier firms with similar process technologies that met regularly to discuss improvements in new technologies and work organization. However, competitive pressures from the Big Three automakers to cut costs quickly undermined the appetite for cooperation among supplier firms, as firms placed restrictions on which improvements could be discussed and several dropped out. Issues that are perceived by industry to be important and nonthreatening, such as the development of a skilled labor force or even regional quality-of-life issues, are likely to prove more fruitful avenues for promoting collaborative efforts among firms.

Fourthly, networks that include large firms are likely to be more stable, attract more members, and be more sustainable than networks of exclusively small and medium-sized firms. Large firms have the market leverage and credibility to encourage smaller firms to follow their lead. For example, the prominent role played by larger firms in the government sponsored semiconductor network, SEMATECH, ensured the consortium would focus on problems viewed by industry as central to its near-term survival.<sup>22</sup> Also, the financial, technical, and personnel resources of large firms are valuable for creating and sustaining networks.

Fifthly, successful networks are characterized by a commitment to a cooperative process between firms, regional institutions,

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<sup>22</sup> P. Grindley et. al., "Sematech and Collaborative Research" (1994).

and several public agencies rather than a specific program or agency. An excellent cluster-based strategy is to promote a discussion among firms, associations, and public institutions about the economic or technological challenges facing the regional cluster of firms. The goal of such efforts is to promote an awareness of the regional cluster's existence and willingness to work collaboratively to address the problems. For example, at a recent Tech Valley Summit in Albany, 300 technology CEOs discussed the challenges facing the development of a technology cluster in the region. The conference addressed issues such as the public and private resources available to high-tech firms as well as the challenges facing the region.

Sixthly, and finally, the benefits from networks come from increases in the frequency and intensity level of connections among firms. The discussions about the economic or technological challenges facing the regional cluster of firms often helps firms develop personal relationships with other cluster members which provide a valuable outside source for information and often translate into new joint business ventures. This form of peer-to-peer learning is typically the most valued and trusted source of information for firms. Regional discussions can also point out the limitations of individual actions and the need for cooperative solutions to the problem. Cluster firms will then collaborate with the public sector to develop and implement a solution in response to their specific needs.

For example, Arizona's emerging cluster of optics firms identified the three main challenges to their future as finding skilled labor, keeping abreast of changing technologies, and finding overseas markets for their products. No single firm had the resources to address all of these problems alone. Thus, they turned to state and local government to develop a new community college curriculum for optics technicians, to create new optics research centers at the University of Arizona, and establish a new public-private export promotion program.<sup>23</sup> Similarly, the Wisconsin

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23 Mary Jo Waits, "The Added Value of the Industry Cluster Approach" (2000).

Regional Training Partnership (WRTP), a consortium of unions and firms in the Milwaukee metalworking cluster, identified maintaining and developing a skilled workforce as the main challenge in preserving the region's competitive advantage. The WRTP is now working with state and local governments to improve school-to-work programs, incumbent worker training programs, and supplier upgrading assistance. These cooperative endeavors with the public sector point to how industry clusters can shape government assistance and maximize its effectiveness.

By building networks among firms, cluster policies can encourage firms to act collectively to address their common problems. For example, the Tech Valley initiative has actively sought to organize a loose network of high-tech firms in the Capital Region. This initiative has been successful in involving public and private sector leaders in a discussion of the region's strengths and weaknesses and what the private and public sector need to do to help the cluster develop. By promoting an awareness of the interdependence of firms on each other and the public sector in the Capital Region, cluster policies provide the framework for collective action. Many economic development professionals have noted that once companies have identified a public good that they want, they often organize effectively in an attempt to get it. For example, in the Rochester area, Kodak, Corning, and Xerox are energetically seeking state funding for a facility at which they can test prototypes of advanced products. By helping industry organize itself, cluster policies help industry help themselves as well as provide industry with the ability to promote the development of policies that better meet their needs.

### ***Using Clusters to Maximize the Impact of Government Assistance***

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The third way that state and local economic development officials can use clusters is to organize government development assistance around clusters of firms rather than individual firms. Presently, most economic development programs focus on the needs of individual firms and industries. Many individuals involved in eco-

conomic development policy have found that a cluster strategy offers a more efficient and effective way to use limited public resources to promote the comparative advantage of a region, deliver programs and services to industry, build on the strengths of the regional economy, and foster economic development.

