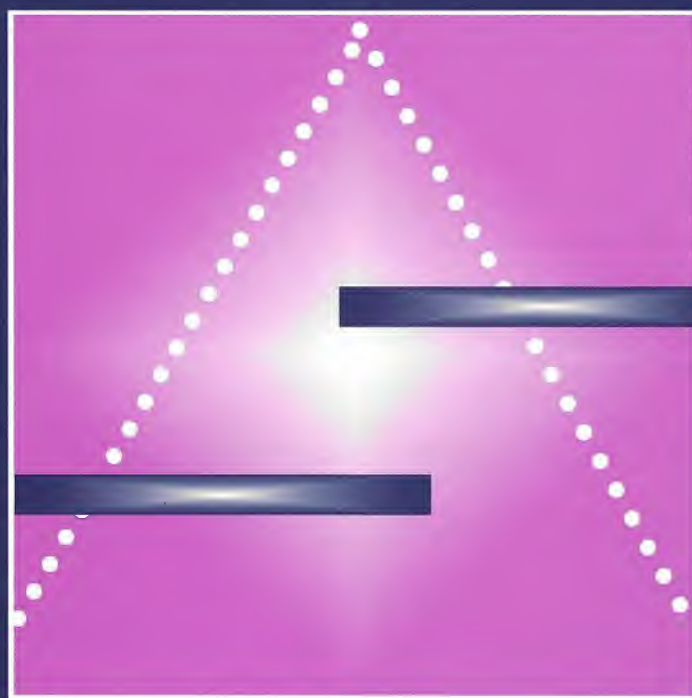


UNDERSTANDING STATE ECONOMIES THROUGH INDUSTRY STUDIES

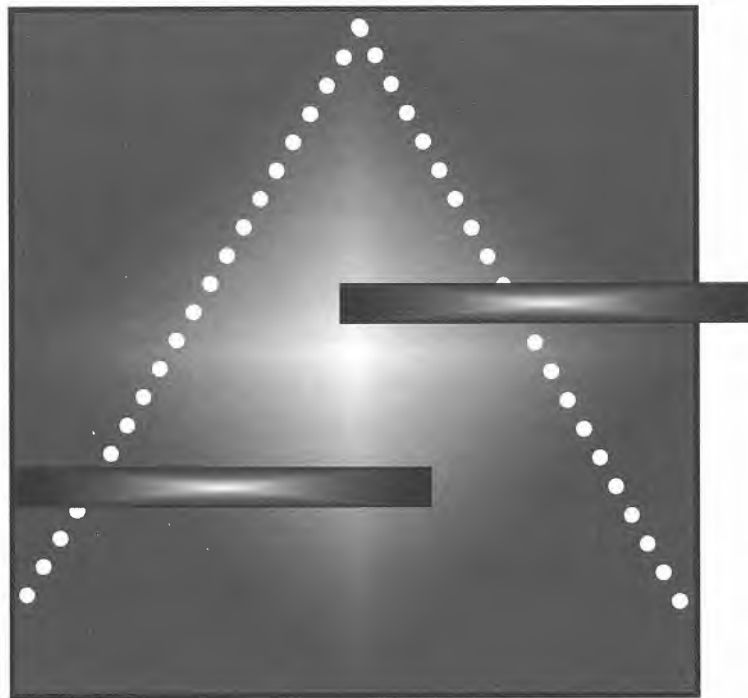


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Library of Congress Cataloging-in-Publication Data

Redman, John M., 1949-

Understanding state economies through industry studies / by John Redman.

p. 102 cm.

Includes bibliographical references.

ISBN 0-934842-70-1

1. United States--Industries. 2. Industry and state--United States--States. 3. Industrial organization--United States--States. 4. United States--Economic policy--1981-1993. I. Title.

HC106.8R427 1994

338.0973--dc20

94-5574

CIP

Cover design by Janice Mauraschadt Design.

Printed in the United States of America.

The Council of Governors' Policy Advisors is a membership organization of the policy and planning staff of the nation's governors. Through its office in Washington, D.C., the Council provides assistance to states on a broad spectrum of policy matters. The Council has been affiliated with the National Governors' Association since 1975.

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This project was supported by the Joyce Foundation and additional support for this publication was provided by the Rural Economic Policy Program of the Aspen Institute.

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PREFACE

The Council of Governors' Policy Advisors (CGPA) has a long tradition of publishing well-researched monographs on state development policy. In the late 1970s and early 1980s, the organization, then called the Council of State Planning Agencies (CSPA), published a series of thirteen reports on the subject. In 1985 CSPA published *The Wealth of States: Policies for a Dynamic Economy* by Roger Vaughan, Robert Pollard, and Barbara Dyer, which is frequently cited in debates on state economic development policies. Later in the decade, Mark Popovich conducted original research on rural entrepreneurship, and CGPA published several reports on rural development. In the summer of 1993, CGPA published *Strategies for Rural Competitiveness*, which I wrote, that summarized some of the most promising state strategies to improve the economic competitiveness of rural communities.

We are very pleased to continue the tradition by publishing this report on state industry studies by John Redman of the Economic Research Service (ERS) of the United States Department of Agriculture (USDA). The evolution of state development policy over the past two decades has been driven by a host of factors: declining federal support for state economic development programs, increasing international competition, greater emphasis on small business creation and entrepreneurial ventures, and major fiscal challenges to make public infrastructure investments. As a result, state governments understand they must be strategic and sophisticated in how they allocate, spend, and invest their funds to promote economic development.

This paper serves an important purpose by describing key analytical concepts that have shaped some of the best work in state economic development research and policy formulation. Its objective is to help gubernatorial policy advisors, economic development officials, and public sector researchers learn more about their own state, regional, and local economies.

The first chapter discusses why state governments might choose to conduct focused industry studies. The second presents alternative definitions of industries and suggests that less conventional, analytic approaches to industry studies may provide a richer understanding of state economies. The third chapter begins by asking what we might want to know about industries or clusters of related industries. It also discusses how a sectoral approach might deepen our understanding of the interactions between and among firms, and the importance of this dynamic to economic growth. The fourth chapter offers general advice about how to conduct an industry study. The appendices provide a variety of primary data sources for this research.

Most of the illustrative examples in the report come from recent industry studies conducted by or for state governments. In the spring of 1993, CGPA surveyed its membership

to locate industry studies commissioned by state governments. We learned from this research that several state governments have become proficient in how they study their economies and use the results to contribute to strategic policy decisions. We also learned that the individuals we contacted are very interested in how other states conduct their research, how other analysts define clusters, and how a sectoral approach might lead to a different set of policies and strategies. This paper addresses most of the questions posed by these respondents.

We express our appreciation to the Joyce Foundation, which provided the financial support for this project and also generously supported CGPA's earlier work on rural development policy in the Midwestern states. We also appreciate the additional support for this publication that was provided by the Rural Economic Policy Program of the Aspen Institute.

We are very grateful to John Redman for his scholarship and commitment in producing this fine report. We want to acknowledge the support John received for his work from the leadership of ERS; and we thank CGPA members and countless others in state economic development agencies who shared information and ideas with us over the course of the study.

We extend our appreciation to the following people who took time to read an earlier draft and provided helpful comments: Brian Bosworth of Regional Technology Strategies, Inc., Terry Buss of the University of Akron, Cathy Cotter of the First Chicago Bank, Dan Luria of the Industrial Technology Institute, Molly Shonka of the National Governors' Association, David Sears and Patrick Sullivan of ERS, Paul Sommers of the Northwest Policy Center, Ernest Sternberg of SUNY at Buffalo, Priscilla Trumbull of The WEFA Group, and Mary Jo Waits of Arizona State University.

The study was conducted under the supervision of Alice Tetelman, former executive director of CGPA. Both John and I appreciate her support for this effort. We also thank Gabriela Nosari for serving as report production manager, Matt Bonaiuto for assisting in report preparation, and Sandra Macdonald for copy editing the manuscript.

We hope this work serves its objective, providing valued analysis to those who want a deeper understanding of their state economies. As always, those of us at CGPA would be pleased to hear from readers.

THOMAS W. BONNETT

Director, Economic Development and Environment

INTRODUCTION

The 1980s was a tumultuous, challenging decade for the United States. On the economic front, it embraced increasing globalization and technological change, two major recessions, slow growth in real income, deepening inequalities in household and regional incomes, and a retreat by federal government from traditional economic development activity. The convergence of these and other events has spurred states to expand and diversify their business assistance initiatives. Industrial extension services, small business incubators, and technology development, for example, are now firmly ensconced alongside more traditional industrial recruitment programs.

In adopting new initiatives, states have inevitably confronted some limitations. Economic development practitioners are increasingly concerned that resources to enhance competitiveness are too broadly "shotgunned" to have an important impact on state economies. They also note that businesses, for various reasons, are often disinterested in the services states offer. For example, a recent study of a New York State defense diversification initiative comments:

Many defense contractors on Long Island were initially skeptical about publicly supported programs aimed at diversification. Of the estimated 450 defense contractors on Long Island, 52 were represented at the entrance conference and received surveys [program application forms]. Only 18 companies . . . completed surveys to confirm their candidacy for selection. This level of participation resulted despite mailings issued to over 1,400 executives and aggressive telephone follow-up aimed at soliciting improved participation.¹

There is growing sentiment that states might do well to address these issues by pursuing a more tightly focused, "strategic" economic development policy. The strategic approach seeks a "bigger bang for the buck" by directing business assistance to certain sectors, types of firms, or both. Such a practice is common in industrial recruiting but has not become routine in the newer kinds of development programs.

Under a strategic assistance policy, manufacturing industries tend to receive highest priority, and with increasing frequency, classes of firms within manufacturing, e.g., small- and medium-sized firms, and firms meeting or seeking ISO 9000 certification. This trend is evident not only in relatively urbanized states such as Florida and California, but in more rural states like Nebraska and Oklahoma. States believe these industries are promising as long-term sources of

¹New York State Department of Economic Development, *The Long Island Defense Diversification Initiative: A Manual for Defense Diversification*, prepared by Ernst and Young, May 1993, p. 8.

new, higher paid, more stable, "good jobs," especially for workers without college degrees. States also may be seeking to prevent a good job base from further contracting. (This industry study handbook echoes the current state emphasis on manufacturing, although many of the guidelines apply to nonmanufacturing as well.)

States also are addressing the perception of industry disinterest in assistance programs by getting businesses involved in program design and implementation. The rationale is that industry involvement yields more effective program structures and builds constituencies and political support for such efforts. Some states hope, further, that meaningful participation by industry will lay the groundwork for long-term private-public sector collaboration and continuing cooperation among firms themselves.

An industry study, as I view it, is a process that supports *both* the strategic rethinking of resource allocation across and within sectors, *and* the growth of collaborative relationships among private- and public-sector actors. With this discussion, I hope to foster an understanding of why a state might choose to perform an industry study, activities the study process might include, questions it might investigate, and tools that can be used by state study teams.

I intended this work to be accessible to those with no formal training in economics or prior experience with industry studies. My primary interests are to help study teams of non-economists focus their inquiry more rapidly than might otherwise be the case, and to review basic literature, data sources, and research techniques. At the same time, I hope professional economists will find this report usefully condenses a much broader body of literature.

I have drawn generously on roughly sixty state studies received from more than half the fifty states in response to the CGPA 1993 canvass of states for industry studies. These added greatly to my understanding of state policy trends and provided a wealth of examples for the concepts presented. Finally, I wish to express my very sincere gratitude to those who took the time to locate and mail these materials and answer follow-up inquiries.

CHAPTER 1

HOW ARE INDUSTRY STUDIES USEFUL?

There are many reasons a state might undertake a focused study of its manufacturing industries. One is to inform interested firms, organizations, and individuals about current industry conditions and trends. For example, the annual *U.S. Industrial Outlook* by the U.S. Department of Commerce provides an overview of major trends in each of several hundred industries. More intensive studies of manufacturing industries present additional benefits, most of them substantive but some political. Industry studies help states:

- Distinguish among industries in setting business assistance priorities
- Prioritize policy options for working with firms in a given industry
- Increase the effectiveness and visibility of business service delivery
- Promote cooperative linkages between the state and private sector
- Promote long-term cooperative linkages among industry firms
- Build a coalition of business assistance program supporters
- Enhance the credibility of business assistance policies and programs

HELPING STATES DISTINGUISH AMONG INDUSTRIES

Industry studies can help states identify where the “payoff” from their business assistance dollars is potentially highest. In short, they help states become better-informed investors.

Currently, many states do not distinguish among industries when defining criteria for program eligibility or assistance award. They may provide assistance, for instance, on a first-come, first-served basis. Many argue that focusing resources on a particular industry is not sound policy, because it interferes with the way the market invests resources across industries. From this perspective, the sole reason the public sector should intervene is to correct market failure, regardless of the industry. This is the more traditional way of thinking about development policy. It also demands less knowledge about specific industries.

Examples of programs to correct market failure include efforts to improve the availability of market information; increase the amount of investment capital available to small businesses; and train economically disadvantaged persons who otherwise would have no access to such services. See Figure 1 for a fuller description of the market failure concept.

Others argue that it makes more sense to invest in programs that assist a smaller number of carefully selected industries, and even specific types of firms within those industries. In the

Figure 1: The Market Failure Concept

Market failure, from the standpoint of efficiency, means that “real world” conditions have kept the market from fully employing available resources, and/or producing the mix of goods and services that yield the greatest overall consumer satisfaction. Both situations are supposed to occur in a “perfectly” free market. The following market failures were described in a 1991 article by Timothy J. Bartick—and cited subsequently by Thomas W. Bonnett—as conditions that can provide the rationale for public intervention to improve efficiency:

Unemployment, when “individuals without employment are willing to work at the prevailing wage for jobs for which they are qualified.... Reducing involuntary employment for current residents is a nonmarket benefit that is a possible goal to be maximized by regional economic development policy.”

Underemployment, when the existence of sizable wage differences across industries “cannot be explained by differences in workers' skills. Shifting a regional economy toward high-wage premium industries provides nonmarket benefits that are a possible goal of regional economic development policy.”

Human capital, when “individuals underinvest.... There are four possible reasons for underinvestment in human capital. First, individuals may have difficulty financing training or education because lenders cannot repossess human capital. Second, education may increase social stability by instilling civic virtues or by providing a sense of opportunity for the poor. Third, human capital may have externality benefits, because one worker's ideas enhance the creativity of other workers. Fourth, human capital's value is hard to measure before acquisition.”

Research and innovation spillovers, when businesses and individuals do not consider social gains (from new product or production techniques adopted by others), but “only their own private gain, thus leading to underinvestment in research, development,

past, states frequently targeted certain industries (e.g., the “high-tech” industry) or types of activities (e.g., corporate headquarters) in recruiting out-of-state firms. Over the past decade many states began experimenting with industry-specific approaches for in-state businesses as well. After stipulating that certain sectors are ineligible for new state economic development incentives a 1993 report by the state of Kansas sets forth the basic principle:

and innovation.... The innovation spillover argument may justify economic development programs that subsidize applied research (e.g., Pennsylvania's Ben Franklin Partnership Program) or product development (the Connecticut Product Development Corporation)."