One strategy is to create specialists within an agency to work with specific industries. For example, the Minnesota Department of Trade and Economic Development has industry specialists who work with the computer and electrical components, health care and medical products, printing and publishing, tourism, and wood products, plastics, and composites clusters. Similarly, staff in the Strategic Business Division of New York State's Empire State Development Corporation are assigned responsibility for building and maintaining communication with significant companies in their clusters. The creation of trade or industry specialists can promote continuing communications and relationships of trust between staff and industry cluster members. Agencies gain ongoing information about industry needs and barriers to cluster growth, rather than snapshot views of an industry cluster at a particular time from a cluster report. These positions may help increase the understanding of and facilitate the delivery of services to specific industries in the state.

Other states, such as Arizona and Oregon, have structured their state economic development initiatives using the industry cluster framework and coordinate their agencies' efforts to work with the industry clusters. These states encourage their education and training providers, research institutions, transportation and technology providers, and economic development agencies to work collaboratively instead of having three agencies with three different and uncoordinated programs focused on the same industry or cluster. Agencies in these states generally work with clusters of firms, rather than individual firms, to understand and address key concerns. Such efforts are typically coordinated with a team of industry leaders or across public agencies. An added benefit from this administrative coordination is a better, common understanding among public agencies of what other organizations are doing. In New York,

a recent report, *Building Skilled Workforces for New York's Regional Economies*, found that few educators were aware of Empire State Development and the majority of community college workforce development directors were not aware of the Manufacturing Extension Partnership program to help small manufacturing enterprises.

A third option is involving networks or clusters of firms in designing the content and delivering the services. This approach is predicated on the view that cluster organizations or networks are better able to design and deliver assistance to firms than most government agencies. For example, a machining training program designed and run by the local industry association in Springfield, Massachusetts, has a 96 percent placement rate.<sup>24</sup> Similarly, an international study of technical and community colleges found that programs that targeted local clusters of firms were "better able to create a real life context for learning relevant to the lives of students; encourage informal learning that is not easily verbalized or codified; and support more effective informal labor market information systems."<sup>25</sup> These advantages apply to other programs. In Arizona, many firms were unaware or uninterested in the state export promotion program. After the state redesigned the export program in coordination with its optics and software clusters, it saw dramatic increases in the usage, success, and private support for the program.<sup>26</sup>

One variant of this is to create regional, cluster-specific, industry-led intermediaries with industry associations, technical assistance centers, or colleges and universities. These intermediaries could act as a "wholesaler" of services to regional clusters. For example, Alfred Technology Resources, Inc. manages two business incubators, a venture capital fund, and an internship program for the ceramics and advanced materials cluster in New York's Southern Tier. Such one-stop shopping service delivery mechanisms are

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24 Robert Forrant and Erin Flynn, "Seizing Agglomeration's Potential" (1997).

25 Stuart A. Rosenfeld, "Community College/Cluster Connections" (2000).

26 Waits, 2000.

likely to both increase the ease with which cluster firms can access the services and the overall quality of public assistance.

A final option for state policymakers is to use government services to help industry organize itself. Using regional industrial associations as the service delivery vehicle, as is done in Germany, encourages local firms to join the association. This associative behavior, in turn, strengthens the informal relationships among cluster participants. Few states in the U.S. have pursued this approach to date. However, it is possible that firms are more likely to cooperate than is often suspected. For example, a recent report by Regional Technology Strategies for Empire State Development found strong interest by corporations in forming consortia and pooling resources to improve the caliber of training they received.<sup>27</sup>

While state strategies targeting clusters of firms are still in their infancy, this strategy has numerous advantages over the conventional economic development strategy of providing one-on-one assistance. Clusters improve private industry input to the program, increase the accessibility and scale of the programs, and provide a critical mass of companies to justify providing resources and programs. Industry cluster strategies do not necessarily involve government creating special advantages for some industries at the expense of others. In Arizona, for example, if a cluster can organize itself and show its value to the economy, the state will work with it to bring in government, education, and other support groups to form a working cluster. The state does not provide the cluster groups with any money, nor does it limit the clusters with which it works to a set number.