Other imperfections in information markets, when "underprovided by private markets.... The problems with private information provision may rationalize government programs that provide information intended to encourage economic development; industrial extension services that provide information on modernization; expert information programs; and marketing programs providing information on potential new branch plant sites."

Imperfect capital markets, whenever "socially profitable loans or investments are not made. There are three possible causes of such market failures. First, financial markets in the U.S. are regulated. Competition among banks is restricted, and this may limit credit availability. Furthermore, risks taken by financial institutions are supposedly restricted by government regulation. This may prevent financial institutions from making risky loans or investments despite an expected good return."

From Timothy J. Bartik, "The Market Failure Approach to Regional Economic Development Policy," *Economic Development Quarterly* 4, No. 4, November 1990, pp. 361-370, summarized in Thomas W. Bonnett, *Strategies for Rural Competitiveness: Policy Options for State Governments*, 1993, pp. 50-51.

Market failure also encompasses equity issues. While efficiency arguments are sometimes amenable to empirical analysis, equity is largely a matter of values. The most extreme free market proponents argue that the social cost of altering market allocation for the sake of equity exceeds the social benefits of doing so. Others, of course, disagree; they believe the benefits of increased equity justify any possible efficiency penalty. This is likely to remain an eternal issue, because there is no good way of quantifying either the true benefits (including nonmaterial benefits) to the individual of increased income, or the true cost to the individual of decreased income.

A strategic approach to problem-solving dictates choices, demands selectivity and focus, and requires the setting of clear priorities. This means that the state's economic development program cannot hope to serve all interests and still remain credible and effective. A "scorecard" or "checklist" mentality, where programs are aimed in all directions and resources are dissipated across fragmented and inherently marginal activities, is a waste of limited resources. The state must avoid this trap.¹

¹State of Kansas, Kansas Inc., *A Kansas Vision* (Topeka, Kansas: Kansas Inc.), February 1993, p. 6.

There are several reasons why closer study might prompt a state to distinguish among its industries when designing business assistance strategies.

Industry Size

Some state industries are simply much bigger than others and disproportionately affect state economies. The auto industry in the industrial Midwest, the textile and apparel industries in the Southeast, and agriculture in the Plains states are obvious examples.

Export Base

An industry may be part of a state's export base—the economic activities that bring outside income into the area by selling goods and services outside the area. These industries hold a key position in local economies because such “exports” generate income on which other sectors rely. For example, an auto assembly plant generates income directly for its own workers and indirectly for workers at firms that supply the plant (e.g., auto parts manufacturers). These workers, in turn, spend part of their income locally (at retail stores or gas stations), further inducing local income growth.

High Pay

Some industries pay more than others. All other things being equal, it is preferable to try to retain or promote industries that offer higher-paying jobs. Not only will workers themselves enjoy higher incomes, but higher incomes may generate higher levels of “induced” local growth.²

Growth Prospects

Some state industries have dramatically better growth prospects than others, and some will suffer particularly rapid contraction over the next decade. Focusing public programs on either type of industry may promote social welfare more than targeting industries with average growth prospects.

²This issue is not as clear cut as it seems. For several reasons, particularly differences in average output per worker hour, higher-paying industries may generate fewer jobs for a given increase in production. The auto industry, for example, creates far fewer jobs per million dollars of production than apparel, which pays much lower wages. If substantial local unemployment exists, however, the additional jobs created in apparel can raise total area income more than if auto output increases a similar amount, because bringing a greater number of previously idle people into the work force more than offsets the lower wages in apparel—one reason for the caveat “other things being equal.”

For example, efforts to accelerate growth in the potentially fast-growing biotechnology industry may yield greater employment increases than a similarly sized effort in the more mature food processing industry. Conversely, developing an adjustment strategy for dislocated apparel workers in response to imminent trade liberalization may pay a high efficiency dividend to states with apparel-dependent communities. This is because labor markets have demonstrated much greater than average difficulty absorbing displaced apparel workers, in part because of the typical apparel worker's lack of transferable job skills and low educational levels, and the often heavy reliance of local (particularly rural) economies on the apparel industry.

International Competition

Industries that compete internationally may merit special assistance, because other nations have programs that promote the competitiveness of these same industries on world markets. In Figure 2, an Ohio study of the state aerospace industry describes how the Japanese government in recent years helped improve the competitiveness of Japanese aerospace producers. The support of Airbus by the European Community is another classic example of the strategic development of a priority industry through concerted, long-term public backing. Other states, too, may require programs to enhance the international competitiveness of their industries. States that fail to counter initiatives by other countries risk losing their competitive edge.

Alternatively, exposure to foreign competition may justify special assistance if state firms lag behind their overseas rivals in important ways (e.g., poorer quality, higher inventory levels, or less aggressive pursuit of export markets). As trade continues to liberalize over the next decade, this may become an increasingly important rationale for special assistance programs.

Percentage of Small and Medium-Size Firms

Industries with an unusually high percentage of small and medium-size enterprises (SMEs, or firms with less than 500 to 1000 employees) may also merit targeted assistance programs. First, industries with many smaller firms need an aggressive approach, because assistance programs must reach a greater number of firms to have a significant impact on overall industry performance. Second, as described in more detail below, SMEs generally have a difficult time accessing information and resources to maintain their competitiveness in an ever-changing economic environment.

Diversification Potential

One factor that may affect the appeal of an industry is whether or not it helps diversify a state economy. Diversity can increase the stability of a local economy if local industries do not all respond the same way to broader economic changes, e.g., interest rate or currency fluctuations.

Figure 2: A Short Summary of Japanese Aerospace Policy

Over the past decade, Japan has developed a three-part strategy to assist its aerospace firms to compete in the global market place. First, the government has helped large companies to form consortia, decreasing the risk any one firm faces and increasing bargaining power. Unlike consortia in other Japanese industries, which share R&D only up to the precompetitive stage, these extend to the production stage. All of Japan's major international projects—the Boeing 767 and 777—have been handled through such consortia.

Second, the government provides direct financial assistance. Loans for up to 50 percent of the product development costs for aircraft projects are available through the government-owned Japan Development Bank (JDB). MITI [Ministry of International Trade and Industry] pays the interest on these loans with funds it gets from another government-funded organization called the International Aircraft Development Fund (JADF). Companies begin repaying only when the project reaches the break-even point. Though companies are required to repay principal fully, if projects... run into difficulty, experience indicates it is likely MITI would ease repayment requirements. These loans greatly reduce private-sector risk and enable companies to make much larger investments in aerospace projects than they would otherwise make, thereby speeding development of the industry.

Finally, the government has great influence over purchases made by domestic airlines. And it uses this influence to encourage foreign manufacturers to increase the amount of work they subcontract in Japan. The government does not make overt demands on foreign firms, but firms are acutely aware of these interactions and take into account that subcontracting in Japan may help them sell to Japanese airlines.

Although Japanese firms appear content, for the time being, to produce subsystems, a recent report prepared by a team of researchers at Texas Christian University contends that Japan is pursuing the objective of developing the ability to become systems integrators on the scale of a Boeing or Airbus and may be able to meet this objective within the next 15 years.

From the Ohio Department of Development, Data Users Center, *The Ohio Aerospace Industry* (Columbus, Ohio: Ohio Department of Development), Business and Industry Series, January 1993 pp. 19-20. Jim Kell, principal analyst.

Technology Linkages

Some industries produce technologies or services that have an important influence on performance of other state industries. For example, a Battelle study to help target key Iowa technologies and industries notes:

In terms of linkages *among technologies*, technologies with the greatest impact on technologies include: electronics and related fields, computer and information science, advanced materials, biotechnology, biomedicine, and advanced manufacturing.

concept of "facilitating technologies," which impact a number of other technologies, is somewhat analogous to employment multipliers.³

Many other states have recently conducted studies to help them differentiate among industries when setting business assistance priorities. Arizona and Florida have conducted studies to identify industries that may generate significant numbers of new, higher-paying jobs, and in which these states have strong and sustainable competitive advantages. Oregon, following its strategic planning study *Oregon Shines*, has targeted thirteen "key industries." The state also recently established industry-specific benchmarks to measure industry strength and performance.

California has established an Energy Technology Export Program (ETEP) to help firms that produce alternative energy technologies to penetrate export markets. In the first program year (1987) and every two years since, ETEP has conducted an extensive industry survey to help the state in better ". . . estimating growth from proposed programs and activities, characterizing the industry, identifying barriers to trade, and in developing performance evaluation information for the state legislature."⁴

In 1991 Oklahoma began a "targeting review process" using intensive data and other analyses to differentiate among its industrial prospects for recruiting and business expansion and retention programs. The state subsequently targeted five industries (all in manufacturing) for expansion and retention and established an industrial extension program to work with the five. More recently, the state began hiring an industry specialist for each targeted industry; the specialists' main job will be to develop detailed intelligence on industry trends. The state believes this information will bolster the efforts of industrial extension agents while helping small- and medium-size firms improve their strategic planning.

Kansas, following a 1993 strategic planning report, *A Kansas Vision*, has narrowed the eligibility for special financial incentives to manufacturing firms, and within manufacturing, to firms that pay higher-than-average wages and spend at least 2 percent of their payroll on work

³Iowa Department of Economic Development and The Wallace Technology Transfer Foundation, *Identification of Key Technologies and Industries for the State of Iowa* (Columbus, Ohio: Battelle), May 1992, p. IV-17.

⁴State International Policy Network, "California's Energy Technology Exports: A Study in Sectoral Trade Development," *Clearinghouse on State International Policies*, Vol. 3, No. 3, pp. 1-2.

force training. The state also plans to encourage industry-specific consortia of manufacturing firms to pursue competitiveness-enhancing activities and give greater priority "to start-up firms that export products and services out of the state or nation . . ."

Following a review of its late 1980s strategic plan, Pennsylvania also targeted part of its business assistance budget to "high quality" manufacturing firms. To qualify for loans under the Pennsylvania Industrial Development Authority (PIDA) retention program, a firm must meet ISO 9000⁵ criteria and pay above-average wages. In addition, regional and local business assistance providers are now to give priority to helping firms achieve ISO 9000 certification.

In 1993 the New York State Department of Economic Development undertook a competitive analysis of the Mid-Hudson Valley economy and the role of industry clusters. The study identified five clusters that characterized the regional economy. Through additional quantitative analysis, interviews with local officials, and focus groups of industry cluster representatives, also delineated cluster-specific strengths, weaknesses, and policy issues.

In the mid-1980s, Delaware commissioned a *Business Development Marketing Study* to help "in identifying industries to be targeted in the state's efforts to promote business expansion and development."⁶ Indiana recently completed an in-depth study of its wood product manufacturing sector and according to state personnel, is currently "conducting extensive work in the area of sectoral analysis using establishment-level data." These are but a sample of recent studies intended to help states differentiate among its industries.

More generally, a 1993 study for the state of Ohio reviewed the business development programs of ten other states and the province of Ontario, Canada. Included among its findings

⁵The ISO 9000 standard is "a unified, comprehensive quality control method which is being implemented in response to the perceived need of the European Community to protect itself from substandard products and services . . . All in all, the state of a company's quality control program will ultimately determine the time and expense required for certification. For some, this means a complete overhaul of their quality control program . . . Since few companies are as yet certified, compliance can provide a temporary competitive advantage. In the future, companies lacking ISO 9000 certification will probably become very conspicuous indeed." From Turner, Tommy, "The Implications of ISO 9000 for Small Firms," *State International Policies* (Research Triangle Park, North Carolina: Southern Growth Policies Board), Vol 2., No. 9, October/November 1992.

⁶State of Delaware, Delaware Development Office, *Delaware Business Development Marketing Study*, prepared by Kenneth Leventhal and Co., June 1986, p. 1.

“Business development strategies are becoming more focused on specific industries and business opportunities, which is evident in all the states examined.”⁷

To summarize, states have generally taken two approaches to business assistance. The more traditional, functional approach seeks to mitigate market failure with little regard for which industries receive assistance. In recent years, states have increasingly pursued an industry-based approach, focusing public resources strategically on a smaller number of industries, and in some cases, differentiating among firms within those industries.

The generic differences between functional and industry-based approaches are not as great as they might appear. An industry-based approach can have the same intent as a functional one (i.e., to correct market failure). The difference is that an industry-based strategy more sharply differentiates among market failures, for example, distinguishing those that affect the competitiveness of a big, export-based industry from those affecting smaller, secondary industries.

It is also true that the functional approach allocates business assistance resources in very specific ways, assisting some industries more than others. The resulting industry mix is simply not as apparent as when assistance programs are explicitly designed along industry lines. It can, in fact, cost states a great deal of money to discover how a functional approach distributes resources across industries if neither the legislature nor the governor require program managers to report data in this format.

Ultimately, the factors that favor one approach over the other will weigh differently in different states. We raise these issues to help study teams recognize and discuss them.

HELPING STATES CHOOSE AMONG POLICY OPTIONS

Industry studies help states set business assistance priorities and optimize the effectiveness of their policies and programs by identifying the most appropriate mix of investments for a particular industry. A first objective is to avoid adopting marginally productive or even counter-productive measures, as the consequence of a gap between fact and perception.

⁷Ohio Department of Development, *Ohio Economic Competitiveness Project: Summary of Findings and Recommendations* (Columbus, Ohio: Ohio Department of Development), prepared by the Cleveland State University Urban Center, March 1993, p. 30.

In the early 1980s, for example, many believed the primary cause of competitive difficulties in the U.S. auto industry was its inability to raise capital to modernize aging plant and equipment. The federal government, they argued, should create a multi-billion-dollar national development bank to provide a significant portion of the necessary funding. Subsequent events, including an enormous amount of new investment financed by the auto industry itself, have shown that inferior product design and quality, due in part to ineffective management, were far more important than the inability to raise capital.

More important, an industry study can provide objective data and analysis with which to tailor economic development policy to on-the-ground conditions. A good example is a cooperative public-private strategic audit of the regional apparel industry spearheaded by the Bethlehem, Pennsylvania Industrial Resource Center, a regional office of the state industrial extension program. The study found that growing regional firms were broadening the range of services they offered and had one of three types of managers: a younger member of the owning family who had taken control from an older member; skill-based entrants from other industries (e.g., microelectronics); and immigrants.⁸ If a state were developing a program to enhance the robustness of its apparel industry, a similarly detailed profile of its own successful firms would clearly provide useful information. Conducting a focused industry study would be necessary to obtain such a detailed profile.

Industry studies can be useful not only in framing strategies to assist firms to innovate or modernize, but also in crafting an approach to adjust to industry downsizing. For example, as trade liberalizes in the 1990s, rising apparel imports will dislocate some U.S. apparel workers. A poorly documented but widely known fact is that a typical apparel plant has an annual labor turnover rate of 30 to 50 percent; the problem is so severe that some employers have begun offering bonuses to employees who stay a certain number of months. A second poorly documented industry characteristic is that a cultural taboo deters men from working as sewing operators. Thus, aggregate unemployment statistics may greatly overstate the pool of available sewing operators, and in fact, mask chronic shortages.

A good industry study would conclude correctly—though counterintuitively—that the problem with apparel industry downsizing is not the overall contraction of employment opportunities in the industry (since the typical plant is routinely hiring), but geographic mismatch

⁸Lehigh Valley (Pennsylvania) Apparel and Textile Industry Labor-Management Innovation Network, *Second Year Report* (Princeton, New Jersey: Participative Systems, Inc.), 1991.

between available openings and dislocated workers. This conclusion suggests that in its adjustment package, a state might do well to emphasize measures facilitating employer-employee matching, such as expanding prenotification requirements for plant closure/mass layoffs or improving labor market information and outplacement.

ENHANCING THE EFFECTIVENESS OF SERVICE DELIVERY

Industry studies can help states overcome barriers that compromise the effectiveness and visibility of their business assistance programs. An industry study can be a catalyst for improving coordination among programs, clarifying program priorities, increasing program accountability, and enhancing technical expertise.

Coordinating Programs

At present, firms may find it extremely difficult to locate and interact with relevant publicly funded assistance programs. In words echoed in other studies, a Massachusetts report notes:

A company with a project that involves contact with state government often must deal with multiple staffs and with multiple—and sometimes conflicting—requirements and expectations. Government agencies with overlapping functions can represent a formidable challenge to companies trying to discover who is responsible for activities related to their project and how to meet the demands of many agencies at once. The company must “connect the dots” itself in the absence of government’s ability to coordinate its own operations.⁹

In many past speeches, Doug Ross, former Michigan secretary of commerce and now assistant secretary for employment and training at the U.S. Department of Labor, put the issue more succinctly: “Coordination is an unnatural act among nonconsenting adults.”

Industry studies can provide information on how to improve service delivery and make services more visible and accessible. A study may find, for example, that the most effective means of coordinating service delivery is to physically co-locate assistance providers from

⁹State of Massachusetts, Executive Office of Economic Affairs and the University of Massachusetts, *Choosing to Compete: A Statewide Strategy for Job Creation and Economic Growth* May 1993, p. 6.

different programs, or assign an experienced industry person to “broker” between industry firms and service providers. States may not easily envision such nontraditional, crosscutting solutions in the absence of a focused and manageable coordination effort. While strong, consistent political leadership also is essential, an industry study can give political leaders a blueprint to follow. The more the state involves the private sector in developing this blueprint, the higher program quality is likely to be.

Program Priorities

Even in the absence of formal institutional change, industry studies can improve coordination by establishing common priorities across programs. For example, a state may give high priority to encouraging exports from a given industry because industry trends have produced significant new export opportunities in Europe. This finding may prompt managers of job training and industrial extension programs to devote a greater proportion of their resources to that industry, and within the industry, to focus services on helping firms meet ISO 9000 certification requirements.

Program Accountability

A state also can use explicit, common program priorities to hold program managers accountable for performance. For example, are job training and industrial extension managers increasing their effort to help industry firms with ISO 9000 certification? And if not, why not?

A number of states are moving toward even more demanding systems of program accountability. Oregon's benchmarking initiative ties funding for state government programs to a measurable improvement in one or more indicators of state social welfare, e.g., adult literacy or infant mortality. To this end, managers from separate (including traditionally unrelated) programs may propose and pursue joint efforts to move the state more quickly toward specific benchmarks. Over time, funding will gravitate to the most effective program consortia, helping public service delivery achieve a higher level of overall effectiveness.

Oregon has just extended its benchmarking tool to each of the state's “key industries.” In 1993 the state involved more than 600 industry officials in establishing industry-specific benchmarks to measure progress in international competitiveness and help gauge the effectiveness of public programs designed to assist businesses in this area.

Florida, through its Enterprise Florida program, is planning to apply the benchmarking concept to industry-specific business assistance efforts:

The success of Enterprise Florida should be measured in terms of new business start-ups and survival rates, expansion of both small and large businesses, attraction of businesses within targeted economic clusters and higher job quality (rising real wages) as well as job creation. Enterprise Florida would establish benchmarks based on national and regional standards, which would become appropriate goals in each of these areas.¹⁰

Kansas intends to develop benchmarks, or "Kansas keystones," in part to track the effectiveness of a newly adopted strategy of "targeting export assistance services to sector-based clusters and higher value-added firms."¹¹ Appendix A lists priority indicators recommended to Arizona by SRI (Stanford Research International) for tracking the relative performance of state industries. An appendix to the SRI report lists many other potentially applicable indicators.

Technical Expertise

By helping focus business assistance on a smaller number of priority industries, industry studies can contribute to raising the level of technical expertise within the public sector. A more traditional, functional program that addresses market failure across a range of industries cannot easily develop the skills to meet specialized needs. For example, personnel who promote state exports may have little detailed knowledge of foreign markets for a given product. A general-purpose extension program may lack staff engineers who are knowledgeable about an industry's unique technical features. Broadly based small business loan programs may be unable to judge whether or not an assistance applicant is strategically well-positioned within the industry. In contrast, directing resources to priority industries can make programs more credible, relevant, and effective by developing a "deep depth"¹² of industry-specific knowledge and experience.

¹⁰Florida Chamber of Commerce and Florida Department of Commerce, *Enterprise Florida: Partnership for a Competitive Economy*, Prepared by SRI International, Center for Economic Competitiveness, Final Report, October 31, 1991, p. 3.

¹¹State of Kansas, Kansas Inc., *op. cit.*, p. 93.

¹²The term "deep depth" comes from Earl Weaver, former manager of the Baltimore Orioles, who used it to describe the level of team talent the year the Orioles last won the World Series.

ESTABLISHING LINKAGES BETWEEN THE STATE AND PRIVATE SECTOR

Involving the private sector in industry studies helps establish new ties between the state and private-sector actors. These ties, if cultivated, can keep the state abreast of industry trends and conditions, including ways the state can help enhance industry competitiveness.

One approach to involving the private sector in industry studies is to convene a team of public-sector personnel to perform background research and subsequently interview a sample of industry firms or representatives. A second approach is to include representatives of industry-related institutions on the study team itself (e.g., trade associations, unions, selected industry firms), later interviewing a broader industry sample. A third alternative is to bring together, prior to the study, a group of industry representatives who wish to develop a better understanding of the competitive environment, and who want to work with the public sector to identify the kind of support that will be most useful. This group of firms, cooperating with public and other private-sector actors, will play a leading role in defining the study agenda and providing input. In this way, the study becomes "industry-driven."

ESTABLISHING COOPERATIVE LINKAGES AMONG FIRMS

Industry-driven studies strengthen public/private-sector linkages and promote interfirm linkages as well, leading to collective learning and other forms of cooperation. If a study proves valuable to industry participants, it will encourage future collective activity, deepen understanding of industry dynamics, and provide meaningful advice on state program structure. It may prompt other kinds of cooperative ventures, such as marketing products or developing training programs jointly, as firms come to better know and trust one other. Some development practitioners believe, in fact, that the single most effective action a state can take is to nurture this kind of collective activity, particularly among small- and medium-size firms. An industry study so structured can directly serve this end.

BUILDING A COALITION OF PROGRAM SUPPORTERS

There also are political benefits resulting from a well-conceived industry study. When the study process brings together public officials, business firms, unions, industry associations, and other interested parties, the study can help build a broad and diverse base of political support for initiatives the group believes worthwhile. Building an effective coalition, in turn, helps marshal resources for a sustained effort to secure legislative action.

ENHANCING THE CREDIBILITY OF POLICIES AND PROGRAMS

A second political advantage is that by involving a large number of respected individuals in an industry study, policies and programs are imbued with a rigor and substance they may otherwise lack. Critics will find it more difficult to dismiss study recommendations, or declare them irrelevant to on-the-ground conditions. Further, speech and action are more persuasive when they flow from the conviction that a proposal makes sense—an intangible factor that can prove important when attempting to sell programs to a skeptical audience.

SUMMARY

To summarize, industry studies have the potential to yield both substantive and political benefits. They facilitate states' ability to set priorities among industries. They help states define the most promising industry strategies, and enhance the effectiveness and visibility of service delivery. They help establish long-term cooperative linkages between the public and private sectors, and among industry firms. Finally, they help build political coalitions and enhance the credibility of business assistance policies and programs.

In the next three chapters, we discuss how to define an industry, what to consider when studying an industry, and which activities a state might undertake as part of a study.

CHAPTER 2

WHAT IS AN INDUSTRY?

People use the term "industry" in many different ways. Common are references to the U.S. manufacturing industry, the construction industry, or the service industry. These are general terms that subsume an enormous number of distinct products and activities. Other terms may be highly specific. Thus, a team must define its industry before it can undertake any other activity.

If the primary purpose of an industry study is to discuss trends common to products and activities within a wide grouping, it may be appropriate to define an industry as broadly as "services" or "manufacturing." For example, a recent study by the state of Maine¹ describes how manufacturers are changing the way they organize the work place, thus significantly reshaping the manufacturing process.

Broad definitions may not be useful, however, in developing programs for specific industries. Within manufacturing, unique technical features and trends distinguish food processing from biotechnology, or biotechnology from high-temperature ceramics. A program to improve food-processing performance may involve very different priorities and activities than those designed for biotechnology or ceramics firms.

Even fairly narrow industry definitions may embrace a diverse array of final products and be too broad for certain kinds of inquiry. Food processing, for example, produces literally everything from "soup to nuts."

Conversely, even if a team can define the product of primary interest quite precisely, such as low-fat, low-salt, low-sugar breakfast cereals, ever-widening circles of related industries and organizations exist around the core product. These include supplier industries, industries distributing the product, product customers, linked institutions (schools, training programs, research centers, trade associations), laws/regulations (e.g, environmental standards), and industries producing substitute or complementary products. A team may reasonably decide to incorporate some or all of these entities within the "low-fat, low-salt, low-sugar breakfast cereal industry." Later in the chapter we discuss several of these widening possibilities.

¹State of Maine, Maine State Planning Office, *The Productivity Imperative and the New Maine Economy*, April 1990.

Figure 3: Levels of SIC Definition

Major industry group	Food processing	20
General product type	Meat products	201
Industry	Fresh/frozen meat	2011-2015
Product class	Beef not canned not made into sausage	20111-20119
Product	Whole carcass beef	2011112-2011116

STANDARD INDUSTRIAL CLASSIFICATION (SIC)

The most frequently cited industry classification method is the Standard Industrial Classification (SIC) coding system of the U.S. Bureau of the Census. These codes group economic activities in a hierarchy according to similarities in the products they produce and technologies they use. The SIC manual published by the Census Bureau contains detailed industry definitions for each code. Census, in turn, assigns a code to each producing establishment or manufacturing plant, according to what the establishment mainly produces.

SIC codes range from one-digit, general industry categories, such as “durable goods manufacturing,” to more specific, seven-digit product codes, e.g., whole carcass beef. A research team may find it useful to review the hierarchical structure of the coding system in choosing an appropriate level of detail for its work. (See Figure 3.)

A major reason for the popularity of SIC codes is that published Census data, the single most comprehensive source of primary data on specific industries, conforms to this coding structure. The path of least resistance for industry analysts, then, is to define an industry by a single SIC code. On the other hand, there are two major problems with using a single SIC code. The first concerns how Census aggregates its data, and the second concerns industry linkage.

The Aggregation Problem

Simply put, a single SIC code may contain “apples and oranges”—lumping together firms that produce economically discrete products or services. A study for the New York Port Authority by the consulting firm, Telesis, recounts:

The pharmaceutical industry is composed of several different businesses. One of these businesses, patented ethical prescription drugs, involves large outlays for research, detailed marketing programs directed to individual physicians, and very high margins on successful product introduction. However, the industry also includes generic prescription drugs for which original patents have lapsed. This business relies on cost-competitive manufacturing processes and skill in marketing to pharmacy retailers, increasingly a highly concentrated marketplace as multi-store retail chains replace the corner druggist. Price competition is severe in this business, and margins are low. Finally, the third major business group within the pharmaceutical industry is over-the-counter drugs, which rely on popular brand names and large national advertising budgets to market products directly to the consumer. In terms of their competitive dynamics, these three business segments have little in common, yet analysis based on SIC groupings would lump them together.²

A Massachusetts study points out how two metalworking shops producing generically similar products, and therefore falling within the same SIC code, can differ significantly in the type of business they actually pursue:

Moldmaking shops [in Massachusetts] serving the plastics industry specialize in complicated molds requiring sophisticated design capability. Shops work closely with plastics manufacturers concentrated in the Leonminster, Fitchburg and Pittsfield areas developing high quality, custom-made products. High-volume production of less complex molds for low-end plastic products takes place in Spain and Portugal.³

Conversely, an Ohio study of the aerospace industry notes:

The task of studying avionics' contribution to aerospace is made difficult by the fact that the federal government places avionics equipment manufacturers in several different

²Port Authority of New York and New Jersey, *A Strategic Audit of Manufacturing in the New York-New Jersey Metropolitan Region*, prepared by Telesis, September 1989, p. 4.

³State of Massachusetts, Executive Office of Economic Affairs, and the University of Massachusetts, *op. cit.*, p. 98.

industries and these industry classifications combine aerospace products with non-aerospace products.⁴

The co-author of a study of advanced optics and imaging firms in the Rochester, New York area similarly comments:

Even in the most recent revision of the [SIC] classification system, establishments were classified under categories as diverse as telecommunications cable, computer peripheral equipment, and medical equipment. Had we depended on formally collected data, we would never have been able to recognize the existence of this cluster of local firms.⁵

A study of the waste management industry in the Buffalo, New York area illustrates yet a third dimension of the aggregation problem. It found that "formal data is [sic] unavailable because an SIC category for waste handling has only recently been established."⁶ Thus, prior to establishment of an SIC code, Census had to place waste-handling establishments into other, less appropriate categories.

These remarks are *not* intended as a criticism of the SIC system. Any classification method, no matter how sophisticated, will fit some uses better than others. It is important, nonetheless, to recognize the limitations of SIC codes when applying them to a specific task. To summarize, producers within the same code may face different competitive environments; different SIC codes may be assigned to firms producing similar products or using similar technologies; or Census may not have assigned codes to new activities and thus has no appropriate place for firms that engage in these activities.

⁴Ohio Department of Development, Ohio Data Users Center, *The Ohio Aerospace Industry* (Columbus, Ohio: Ohio Department of Development), January 1993, p. 15.

⁵Sternberg, Ernest, "The Sectoral Cluster in Economic Development Policy: Lessons from Rochester and Buffalo, New York," *Economic Development Quarterly*, Vol. 5, No. 4, December 1991, p. 349.

⁶Sternberg, Ernest, *The Sectoral Cluster*, *op.cit.*, p. 350.

The Linkage Problem

The SIC codes also say nothing about other industries that sell inputs to, purchase from, or otherwise interact with a given industry. This omission may pose a problem for a study team, because the performance of one activity may influence the competitiveness of a related one. How well U.S. clothing manufacturers work with retailers in deciding what kinds of garments to produce clearly affects the competitiveness of the domestic clothing industry, as do the cost, quality, and availability of domestically produced apparel fabric. Similarly, the availability and quality of timber resources heavily influence the competitiveness of state furniture and paper products industries.