### **Conclusion: A Blueprint for Cluster Policy**

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The goal of this paper is to present an analytical framework for policymakers to improve economic development policy by using

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<sup>27</sup> Regional Technology Strategies, Inc. "Building Skilled Workforces for New York's Regional Economies" (July 2000), p. 35.

clusters to understand their economy; to promote greater collaboration among firms; and to maximize the impact of government services to private industry. What follows is a brief summary of how cluster policies can be used in New York.

### *Using Cluster Analysis to Understand Regional Economies*

By viewing regional economies in terms of groupings of related firms and supporting infrastructure, rather than individual companies, cluster analysis offers a comprehensive approach for understanding the sources of competitive advantage within the state or region and the potential of economic development strategies that build on the cluster's strengths. In New York, Empire State Development had already identified the key clusters or economic drivers of the state economy (1999). The next step is in-depth qualitative analysis is required to understand two basic questions. First, what are the sources of competitive advantage and barriers to economic growth for the cluster? Secondly, what are the appropriate avenues for public intervention? In-depth case studies would examine the extent of cluster behavior among firms as well as the importance of regional labor pools, supplier firms, and academic R&D institutions to the competitive advantage of the cluster. The culmination of this analysis would be a cluster map that demonstrates the sources of competitiveness and dynamism within the region and identifies appropriate roles for public and private actors. Similar qualitative analyses of the Hudson Valley information technology and distribution clusters by Empire State Development have proven effective in guiding public policy.<sup>28</sup>

### *Using Clusters Councils to Promote Interfirm Collaboration*

State and local policymakers should play a catalytic role in organizing key firms, nonprofits, and public institutions to create cluster councils at the state and regional levels. While the public sector can play a catalytic role, private sector leadership is essential in

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<sup>28</sup> J. R. Held, "Clusters as an Economic Development Tool" (1996).

providing the necessary credibility and direction. The purpose of cluster councils is not to promote any particular policy per se, but to encourage dialogue and cooperation among cluster participants to develop a collective vision of state and regional challenges to the cluster. These consultations help increase the presence of characteristics closely associated with cluster dynamism such as self-awareness and associative behavior among firms. Businesses are more receptive to collaborative endeavors than policymakers often believe. The Regional Technology Strategies report on workforce development in New York found considerable business support for training consortia. Moreover, Empire State Development found that in-depth interviews with leading firms helped “develop a regional identity among the business community and other constituencies, motivating these groups to be actively involved in implementation.”<sup>29</sup>

### ***Becoming Cluster Driven***

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The third way that state and local economic development officials can use clusters is to organize government development assistance around clusters of firms rather than individual firms to take advantage of economies of scale. Empire State Development has already taken the first step in improving their understanding and communication with clusters by creating organizational structures that focus staff on certain clusters. The next step would be to convene cluster participants, through the cluster councils mentioned above, in designing the content and delivering government services. Not only would this improve both the quality of assistance, it would provide an incentive for firms to participate in cluster councils. There is also growing support for such activities. Within SUNY, there is recognition that while there is a tremendous amount of activism at the campus level, SUNY as a system should and could be doing more to foster economic development in New York State. Similarly, there is strong interest by corporations in forming train-

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<sup>29</sup> Ibid.

ing consortium as well as of high-tech research partnerships between universities and the business sector.

### ***A Pilot Proposal***

It is the recommendation of this paper that the Rockefeller Institute undertake a series of in-depth qualitative institutional analysis of three regional clusters in New York. The purpose of these case studies would be identify successful examples of cluster policies at the regional level which other policymakers around the state can emulate as well as identify new opportunities for public action.

1. Perform in-depth qualitative analysis to develop case studies and cluster maps that analyze each cluster's special characteristics in terms of structure, growth opportunities, and common issues on which cluster participants could collaborate.
2. Examine the operation of existing regional consortium or clusters to assess their effectiveness; identify best practices from which other New York clusters can learn; and recommend new opportunities for promoting interfirm cooperation.
3. Identify examples where public policy has been helpful to furthering clusters/consortia, what modifications were needed and how they came about, drawing from that lessons that might be more broadly applied in making certain public policies contribute to the economic dynamism of the cluster and well being of the communities' residents.