An Illinois study of the machine tool industry notes that “machinery and tools produced by this industry play a key role in worker productivity in other industries and the quality of the goods they produce. The metalworking machinery industry contains vital elements in the technological revolution of advanced industrial economies.”⁷

In short, state study teams that wish to explore the nature and importance of similar kinds of competitive linkages must go beyond a single SIC code to the so-called “value-added production chain.”

THE VALUE-ADDED PRODUCTION CHAIN

The value-added production chain is a useful concept whenever it is important to know how related industries influence each other's competitiveness. In its simplest form, a value-added production chain is a group of firms or individuals who collectively produce and distribute a product. A production chain for denim jeans would include not only owners and workers at a blue jeans manufacturing plant, but also:

⁷State of Illinois, Illinois Department of Commerce and Community Affairs, Office of Research, *The Metalworking Machinery and Equipment Industry in Illinois*, 1990, p. 1.

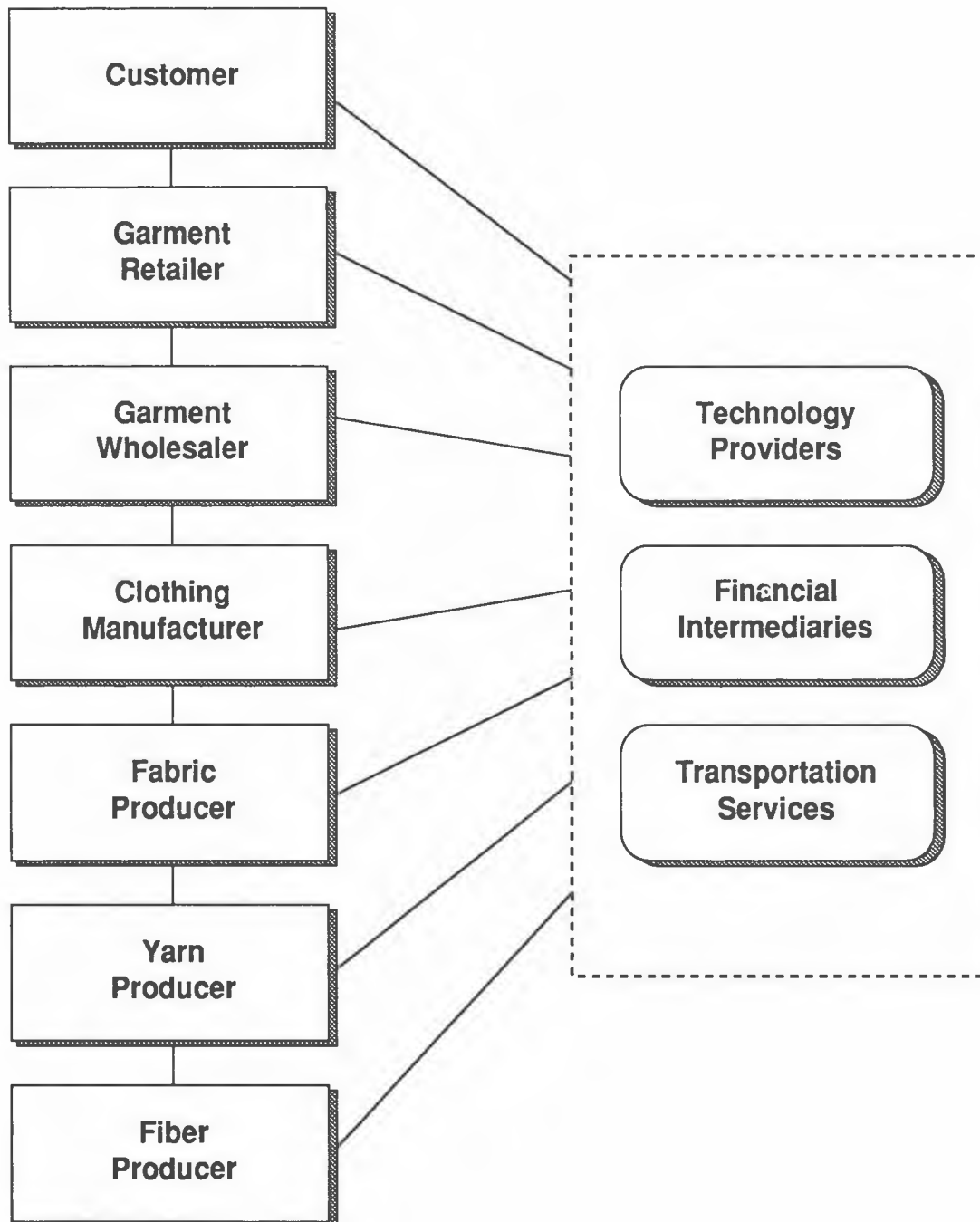
- Individuals who produce the raw fiber in denim (e.g., cotton growers)
- The firm that uses raw fiber to produce yarn
- The firm that produces the fabric used by the jeans manufacturer
- Wholesalers and retailers who distribute the jeans
- Technology providers, e.g., producers of production machinery or communication equipment for producing and distributing fiber, yarn, fabric, and finished jeans
- Financial intermediaries who finance transactions among firms and purchases consumers
- Companies that transport raw material and intermediate and finished products

All these activities may take place within a single, vertically integrated firm, but in many industries, the production chain involves more than one entity. Some analysts argue that recently certain industries have been vertically disintegrating because larger firms are contracting out tasks previously performed in house, either to reduce costs or increase their flexibility, and second because smaller, more flexible rivals are capturing specialized “niche markets” from large established producers.

Figure 4 depicts an apparel production chain of many firms. Compared with the use of a single SIC code, conceptualizing the industry as a production chain clearly facilitates thinking about how linkages among firms with different industry codes may affect the competitiveness of the production chain as a whole.

Realistically, for all but the smallest industries, a study team cannot map every production chain in which firms participate. Moreover, while a production chain of certain firms may remain in place over many years, more typically, relationships among U.S. manufacturers are constantly changing. A supplier to Ford one year becomes a supplier to General Motors the next. Such kaleidoscopic behavior may become less frenetic in future years, as competitive pressures induce firms to work closely over longer periods of time and with a smaller number of partners to

Figure 4: The Apparel Production Chain



improve quality and cost.⁸ Nevertheless, the regular reconfiguring of corporate linkages will undoubtedly remain a feature of the manufacturing landscape for the indefinite future. As a result, a mapping of production chains can quickly become obsolete.

As an alternative way of defining an industry, then, a study team may choose to move from the firm level to more aggregated groupings, such as linked SIC codes. This approach reduces the amount of data that needs to be developed and assimilated. It makes census data more accessible because the Census Bureau, while it cannot disclose individual company data, releases data aggregated by SIC code. Third, it adds greater stability to an analysis of industry trends, because the structure of the relationships among industries will be more stable over time than the constantly reconfiguring relationships among individual firms. In other words, while a jeans producer may buy fabric from one firm one year and another firm the following year, it is still buying from the fabric industry in any given year.

Defining the Production Chain

A useful tool in understanding production chain structure is the input-output model of the U.S. economy published periodically in the *Survey of Current Business* by the U.S. Department of Commerce. Included in the model is a matrix showing how much a given U.S. industry sells to and buys from other industries. While the most recent matrix uses data over a decade old, it is nonetheless a good starting point for thinking about industrial structure. A matrix for a given state economy is likely to differ considerably from the U.S. national matrix. As discussed in Chapter 4, such differences can prove informative.

The Production Chain Does Not Help With Aggregation Problems

The production chain concept, while clarifying industry linkages, does not deal with the aggregation problems in the SIC structure. Unfortunately, there is no easy way to finesse these difficulties. If a team judges them to be severe, it may have to draw on alternative information sources to supplement Census data or elucidate their shortcomings.

⁸In the auto industry, a recent Michigan study notes, "All auto suppliers are facing increasing pressure to reduce costs yet increase quality, reduce delivery time and expand their service. . . . all of the Big Three are in the process of reducing the number of their independent suppliers (called rationalization). Chrysler is down to about 2,500 now and has a goal to decrease that to 750 first-tier suppliers. Ford is somewhere under 2,000 currently and probably will reduce to about 750 by 1995. General Motors has not mentioned a specific number but has said 'logic tells you to move [the number of suppliers] down.'" See state of Michigan, Department of Commerce, *Automotive Update*, (Lansing, Michigan: Michigan Department of Commerce), April 1992, p. 3.

A team may define its industry to incorporate one or more additional dimensions. Industry definitions less traditionally include these dimensions, but each can nonetheless exercise an important influence on the choice of business assistance strategies.

FIRM SIZE AND INDUSTRY DEFINITION

The competitive environment in which large, typically multinational, firms operate (Ford, Eastman Kodak, IBM) can differ dramatically from that of small- and medium-size manufacturing enterprises (SMEs). Study teams may wish to consider distinguishing between large and small firms, since policies appropriate to one group may not be suitable for the other.

The large firm/SME contrast has several dimensions. First, competitive failure or closure of domestic facilities occurs in larger firms in the great majority of cases because of management errors or significant changes in the operating environment (e.g., liberalizing trade, or a great flood). Failure/closure does not typically occur because management lacks time or resources to effect investments, stay up-to-date on markets or production systems, access management expertise, or devote time to operations.

In contrast, managers of SMEs frequently confront all these obstacles. They routinely lack knowledge of sound management practices and have little or no expertise to evaluate equipment options or market opportunities. They have difficulty raising funding for projects and spend much of the day "fighting fires." Economists often attribute these problems to various forms of market failure, especially the imperfect flow of information. (This is a primary rationale for state programs that seek to improve SME competitiveness.)

The typical SME is more sensitive to the loss of a single customer. SMEs have far fewer customers than larger firms; many depend heavily on production contracts from just one or two large companies. Also, many SMEs specialize in one or two products. A narrow product offering limits the range of potential new customers and makes it harder to offset losses in one product line with gains in another.

It is also more difficult for SMEs to identify new customers because they often lack direct market channels to retailers or final consumers. On the one hand, they may produce only supplies that other producers incorporate into finished products. When an SME does produce a finished product (furniture or food), its larger customers may market that product themselves as part of their own offerings. Compared to larger firms with huge marketing budgets, the lack of

established marketing channels is a distinct competitive disadvantage for an SME trying to make up for lost business.

The typical SME lacks the production capability to handle a major new account by itself. The lack of capacity circumscribes its marketing possibilities and is an important reason why SMEs often rely on larger firms to gain market access. Finally, unlike larger companies, SMEs are systematically disadvantaged because they tend not to belong to industry-specific associations that represent their interests and provide technical support.

In industries with a substantial number of SMEs, then, a study team may wish to distinguish explicitly between the role of SMEs and that of larger firms. In many cases, policy initiatives to help improve the competitiveness of SMEs will be irrelevant to the performance of larger firms. A team may find, in fact, that larger firms neither need nor want state assistance or that one of their priorities is simply improving the performance of the SME supplier base. In such cases, the focus of an industry study will narrow to understanding problems and opportunities of state SMEs, specifically, how the state might assist them to overcome problems of smaller scale and become more competitive. (See Figure 5 for findings of a Pennsylvania study team.) In other settings, two separate agendas for SMEs and larger firms may be appropriate.

There are several other elements of a competitive environment (e.g., labor force education and training, consumer base, government programs, substitute and complementary products) that are less often considered when defining an industry. Even if a state study team does not explicitly include these elements as part of its definition, they should at least be treated as variables that influence industry performance.

LABOR FORCE EDUCATION AND TRAINING INSTITUTIONS

Beyond the training programs conducted by firms themselves, a study team may define an industry by including outside institutions that influence the quality and availability of its labor force. These include educational institutions, publicly funded training programs, apprenticeships and other programs funded in whole or in part by industry associations for their members. Until the 1980s, labor quality was most often discussed in the context of less industrialized nations where expanded public education was requisite to developing an internationally competitive workforce. Events now have combined to raise concerns about U.S. labor quality as well: intensifying foreign competition, perceived shortcomings of the U.S. public education system, and a concern that required skill levels in many industries are rising rapidly.

CONSUMERS

Some analysts argue that it is important, if not critical, to define an industry by including its consumer. They contend that the quality of customer demand is central to understanding industry performance. Business consultant and Harvard professor Michael Porter argues, for example, that a significant reason for the phenomenal success of Japanese consumer electronic products is that Japanese consumers are among the most demanding in the world.⁹

Similarly, the quality of demand of purchasing businesses will affect supplier performance in raw materials and intermediate goods industries, such as machinery and industrial supplies. Also relevant to industry performance are the structure and quality of public sector demand, evidenced in public procurement activities.

Market power also enhances customer influence. In the auto industry, independent auto parts suppliers may sell to no more than a handful of customers, and according to a Michigan industry study, over a third of all domestic machine tool orders come from the automotive sector.¹⁰ Consequently, the demands of a few key customers concerning acceptable levels of cost and quality may exercise a more powerful effect on supplier performance than in industries where there are many more potential customers.

The changing demographics of industry consumers, both domestic and international, also greatly influence industry prospects. A Mississippi study of its food processing industry found that the demand for frozen foods had grown rapidly in recent years as a result of the collective influence of an increasing number of working couples who want quicker, easier meals; a growing demand for convenience food for children of the "echo boom" and a rapidly growing elderly population; and much greater concern for nutrition.¹¹ The progressive aging of the U.S. population is another powerful trend that is continually redefining in important ways the goods

⁹Porter, Michael E., *The Competitive Advantage of Nations* (New York: The Free Press), 1990, pp. 86-100.

¹⁰State of Michigan, Department of Commerce, *U.S. and Michigan Industry Profiles* (Lansing, Michigan: Michigan Department of Commerce), April 1992, p. 29.

¹¹State of Mississippi, Department of Economic Development, Research and Information Systems, *Selected Frozen Food Processing Plant Locations in Mississippi*, February 1992, p. 3.

Figure 5: Analysis of the Pennsylvania Small Business Sector

. . . Industry profiles indicate that small- and medium-size firms often need assistance. Start-ups may not need as much assistance because many organizations . . . now provide assistance to entrepreneurs and start-up companies. In addition, large corporations, unlike small and medium-size firms, often have sufficient expertise and resources to address their own problems. The critical needs of small and medium-size firms fall into a limited number of categories and apply to most industries.

Competitive Strategies. Many [SMEs] need to develop or improve their business plans or strategies. An updated competitive strategy is needed by many firms to guide changes throughout the firm, such as in marketing, capital investment, new technology, and new products. Outside assistance may be needed for analyzing industry conditions and trends, assessing firm strengths and weaknesses, and evaluating alternative strategies. Managers need assistance and training so that strategic plans can be improved. This assistance is needed by firms faced with difficult transitions to new product lines, as well as in new firms in emerging industries.

Marketing. Marketing needs to be improved by developing an overall marketing strategy, including reassessing current products, finding new customers and market niches, marketing existing products differently or in new locations, adjusting to changing customer requirements, arranging partnerships with end users, and training personnel in marketing techniques. Since many firms in Pennsylvania face declining sales and shifting markets, there is a critical need to improve marketing. Marketing can increase competitiveness in existing markets and can identify new market opportunities. Many [SMEs] recognize the need for improved marketing but lack the resources and expertise to act on the need. Marketing is critical to the survival of both new firms in emerging and expanding industries and older firms in mature and transforming industries.

and services people purchase. For example, as children of the baby boom move into their later years, the demand for recreation, health care, and retirement homes will increase substantially.

GOVERNMENT PROGRAMS

Porter and others suggest that industry studies should encompass government programs that significantly affect industry competitiveness. These include, among others, taxation, antitrust rulings, price controls, infrastructure investment, research and development (R&D), environmental regulations, product liability law, labor codes, product certification procedures, import quota and tariff levels, patent law, export assistance, and procurement policy (defining the government as "customer"). These programs can influence how firms and individuals invest their resources. To illustrate, a study by Coopers and Lybrand for the New York State telecommunications equipment and services industry notes:

Production Innovation. New products need to be developed through closer interactions with existing customers, formal product development programs, and cooperative arrangements with universities. There is an acute need for companies in declining markets to introduce new products. Most small- and medium-size firms in declining industries have not introduced any new products in the last three years. Furthermore, only about 10 percent of these firms have formal product development programs. R&D support, technical assistance, and low-cost loans are needed to encourage product development.

Process Innovation. Production processes need to be modernized through factory automation, adoption of technologically sophisticated equipment, upgraded quality and productivity, and investment in facilities. A majority of small- and medium-size firms have not made significant investments recently in factory automation or sophisticated equipment. However, most companies have improved quality and productivity and are planning to invest in facilities. The primary needs are for low-cost financing of plant and equipment with little "red tape." These firms also need technical assistance in identifying and incorporating new technologies.

Training. Technical training needs to be provided to employees who may be working with new products or production processes. Development of new products, modernization of plant and equipment, greater emphasis on quality and productivity, and increased involvement in R&D will require continuing training. This need is compounded in the southeastern and central parts of the state, with their tight labor markets and skill shortages.

From state of Pennsylvania, Economic Development Partnership, Profiles of Key Industries in Pennsylvania, January 1988, pp. 5-6.

Unlike the direct role that federal, state and local governments have had in the building and maintenance of the public surface, air and sea facilities vital to the transport of physical goods, government influence for effecting the development of the telecommunications infrastructure vital to the transport of information is exerted through regulatory and tax policies. These policies have a direct influence on the price and availability of telecommunications products and services—the signals which affect the investment and location decisions of both providers and users of telecommunications. Economic development and growth is therefore linked to these governmental policies.¹²

¹²New York State Office of Economic Development, *State Policy and the Telecommunications Economy in New York*, prepared by Coopers and Lybrand, 1987, p. 6.

Figure 6: South Carolina Programs for Auto Parts Manufacturers

Quality Centers

- Quality Institute of Manufacturing provides training programs, annual regional conferences, technology curriculum development with state secondary and post-secondary schools.
- Southeast Manufacturing Technology Center provides technical assistance for small- and medium-size enterprises.
 - Southeast Manufacturing Network, a database of suppliers in South Carolina.
- Quality Forum encourages businesses to adopt and communities to promote quality management practices.
- Regional community-based quality committees promote total quality training.

Training and Education

- State Board for Technical and Comprehensive Education (TECH) recruits, screens, and tests prospective workers. Also:
 - Technical resource centers train personnel and sponsor research activities.
 - Special schools pre-employment training includes customized training.
- State universities, colleges, and technical colleges includes the University of South Carolina, Clemson University, College of Charleston, and fifteen state technical colleges.
- Continuing education programs retrain employees and develop specific work place skills.
- Tech Prep Program sets secondary and post-secondary achievement standards, offers career guidance to students, promotes apprenticeship programs.
- Environmental Training Center assists with state and federal regulation compliance.
- Environmental Health Department, Medical University of South Carolina at Charleston.

Research Opportunities

- Significant state research and development expenditures, especially in competitiveness.
- Clemson University and the University of South Carolina at Columbia.
- South Carolina Research Authority (SCRA) manages large-scale research consortiums.
- Research parks.

Other

- Foreign trade zones.
- Right-to-work laws.
- Low taxes on workers compensation insurance premiums and on self-insurer expenses.
- Low unemployment insurance benefit cap.
- Employment program for former military personnel relocates former military personnel.
- South Carolina State Development Board, industrial site database, technical consultants.
- Southeastern Electric Reliability Council, standards for electricity transmission.
- Low per capita state taxes and no local taxes, other tax and financial incentives.
- No state environmental impact statements, regulations conform with those of EPA.

Compiled from South Carolina State Development Board, *Automotive Parts: South Carolina*, (Columbia, South Carolina: South Carolina State Development Board), n.d.

In other examples, the Ohio aerospace study notes that new FAA aircraft noise standards may prompt the retrofitting of thousands of aircraft with special "hush kits" to reduce noise to acceptable levels. Retrofitting would employ significant numbers of workers in the aircraft maintenance and repair industry.¹³

At the local level, San Francisco has recently enacted the nation's first ergonomic standards for video display terminals, a move that will "push the domestic computer industry centered in nearby Silicon Valley to upgrade in a direction that will ultimately make it more competitive (such standards are bound to become more widespread). Seattle . . . leads the nation in recycling as a result of city mandates," and further, its ". . . environmental awareness is creating the conditions for recycling industry leadership."¹⁴ Historically, the U.S. commercial nuclear power, shipbuilding, agricultural machinery, structural lumber, mass transit equipment, and pollution control device industries are just a few of many where government policies have been influential.

Several of the state studies reviewed for this report explore in detail the kinds of state programs that interface with industry. Figure 6 provides a list of South Carolina State programs relevant to the auto parts supplier industry. Two other studies compare state business assistance programs with those in neighboring states to assess how competitive their offerings are.

Sometimes it is not immediately evident how a public program affects industry competitiveness. The downsizing of the military, for example, while posing a serious threat to dependent state industries, also offers opportunities to upgrade competitiveness in other areas by releasing a large number of highly trained professionals into the civilian labor force. Also, until recently, discussions of international competitiveness rarely focused on health care as a contributing factor; now such discussions frequently begin with health care. Finally, as noted earlier, foreign government programs can be important to consider if they give foreign competitors advantages that are not available domestically.

¹³Ohio Department of Development, Ohio Data Users Center, *op. cit.*, p. 17.

¹⁴NCI Research, *Understanding Your Local Economy: Using Analysis to Guide Local Strategic Planning* (Evanston, Illinois: Institute for Urban Economic Development), September 1991, p. 151.

Figure 7: Plastic Substitutions for Traditional Products

END-USE MARKET	MATERIAL DISPLACED
Textiles	
Man-made fibers	cotton, wool
Packaging and Containers	
Plastic bottles (P.E.T.)	glass
Plastic food tubs	paper
Plastic bags	paper, burlap
Building Materials	
Plastic pipe	iron, copper
Vinyl siding	aluminum, wood
Plumbing fixtures (sinks, bathtubs)	steel, porcelain
Lighting fixtures	glass
Motor Vehicles	
Plastic gas tanks	steel
Radiator overflow tanks	steel
Component housings	steel, zinc
Dash	steel
Electronic Equipment, Computers and Office Machines, and Instruments	
Wire and cable coverings	paper, rubber
Component housings	steel, aluminum
Circuit boards	wood, paper
Plastic lens	glass
Rubber Products	
Synthetic rubber tires	natural rubber
Footwear, hose, and belting	natural rubber
Specialty	natural rubber
Consumer and Institutional Disposables	
Plastic knives, forks, spoons	wood
Plates - Plastic coated	paper
Trays	paper
Beverage cups	paper
Health care and medical products	glass, steel
Aircraft	
Plastic/graphite fiber composites	aluminum, steel
Adhesives	
Epoxy, phenolics	natural glues

From: Illinois Department of Commerce and Community Affairs, Office of Research, *The Plastics Industry In Illinois*, May 1988, p. 31.

SUBSTITUTES

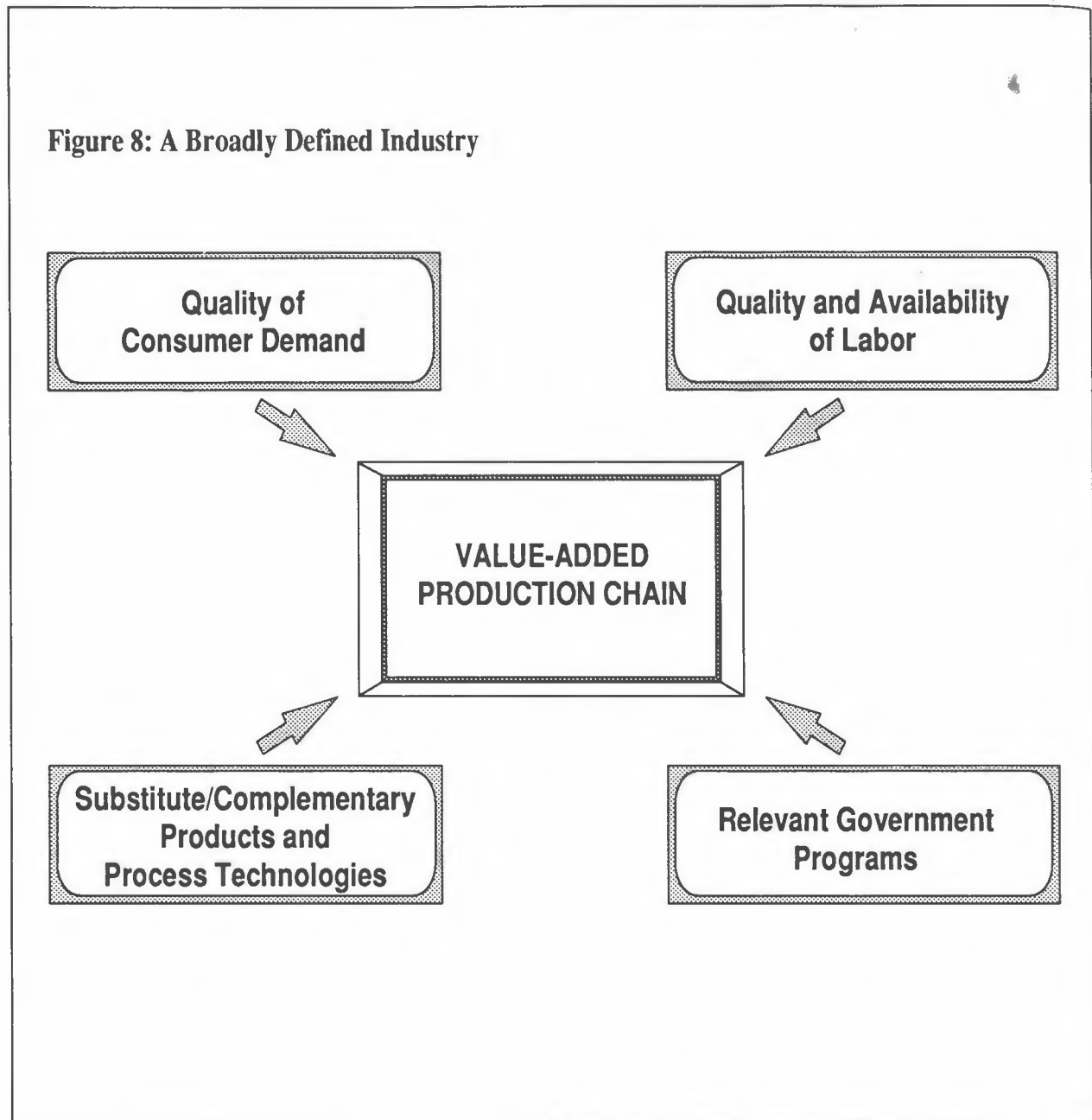
The possibility of substituting one product for another complicates industry analysis, because what happens in a substituting industry may have a negative impact on the industry whose product is being replaced. Conversely, an industry may enjoy good growth prospects if it can successfully substitute its product for a more conventional one. Figure 7, from an Illinois study of the state plastics industry, shows how new plastic materials have captured significant market share from more traditional materials.

The importance of substitution will vary from industry to industry. Unique products, such as semiconductors or disease-specific antibiotics, have no good substitutes. Others, such as a particular food or metal, may have a few or many.¹⁵

Substituting new process technologies for existing ones also may cause established firms to lose market share. Large, integrated steel makers, producing steel from iron ore, dominated the steel industry through the 1970s. Since then, these firms have lost significant market share to younger competitors who use scrap metal as raw material and a distinctly different process technology.

Sometimes a variant of the same product (a "differentiated" product) effectively constitutes a substitute. Someone shopping for a small, inexpensive, subcompact car is unlikely to consider a large, luxury automobile as a substitute; however, the same buyer may be interested a compact car if the price, financing, or equipment options are attractive. A study team from a state producing primarily compact or subcompact cars may find this kind of potential substitution important.

¹⁵A substitute can become more attractive because it becomes more economical in a traditional end use. It can also become attractive because changes in the structure of end use favor the substitute. For example, studies of petroleum refining must now include the probability that technological and regulatory trends will yield, within the foreseeable future, a commercially viable electric alternative to the internal combustion engine, at least for certain kinds of transportation, e.g., commuting to work, local business travel, personal errands, weekend recreation. In a similar vein, the Mississippi food processing study notes that diffusion of microwave ovens has reinforced demographic trends spurring demand for frozen food by changing the way a typical household prepares food.

Figure 8: A Broadly Defined Industry

COMPLEMENTS

Complements are products or services for which demand varies directly with the demand for another product. By extension, the growth prospects of a given industry may depend to a greater or lesser extent on the prospects for complementary products. For example, an increase in the growth rate of automobile sales will produce an increase in the demand for gasoline and steel, other things being equal.

DEFINING THE INDUSTRY MOST BROADLY

When a state study team defines its industry most broadly, it will include not only the value-added production chain, but all the widening possibilities reviewed. Figure 8 schematically depicts a broad industry definition. This framework helps conceptualize the institutional interrelationships that systematically influence industry competitiveness. It can help draw a rich portrait of an industry, including the strengths and weaknesses of core production chains and the institutions supporting these chains.