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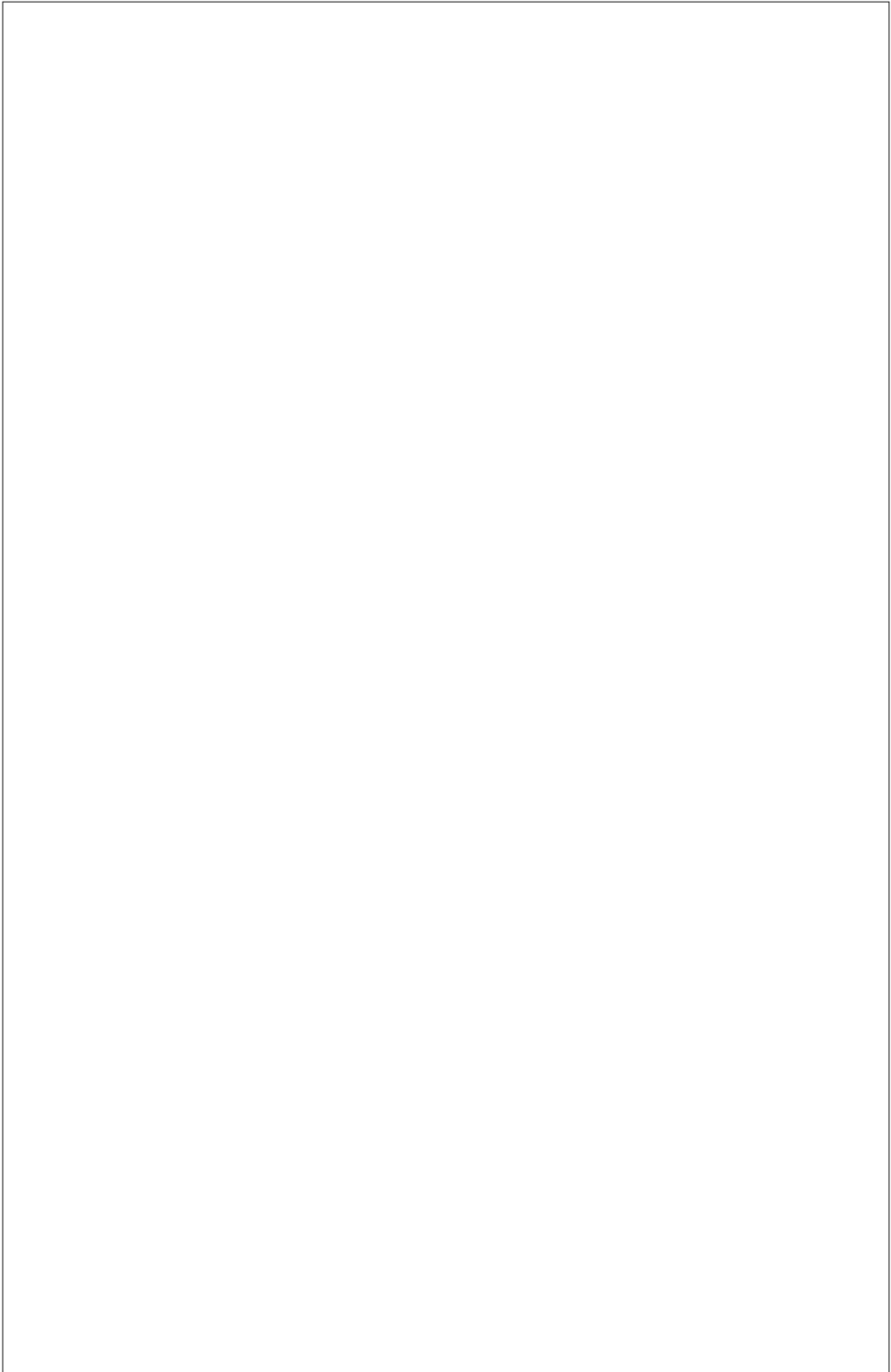
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