INDUSTRY FROM THE PRIVATE-SECTOR PERSPECTIVE

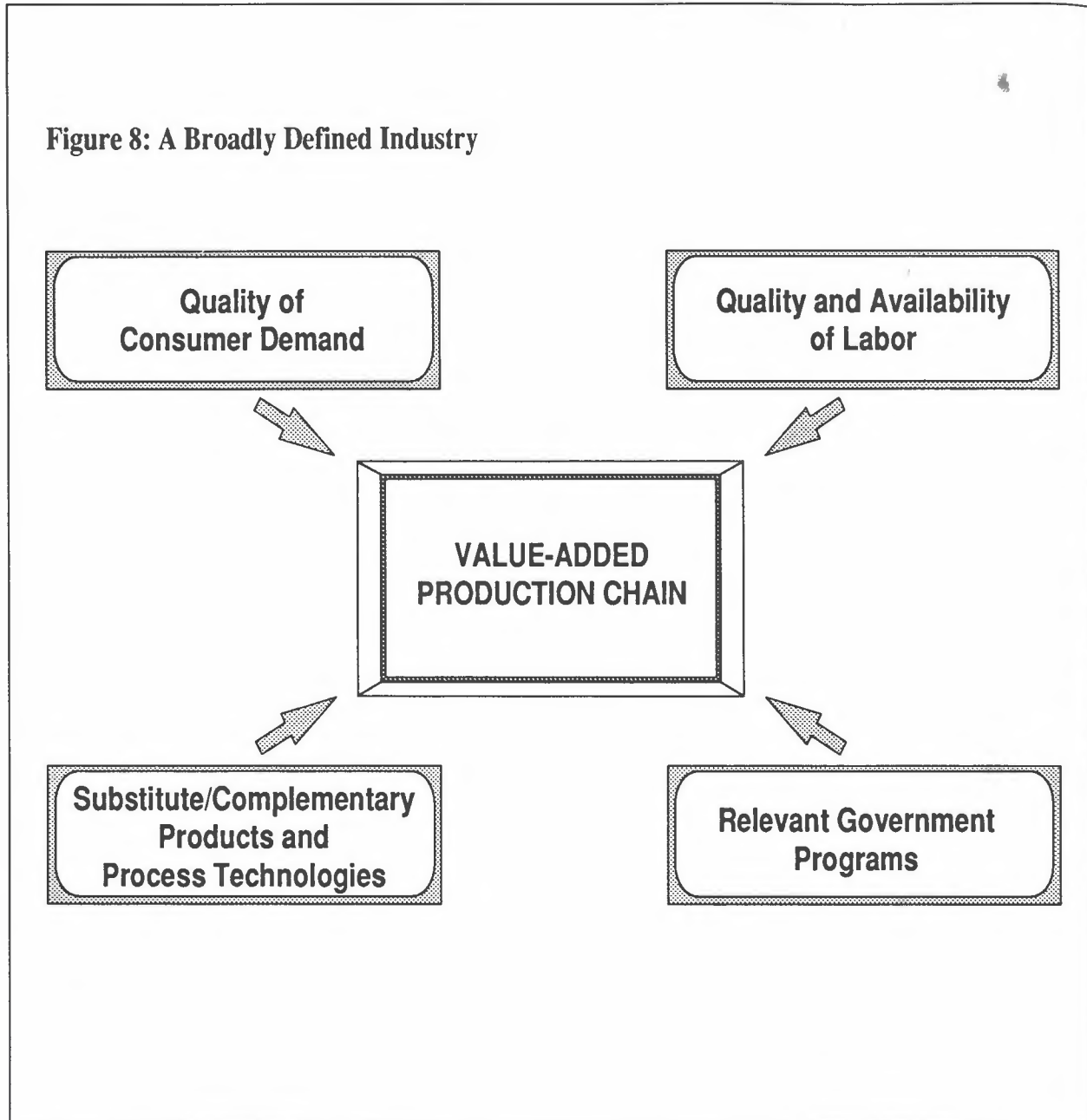
Industry personnel have a role to play in defining an industry. In industry-driven studies, firm participants will have the primary role. In studies with less extensive private-sector involvement, it will still be important to solicit industry opinion. While the final definition may prove similar to what the team would have developed on its own, industry participants may provide useful detail or a slightly different emphasis.

A study team may find, in fact, that defining the industry the way a private-sector organization does is perfectly satisfactory. The team also will have greater confidence, as it pursues its work, that is "on the same page" with the private sector in thinking about what is important. The Ohio State aerospace study, for example, simply adopted the industry definition of the Aerospace Industries Association.

THE INDUSTRY CLUSTER

In recent years, the term "industry cluster" has gained great currency in development policy. A cluster denotes a pronounced geographic concentration of production chains for one product or a range of similar products, as well as linked institutions that influence the competitiveness of these concentrations (e.g., education, infrastructure, and research programs). The industry cluster is not, strictly speaking, an alternative definition of an industry; rather, it describes an area of unusually high and diverse industrial activity. The steel industry in the Pittsburgh region, the apparel industry in New York City, the photographic industry in the Rochester, New York area, the auto industry in Michigan, the computer-related complex of Silicon Valley, and the carpet industry in Dalton, Georgia are classic examples of clusters.

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Economists sometimes use the terms “industrial agglomeration” or “industrial complex”¹⁶ to describe these concentrations, but the term “cluster” has recently come into fashion.

SUMMARY

A study team may define an industry as a single SIC code, or more broadly, as a group of SIC industries that constitute a value-added production chain. The team must be aware that how Census assigns firms to specific codes can affect the utility of Census data. Finally, team members may wish to include in their definition some or all of the following: institutions influencing labor force quality; industry consumers; relevant government programs; substitute products or process technologies; and complementary products.

Resource constraints may limit how far a team pursues these ever-widening circles. For example, studying semiconductor manufacturing, a daunting task in itself, demands less effort than analyzing the entire personal computer production chain. Also, casting the net too widely may produce a study that fails to help local business assistance practitioners decide where best to put their resources. For example, studying the full production chain of a regional auto industry may not yield sufficient detail on a supplier industry critical to the economy of a local jurisdiction. Ultimately there is no right or wrong answer to these issues. The choice becomes easier, however, the more clearly study teams define their objectives and resource constraints.

¹⁶Other economists have used “agglomeration” or “complex” to refer to much more diversified geographic concentrations of many different types of economic activities, such as large metropolitan areas. A reader must refer to the context to understand what the author means by these terms.

CHAPTER 3

WHAT SHOULD INDUSTRY STUDIES ASK?

The questions an industry study asks will be determined by its mandate. The primary purpose of *Industrial Outlook*, by the U.S. Department of Commerce, is simply to present data on basic industry trends, such as growth in employment or shipments. Many of the state studies reviewed fall into this category. Other studies seek to produce a full-fledged policy package delineating policy objectives, strategies, and programs. This kind of analysis requires a great deal more from a study team, who will need to investigate:

- Key elements of the industry environment and their impact on performance
- How recent trends in these elements might change
- Which elements are most amenable to state action
- Which elements are likely to facilitate or impede state action

What specific questions does a study team need to ask in undertaking this kind of analysis? Figures 9 and 10 illustrate two possible approaches. The first was used by the Northwest Policy Center of the University of Washington to lead focus group discussions of Oregon producers of primary and secondary wood products. The second is from William Nothdurft's book *Renewing America*.

Pursuing any one of these questions produces a related subset of more precise questions. For example, investigating "access to processing technology/equipment" will prompt a team to explore how managers learn and what they know about new technologies; how they evaluate the potential payback on new technology; what type of investment payback they require (the "hurdle" rate); what type of support they receive from vendors; and how public programs might promote technology transfer. Each question (and answer) assumes an industry-specific character.

It would be of marginal utility to include here a long list of questions that might prove relevant to an industry study. As a team progresses with its study, it will quickly identify many more questions than it can pursue fully within the time and resources available. It seems more useful to compare two policy paradigms that surfaced, among other places, in the state industry studies received over the past year. These paradigms raise important issues and influence how a team prioritizes different industry-specific questions.

The first paradigm is the cluster approach to industry competitiveness. The second, for want of a better term, is called the "functional specialization approach." It emphasizes a more selective state response to economic globalization.

**Figure 9: Northwest Policy Center,
Oregon Secondary Manufacturers Focus Group Discussion Outline**

A. Supply Impacts

1. On a scale from 1 to 5 how would you rate the economic dependence of your area on the wood products industry? (5 is most dependent.)
2. On a scale from 1 to 5 (5 is weakest) how would you rate the strength of the industry? (Ability to withstand market shifts? Supply shifts?)
3. In what ways is your area dependent on threatened timber supplies? Who will be affected most? Who will survive? Which subsectors are at greatest risk?
4. What are the most important species/sizes processed in the area?
5. How available are substitute domestic or foreign species? How common is it to import substitutes?
6. How "export dependent" is this area? How much timber stays here for further processing? Where does the rest go?
7. How are your relationships with local primary producers? Are you able to get what you need from them? Can they supply the quantity/quality you need?
8. What is your view of a log export ban?

B. The State of "Value-added": Products/Markets/Opportunities

1. Does the area have a strong/weak value-added sector? What kind of value is being added? What is unique about the local industry? Are there niches? Specialties?
2. Where is the product sold? Who are your customers? How are needs changing?
3. What are local industry advantages, disadvantages, strengths and weaknesses? What species have diversification potential? What kind of products are they suited for?
4. Over the past five years what have been some of the trends you've seen in value-added processing? Nationally? Internationally? Locally?
5. Are primaries doing more secondary processing? Are secondaries diversifying more?
6. What is being done about waste utilization? Lower grade utilization?
7. Are there "hot" products? Hot markets? How do you identify them? How do you develop new products and markets?
8. Is there a strong tendency among local firms to seek out new products/markets?
9. What is the competition? Internationally? Nationally? In what ways are area products competitive?

We have enlisted the help of two imaginary "cheerleaders" to highlight the differences between these paradigms. Each cheerleader presents an argument for structuring state policy according to the principles suggested by the paradigm. Following their presentations, the cheerleaders yield to a more balanced review of the issues they raise.

- 10 Is competition based on quality, price, or something else?
11. In the best of all possible worlds, describe the secondary wood products industry here five or ten years from now. How is it better? Stronger? More diversified? What products are being made? Where are they being sold? To whom? What is the specialty? Its reputation?

C. Barriers to Expansion (If there were positive answers to question 10 above)

1. What [is] standing in the way of the growth of value-added processing?
2. Financial restrictions?
3. Access to processing technology/equipment?
4. Access to market information? Product research and testing?
5. Access to skilled labor? What skills/training are needed?
6. Supply/inputs?
7. What are the marketing barriers?
8. Other barriers? Regulatory barriers?

D. Solutions

1. Are there examples of how firms in the industry work together to solve common problems? Manufacture products?
2. How do local firms interact?
3. What services, resources or organizations have been most helpful in the development of secondary wood products firms?
4. Provide some brief examples of European and American efforts to support value-added processing: industry service centers; purchasing co-ops; marketing associations; product research institutes; the Lakeview Cutting Circle, etc. Are there examples that grab your attention that might be applicable here?
5. What do you think of the Lakeview Cutting Circle?
6. Based on what you said the industry could look like five or ten years from now, what else could be done to get from here to there?
7. What role could the state play in the development of the value-added sector?

From Northwest Policy Center, *Improving the Vitality of Oregon's Secondary Wood Products Sectors: Report for the Oregon Interim Legislative Committee on Forest Products Policy*, October 1990, pp. 66-67.

CHEERLEADER 1: THE CLUSTER PARADIGM

As described in the previous chapter, an industry cluster denotes a pronounced geographic concentration of production chains for a product or similar products, as well as institutions

directly influencing the competitiveness of these concentrations. Clusters exercise a significant, if not dominant, influence on state or regional economic health by bringing new income into the area through sales to other regions or nations.

Analysts do not fully understand why clusters arise and flourish, or why some eventually lose their dynamism. They generally agree, however, that concentrating industrial activity and supporting institutions in a given area yields competitive advantages beyond the more basic benefits an area already enjoys (e.g., lower wages or good market access). As a result, the strength and adaptability of the cluster over time becomes much greater than the strength and adaptability of its individual parts. Cluster-induced advantages include:

- Access to a much deeper pool of specialized labor
- Greater ease in interacting and collaborating with other industry members
- More up-to-date information about industry events and trends
- Products tailored to specific industry characteristics (e.g., software, advertising, insurance policies)
- More rapid diffusion of new technologies and techniques
- Greater support for publicly funded efforts to serve the cluster
- A greater propensity to generate “spin off” firms within the region and draw in additional suppliers from outside the region
- Better industry expertise within local financial institutions, thereby improving industry access to financing
- Greater visibility of local firms vis-à-vis prospective customers

These advantages feed upon themselves in a spiral of cluster “deepening,” generating a larger, more diversified, more competitive producer base. Strength in one part of the cluster synergistically augments strengths in other parts. The deepening process simultaneously spurs overall income growth throughout the area.

Figure 10: Auditing In-state Resources

For our purposes, an audit of in-state resources—that is, of inherent strengths and weaknesses—operates on at least three levels. First, a prerequisite to any effort to mobilize state resources—natural, human, or financial—to generate new economic activity is a thorough understanding of the existing state economy. If the name of the game is capitalizing on comparative advantages, then knowing what the advantages are would seem critical. However, according to Michael Kieschnick, former head of California's Office of Economic Planning, Policy and Research, "most studies of a state's comparative advantages tend to reproduce its existing and frequently inadequate industrial base, rather than identify possible avenues of change." The question is not just what is the industry mix, but what is happening to it? What products and services are being produced; what technologies and resources are being used; and what is the future of current markets? What is the nature of the competition? What kind of labor is available at what skill levels and wage levels? Where is investment capital coming from and where is it going? What patterns of disinvestment are visible? What research and development are under way? What fixed assets (infrastructure, physical plant, etc.) are in place and what is their condition? Few states currently are able to answer such questions.

Second, with respect to resource-based economic activity, a similar set of questions apply: What natural resource assets does the state possess? What is the condition of these assets? What level of investment is currently targeted to enhancing or protecting resource productivity? What role do primary resource industries play in the state economy? What level of secondary activity is generated by these industries, both upstream and downstream? What is the current condition of their markets? Future prospects? To what extent are local economies and community structure tied to these industries? What investments are being made to ensure continued productivity? What additional investments will be necessary to meet projected future demands? Where will these investments come from? What prospects exist for developing new resource-related enterprises? What contribution could they make to the state's economy? How adequate are available sources of investment capital for these enterprises? How value-adding are both existing and prospective new resource-related industries? What opportunities exist to increase their value-adding potential?

Third and finally, what skills, tools, and techniques are available within state government to address these and other questions in the process of developing a manageable growth strategy? What kind of long-range planning is already under way in the state? What are its targets, procedures, and results? What kinds of data are collected regularly? How are they analyzed? What do state managers think of these existing programs? What is the relationship, if any, between these planning programs and budgeting procedures? What forecasting and associated research data are available, if any? Is there any relationship between tax, expenditure, and regulatory policies or state investment rules and the objectives of existing planning programs? The critical underlying question in this step is: To what extent are the political leadership of the state and [its] institutions capable of seizing emerging opportunities and shaping their own destiny?

From Nothdurft, William, *Renewing American: Natural Resource Assets and State Economic Development* (Washington, DC: Council of Governors' Policy Advisors), 1984, pp. 172-73.

The cluster approach suggests that state policy priorities are, first, to identify industry clusters that competitively export goods and services from the region; second, to maintain competitiveness of the robust parts of each cluster; and third, to nourish activities in which cluster is, or is becoming, "shallower." This approach incorporates a time-tested strategy pursued for decades by less industrialized countries under the label "strengthening backward forward linkages" among different activities in targeted industries. Additionally, it places increased emphasis on augmenting an industry's horizontal dimensions, or the strengthening number of firms in the same line of business within the cluster (e.g., metalworking machinery within the automobile complex).

This approach can and should lead states to distinguish between clusters with the potential to generate high-paying employment and clusters with less potential to do so. Nourishing high wage clusters not only creates more jobs, but more "good jobs" that raise state living standards.

The cluster approach to state economic policy has been gaining ground rapidly in recent years. South Carolina has an ongoing effort to attract auto parts manufacturers to complete BMW's decision to locate a major assembly facility between Spartanburg and Greenville. Mississippi has recently attempted to attract an upholstery fabric plant to augment the competitive strength of its Tupelo furniture cluster.² A separate Mississippi study suggests several ways including better networking of in-state firms, to deepen its electrical products cluster:

Branch plants of large companies comprise more than one-half of Mississippi's electrical products industry. An opportunity exists to attract the home offices of these companies to the state.

Where Mississippi plants are producing intermediate products and shipping to an out-of-state customer, an opportunity exists to attract the companies producing the product in Mississippi.

Electrical product manufacturers making intermediate products often have pursued area markets which may be available with only minor modification to their product lines. Conversely, Mississippi purchasers of electrical raw materials have

¹See South Carolina State Development Board, *Automotive Parts: South Carolina* (Columbia, South Carolina: South Carolina State Development Board), n.d.

²State of Mississippi, Department of Economic Development, Research and Information Systems, *Incentives for a Textile Mill to Serve Mississippi's Furniture Industry*, October 1989.

diligently pursued potential area suppliers. Both producers and suppliers could secure additional business by reassessing the Mississippi market.

. . . Almost 90% of the raw materials purchased by the state's electrical products manufacturers came from outside the state. [This] indicates the possibility of substantial transportation savings [on raw material purchases], provided raw material purchases could be made within Mississippi.³

In Figures 11 and 11a, Arizona gives its view of the role of export clusters in the state economy. The 1992 report notes on its first page:

The ASPED [Arizona Strategic Planning for Economic Development] Strategic Plan's goal is to position our economy for success in the twenty-first century. This will be done by developing the economic power of competitive clusters of businesses and by strengthening the state's foundations [supporting institutions] for economic growth. The result will be to make Arizona more successful in retaining, expanding, and attracting industry clusters that provide quality jobs and contribute to an improved quality of life for all.⁴

The state of Florida uses a similar concept in describing its 1991 Enterprise Florida program:

The major benefit of Enterprise Florida will be coordinating existing state and local economic development efforts to create a more strategic approach. Instead of a wide variety of unrelated programs, Florida will have a strategy for a competitive economy that will focus on attracting, retaining and growing high-value-added economic clusters based on strong economic foundations of skilled human resources, capital availability, accessible technology and a competitive tax and regulatory climate. This will result in higher quality jobs for Florida residents, more customer focused economic development services

³State of Mississippi, Department of Economic Development, *Mississippi Electrical Products Industry*, January 1989, pp. iv-v.

⁴State of Arizona, *Creating A 21st Century Economy: Arizona's Strategic Plan for Economic Development, Volume 1: Strategic Plan* (Phoenix, Arizona: Arizona Department of Commerce), January 1992, pp. 5-1.

Figure 11: What is an Economic Cluster?

In the most advanced economies worldwide, one or more economic clusters serve as the driving force . . . At the core of an economic cluster are geographic concentrations of interdependent, internationally competitive firms in related industries. Each cluster includes export-oriented firms—those selling primarily outside the region—as well as supporting or linkage firms that provide components, support services, and raw materials. Supporting the cluster are specialized economic foundations in human resources, technology, finance, and infrastructure. Foundations are provided both by the public sector (e.g., universities, airports) and by some of the companies within the cluster (e.g., venture capital and engineering firms).

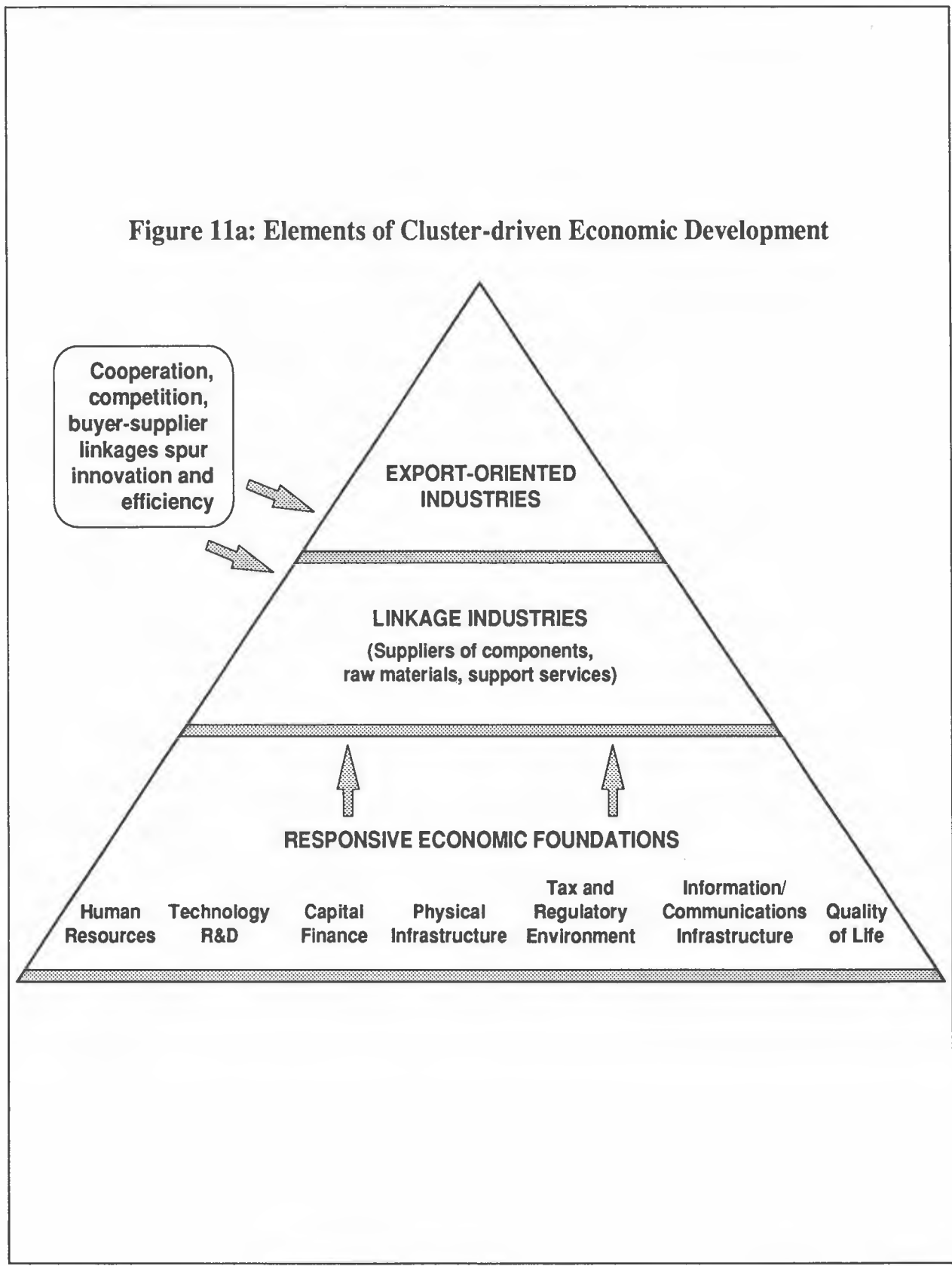
Clusters evolve over time, often slowly. Worldwide, they can be found in urban areas, rural areas, and spanning both urban and rural areas . . . A salient feature of economic clusters, at their more advanced stages, is that their elements [are] mutually supporting. Close competition and cooperation spur innovation across industries, often spawning the development of entirely new companies and industries. Personal contacts between companies facilitate the free flow of information and rapid diffusion of innovations that give cluster companies an advantage in global markets. As they grow, economic clusters create their own demand for suppliers and can attract buyers and partners of local companies. Existing suppliers expand to fill market demand; new suppliers form to sell new products in new niches in the cluster as well as globally.

Cluster companies draw on specialized economic foundations, placing demands on them to provide better services—more advanced telecommunication links, higher high school graduation rates, more graduates in special fields. At the same time, companies improve the region's economic foundations by recruiting and training workers or by developing special facilities. Better foundations, combined with a growing concentration of related companies, increase the attractiveness of the area to outside companies, the potential for spin-offs, and opportunities for expansion of existing companies. The momentum within the cluster fosters its growth and brings the economy national and international recognition as a center of excellence.

Economic clusters can propel growth in a range of sectors across the economy . . . Key components of an economic cluster relate to each other, to the rest of the state economy, and to the global economy. Export-oriented providers bring newly created wealth into the economy. Although these companies typically employ a small share of local workers, global competition moves them toward higher value added, which often leads to relatively high wages. The presence of highly developed linkage industries minimizes the amount that export-driven industries send back out of the economy by purchasing inputs. (Although many linkage industries start out serving local export producers, they can also progress to the point where they bring new wealth into the economy through export.) Activity in export-oriented and linkage industries spurs growth of traditionally population-driven industries, such as retail and real estate. All three types of industries depend on and contribute to the area's infrastructure.

Excerpted from state of Arizona, *Creating A 21st Century Economy: Arizona's Strategic Plan for Economic Development, Volume 1: Strategic Plan* (Phoenix, Arizona: Arizona Department of Commerce), January 1992, pp. IV-1 and IV-2.

Figure 11a: Elements of Cluster-driven Economic Development



for the private sector and a more efficient and effective delivery of services provided by the public sector. New economic development tools including access to risk capital, applied technology and industry-based training would be provided in a more focused manner.⁵

. . . In Florida, clusters should be viewed as statewide networks of firms with the potential for buyer-supplier relationships across the state. Florida must recognize and develop potential in all its clusters ranging from the mature and still growing (e.g., tourism) to those that are fast emerging (e.g., health, international distribution).⁶

Many more states will explicitly adopt a cluster approach in the coming years. Those that do not will risk a “bleeding” of competitive strength to out-of-state clusters, both domestic and foreign. As part of their deepening process, these out-of-state clusters will draw investment from themselves much as whirlpools draw water to their center.

CHEERLEADER 2: THE FUNCTIONAL SPECIALIZATION PARADIGM

The cluster approach is, indeed, powerful in its simplicity. Unfortunately, it is just as simplistic. Reality is simply not that orderly or predictable. At least three factors limit the usefulness of the cluster paradigm as a guide to state policy:

- The increasing ease of operating globally has made physical proximity much less important to competitive strength.
- The interstate nature of clusters makes an effective state policy difficult to develop and implement.
- High- and low-wage employment frequently coexist within a cluster. Therefore, pursuing a cluster approach does not mean that wage levels will rise.

Globalization

The first problem with the cluster approach is the increasingly international nature of production chains. It is common knowledge that the 1980s saw a dramatic rise in the rate

⁵Florida Chamber of Commerce and Florida Department of Commerce, *op. cit.*, p. 2.

⁶*Ibid.*, p. 9.

global economic integration. What may surprise some is how quickly industry developed the capacity to pursue different activities in the same production chain at widely dispersed locations. Today, the making of a single garment might include: a U.S. design, fabric from Japan, assembly in China, and air freight to Western European retailers. Japanese auto companies provide "just-in-time" delivery of auto parts from suppliers in Japan to U.S. assembly plants, while U.S. automakers assemble cars in northern Mexico from both U.S.- and Japanese-made parts.

An Illinois study of its machine tool industry notes that ". . . nearly half of all domestic machine tool companies import either components or complete machine tools as they try to cut costs and enhance their competitive capabilities."⁷ The Telesis study for the New York Port Authority writes of the pharmaceutical industry:

[A] shortcoming of the SIC code approach is that it combines all activities of an industry into one category. . . These varied activities may be co-located in a particular region, but more likely in today's global economy they will be carried out in widely dispersed facilities. Even within the basic manufacturing function, the basic compound may be produced offshore in Puerto Rico or Ireland, formed into capsules within the New Jersey industrial corridor, and sent to a Midwest location for packaging and distribution.

. . . An American manufacturer of personal electronics items might design the product in Taiwan, source semiconductors from Japan, have boards stuffed automatically in Singapore, make plastic cabinets in Hong Kong, and send everything to China for final assembly by the lowest wage labor. A given regional economy could be affected by such a business through operations as diverse as a warehouse and distribution center or a headquarters office.⁸

Figure 12 offers a summary perspective from a recent United Nations report on the "transnational" corporation. The feasibility and efficiency of transacting across international borders will only increase in the years ahead as the world continues to shrink. As a result, production chains will become increasingly internationalized.

⁷State of Illinois, Illinois Department of Commerce and Community Affairs, Office of Research, *The Machine Tool Industry in Illinois*, 1986, p. 3.

⁸Port Authority of New York, *op. cit.*, p. 5.

Figure 12: New Strategies by Transnational Corporations

The ability of transnational corporations to contribute to international economic integration is a result of their attributes and how they respond to the economic and policy environment.... [Their] strategies evolve as [they] respond to pressures and opportunities, including improvements in information technologies, the convergence of demand patterns across countries, the intensification of competition, and the opening of markets to international trade and foreign direct investment. New strategies imply changes in how production is organized across borders [leading] firms to locate a wider range of their value-adding activities abroad.

The strategies of transnational corporations increasingly involve more complex forms of cross border integration.... Under the simplest strategies—stand-alone affiliates or multi-domestic affiliates engage in international production while serving a single host economy or host region—affiliates have a high degree of autonomy from the parent. They are responsible for most activities that comprise their value chain, and in some instances can act as self-contained entities.

As trade barriers fall, as communications technologies improve and as international competition intensifies, firms are turning to outsourcing for parts of their value-adding operations. They are strengthening the links with their foreign affiliates and with separate firms operating as subcontractors, licensees, etc. However, these links are only for specific activities. The existence of outsourcing is based largely upon the cost advantages of a particular host country for a particular component. The affiliate of a subcontractor engaged in outsourcing cannot stand alone. It depends upon the parent firm for a number of key activities, while the parent firm depends on the affiliate for part of its overall value chain.

More recently, many transnational corporations have moved beyond these “simple integration” strategies. They are now treating all activities across the entire value chain as potential candidates for being performed by one or more affiliates. This new approach—“complex integration”—is made possible by huge improvements in communication and information technologies. They allow transnational corporations to coordinate a growing number of activities in a widening array of locations. This, in turn, changes the way in which transnational corporations structure their activities. In a number of instances, indeed, information technology is leading to a “re-engineering” of relationships within firms.

Complex integration is also being driven by the tendency for markets to converge. More products are sold in the same or similar form in a growing number of national markets. In addition, competition forces firms to seek cost savings and profits from all segments of their value chains. As a result, companies are arranging certain functions—research and development,

U.S. firms may establish facilities offshore to perform one or more tasks within a chain. Alternatively, they may form strategic alliances with foreign firms, because they are struggling competitively; they are simply doing what they feel they must to survive.

procurement, accounting, data entry and processing, as well as activities for specific products or product lines, such as component manufacturing and assembly—in a way that requires close links between parent firms and foreign affiliates, among foreign affiliates and firms linked via alliances. With that type of integration, separate activities performed in international locations are valued according to how they contribute to the objectives of the firm as a whole, rather than their profitability at the host country location.

Integration is also occurring across geographical lines. Multidomestic strategies are being superseded by regional and global strategies. The institution or strengthening of regional integration agreements has helped foster regional strategies of transnational corporations, an issue analyzed in *World Investment Report 1992*. Some transnational corporations are beginning to pursue global strategies that include several major regions and cover the allocation of many elements in their value chains. Thus, activities such as research and development or procurement may be situated in an affiliate in a host country or region and linked to operations elsewhere to produce goods and services that are then sold in many markets.

Integration is proceeding at different rates across industries and functions. The cross-national division of labor has undoubtedly proceeded most rapidly in certain manufacturing industries, such as automobiles and electronics, and in services industries including air transport and banking. Research and development, spurred by advances in information technologies, is becoming increasingly cross-border, both within firms and between firms through strategic alliances. But a truly global research-and-development and manufacturing system is still restricted to a relatively small number of firms. Financial management is probably the most global of the major corporate functions, stimulated by electronic transfers and the 24-hour trading day. Marketing has taken advantage of communications technologies, but is still subject to national, regional, and cultural differences in consumer tastes and habits. Such activities as data processing and software writing can take place almost anywhere in the world. On the other hand, regulatory differences mean that accounting and legal reporting are still largely nationally based.

In principle, however, virtually every corporate function can be located anywhere and carried out in an integrated manner for a corporate system as a whole. To the extent that this is the most cost-effective way of organizing production—as it seems to be—it becomes a benchmark for firms that have not yet seized this opportunity or have not yet been driven by competitive pressures to re-engineer themselves.

From The United Nations Conference on Trade and Development, Program on Transnational Corporations, *World Investment Report: 1993 Transnational Corporations and Integrated International Production: An Executive Summary* (New York: United Nations), July 1993, pp. 12-14.

On the other hand, firms may be attempting to protect or strengthen an already healthy competitive position. Boeing and MCI, both powerful U.S. firms, have recently entered into partnerships with foreign companies to help spread the cost and risk associated with developing and marketing the latest generation of aerospace and telecommunications technologies. Boeing

also has agreed to partnerships with Japanese subcontractors in part to improve its chances of winning sales contracts from Japanese commercial airlines. Liz Claiborne, the successful U.S.-headquartered clothing manufacturer, owns virtually no production facilities so it can more easily reconfigure its global sourcing structure in response to shifts in relative value across nations.

Some previously dominant U.S. clusters have lost competitive momentum primarily because of globalization. The U.S. textile and apparel machinery industry, once a world leader, has lost virtually the entire world market to Japanese and European firms. Moreover, while many U.S. textile firms once had robust R&D programs, only a handful still do. To many analysts, losing such engines of innovation and productivity is symptomatic of the competitive decline of the U.S. textile and apparel cluster. It weakens the cluster in much the same way the loss of star players weakens a professional sports team.

Taken at face value, these patterns of interstate and international specialization strongly suggest that geographic clustering of related activities is not the only path to competitive success. While clustering may offer some synergy, the benefits gained by performing different functions in different places often more than offset cluster-induced advantages. For instance, a medical instrument firm might take advantage of lower wage rates in Thailand to perform relatively low-skilled product assembly, yet retain its R&D activities in Boston to take advantage of a superb medical research infrastructure. Just as firms within clusters are constantly reconfiguring their relationships with other firms, so too will interstate and international production chains dissolve and reconfigure as the comparative advantages of various locations ebb and flow over time.

The Interstate Nature of Clusters

A second problem with the cluster approach is that production chains and clusters typically cross state lines. For manufacturing as a whole, a recent study by the Center for Regional Economic Issues at Case Western Reserve identifies twenty clusters of manufacturing establishments that contain collectively almost 90 percent of the U.S. manufacturing work force. Typically, these clusters span at least two and often three states. This pattern suggests that firms within a cluster cooperate extensively across state lines, a finding consistent with the findings of other studies and with common sense. In other words, economic relationships often transcend legal boundaries.

To illustrate the nature of the problem, we return hypothetically to the Mississippi furniture upholstery industry. Mississippi may find that an upholstery plant to deepen its Tupelo furniture cluster is, in fact, a good investment for a private firm. Alternatively, it may discover that locations in other states have stronger comparative advantages, i.e., better water, ra

material, or equipment supply. If the latter, should Mississippi seek to cooperate with other states to improve the competitiveness of out-of-state upholstery producers servicing the Tupelo cluster? In the absence of reciprocal types of support from other states, such a proposal is a difficult political sell, even if it makes sense from a technical standpoint. If they exist at all, instances of states funding competitiveness-enhancing assistance for out-of-state firms are few and far between.

The Battelle Iowa study was one of several that wrestled with similar ambiguities:

An issue that emerged in the interviews, and was confirmed by further analysis, is that while there are several technologies for which Iowa demonstrates strengths and that are also relevant to Iowa industry (bioprocessing, aspects of biomedicine, advanced materials and advanced manufacturing, for example), there are areas where R&D capabilities are strong but where regional or national industrial support are much more important than that of the state (such as pharmaceutical and simulation technology). The policy implications of this situation are significant. Should R&D be focused on technologies with relevance to Iowa's existing economic structure? Should economic development plans emphasize job creation in industries that can benefit from technology expertise now being exported out of state? Should industry attraction efforts be targeted at industries which can benefit most from the technology resources of Iowa's institutions? Does the value inherent in any area of R&D excellence outweigh the economic opportunity costs of exporting technology?⁹

Why Encourage Low-Wage Activities?

High- and low-wage employment often coexist within the clusters states have explicitly targeted. For example, in the apparel cluster, design, marketing, and fabric cutting pay much more on average than clothing assembly, where wages are well below the manufacturing average. If the ultimate objective of state policy is high living standards, fostering the vitality of *all* activities in the cluster puts the state in the self-contradictory position of, literally, promoting the growth of low-wage employment in order to promote the growth of high-wage employment. Can the importance of linkages be so strong as to justify this contradiction? Especially when state government influence on the state economy is (generally) as marginal as it is? And when low-wage employment is particularly vulnerable to much lower-wage offshore competitors?

⁹Iowa Department of Economic Development and The Wallace Technology Transfer Foundation, *Identification of Key Technologies and Industries for the State of Iowa* (Columbus, Ohio: Battelle), May 1992, p. IV-27.

In summary, the cluster paradigm overstates the importance of physical proximity with respect to competitiveness. It is also, practically speaking, a difficult approach for a single state to pursue because of the interstate nature of clustering. Finally, it diverts resources counterproductively by fostering precisely the type of employment states are trying to move away from. These qualifications argue strongly for an alternative approach to policy design. For want of a better term, we call our second paradigm "functional specialization."

Functional Specialization

Because of the intensity of interstate and international competition, coupled with wage differentials across different cluster functions, states should not assume it is possible or desirable to develop full-blown in-state clusters. State efforts will prove far more effective if they focus on high-paying functional specialization(s) in which state firms are strongest. These vary from industry to industry, but seldom include the full range of cluster activities.

Using the paradigm of functional specialization, Iowa cannot assume that its strong research capability in biotechnology will help it to develop related industries, either by attracting firms from out of state, or encouraging the birth and expansion of in-state firms. On its face, the lack of robust or strongly emerging in-state industries that are linked to in-state biotechnology research places a heavy burden of proof on officials who argue that such linkages are either practical or profitable.

Moreover, rounding out the cluster provides no guarantee that new jobs in industries linked to biotechnology will pay high wages. For example, a new biopesticide service may require only semi-skilled, low-wage labor to apply biopesticides to field crops. A food processing company may hire \$5.00-an-hour factory labor to freeze or can a newly created fruit hybrid.

If Iowa cannot find compelling answers to these challenges, it would do better to focus on maintaining and enhancing the competitiveness of its high-paying research capability—in itself no easy task. If instead the state pursues a cluster approach, it runs the risk of frittering away resources in a fruitless attempt to deepen other parts of the biotechnology cluster. Ultimately, too, it may fail to nourish existing biotechnology research capacity in any meaningful way.

A similar issue with a different slant confronts North Carolina in thinking about textile and clothing industry policy. While the vitality of the once-dominant U.S. textile and clothing machinery industry has largely ebbed, North Carolina possesses some special strengths in developing new machinery, such as the new College of Textiles research facility at North

Carolina State University, the research facility of the Textile Clothing and Technology Corporation, and numerous in-state firms in most other parts of the production chain.

If North Carolina were able to accelerate patented innovation in textile and apparel process and product technologies by augmenting its research and development capabilities, it might well benefit from a renaissance in this high-paying industry. Such a resurgence would have the salutary effect of promoting the competitiveness of state commodity fabric producers, a linked industry that has already substantially reduced its labor content and improved quality by applying microelectronic technology to the production process.

On the other hand, it is far less clear that even rapid process and product innovation can forestall a significant downsizing of the state's relatively low-paying clothing assembly employment, given an imminent opening of trade—the North American Free Trade Agreement (NAFTA) and a new General Agreement on Trade and Tariffs (GATT). Here, the collective impact of structural factors, such as higher U.S. wage rates, a fragmented industry whose typical firm performs far below “best practice” levels, and the worldwide availability of identical manufacturing technology, may be too powerful to overcome.

In light of these developments, North Carolina might do well to promote a high-paying in-state machinery industry, despite the fact the industry now lacks a sizeable in-state presence. By the same token, even though North Carolina has a large number of firms in the garment assembly business, it should limit assistance to this lower-paying part of the cluster to helping state workers adjust to downsizing.

Other analysts would argue that within the apparel assembly industry, many different functional specialties exist, such as replenishing retail inventory of fashion goods (as distinct from larger, initial product runs) on a “just-in-time” basis. Lumping all assembly employment into the same “sunset industry” may risk reducing the number of relatively good jobs for those who cannot compete for significantly higher-paying employment. The state might also consider placing research priority on developing machinery to bolster just-in-time production.

In summary, functional specialization pragmatically accepts an industry's competitive limitations and the state's budget constraints. It resists “shotgunning” scarce program resources in pursuit of a conceptually neat, but overly simplistic, cluster approach. Functional specialization focuses instead on strengthening high-paying or potentially high-paying industry activities in which state firms enjoy good prospects for long-term competitiveness. This approach is particularly valid if the state's competitive viability in a high-paying activity is unlikely without

public support. Finally, states must be ready to adapt their approach to the ever-shifting pattern of international comparative advantage.

TOWARD A BALANCED APPROACH

Neither the NPC nor Nothdurft material explicitly treats these difficult policy issues, but a state study team would do well to consider them. Beyond the issue of comparative advantage, there are the following questions:

- Can a state selectively identify and pursue advantages in certain functions (e.g., world-class capability to produce innovative machinery) while ignoring the vitality of linked activities (raw material production and processing, manufacturing, marketing, transport, and financial intermediation)?
- If a state attends to linked activities as well, will a lack of focus compromise the effectiveness of its program?
- How much do local linkages matter in an increasingly globalized economy?
- What will it take to help an industry firmly establish competitive advantage in the face of already daunting and intensifying competition? Given limited resources, what can a state realistically hope to accomplish given barriers to cooperating with neighboring states, the federal government, or other countries?
- Can a state hope to accomplish anything substantial by continuing to provide assistance primarily to individual firms? Or can it significantly strengthen clusters of functions only by stretching its resources to work with much larger groups of firms? Should a state work with all firms or only those with the best growth prospects? Should it focus on marginally competitive firms for whom support may make a big long-term difference, but for whom the risks of failure—and the odds of wasting state resources—are also much higher?
- Critically, how do political factors circumscribe the range of options a state may pursue, regardless of technical merit? Can a state government, for instance, offer adjustment assistance to apparel assembly producers while otherwise promoting the vitality of apparel-related machinery producers?

These questions may not prove as difficult to answer empirically as it may first appear. A good industry study may find, for example, that an industry does demonstrate a strong tendency to cluster within the state and is generating relatively high-paying employment. This finding would tend to favor strategic state support up and down the production chain to increase the advantages of clustering. On the other hand, an industry study may show strength in only one or two high-paying functions and weakness in many lower-paying ones. This finding would argue in the short run for a more selective program.

In any event, business assistance policy can evolve over time. Even if a state first chooses a more selective program approach, long-term changes in the competitive environment may produce new opportunities to work with firms in other parts of a production chain. State success in strengthening priority specializations may, in fact, help create such opportunities.

Whatever the study may ultimately conclude, it seems unproductive to assume *a priori* that a cluster approach is or is not appropriate. A more desirable starting point might be to explore the feasibility of cluster deepening—growing horizontal and vertical linkages, and expanding supporting institutions—while recognizing that this approach may face formidable obstacles. Within this more sober context, the cluster paradigm may help teams avoid an overly narrow vision of program scope and prompt them to consider wholly new policy directions.

One such direction might be to cooperate more extensively with other states. Earlier, Cheerleader 2 waxed pessimistic about the feasibility of interstate cooperation to strengthen clusters, because no state would pay to help firms in another state. While this assumption is correct, it ignores the possibility of cooperating in a way that benefits firms in two or more states.

Several states are participating in ventures such as AMTEX, a recently concluded public-private partnership between federal research laboratories and the textile and clothing industry; and the National Textile Center, a similarly new public-private consortium of southeastern university research programs and industry firms. Both consortia are developing new textile- and apparel-related product and process technologies. In light of the earlier discussion of the textile and apparel machinery industry, it is interesting to note that North Carolina is actively participating in both consortia.

At the international level, the Province of British Columbia has negotiated partnership agreements with several Northwestern U.S. states to promote new industries whose firms show

an interest in cooperation. So far, these include biotechnology, software, and environmental technology.¹⁰ Industry studies can help identify where such partnerships may make sense.

SUMMARY

The use of various forms of analysis, such as the cluster and functional specialization paradigms, will help industry study teams determine the kinds of questions it needs to ask, and when these may be difficult to answer. It is reassuring to note that in many industries, globalization is and may remain a secondary factor; the most important rivals to state firms, at least for the foreseeable future, are other domestic firms. Furthermore, a conscientious industry study will produce more informed policies and programs than might otherwise emerge, a view substantiated by the many informative state studies reviewed for this primer.

¹⁰Personal communication with Paul Sommers, Northwest Policy Center, November 3, 1993.

CHAPTER 4

WHAT ACTIVITIES DO INDUSTRY STUDIES INCLUDE?

We now turn to the nuts and bolts of an industry study. Ideally, the study should progress through an ordered sequence of at least six major tasks. These are a literature review; statistical data analysis; identification of issues; pretest of the interview questionnaire; expanded field interviews; and an outside review. The sequence of tasks will hold however the state structures the team, and however actively involved industry firms are in defining the direction of the study.

LITERATURE REVIEW

The first task is a literature search of previous industry analyses (books, articles, reports, unpublished manuscripts) to help identify industry conditions, trends, and issues. It is beyond the scope of this report to list all available publications or information services. For an introduction to this kind of information, including telephone numbers, Washington Researchers, Ltd., a private, Washington, DC consulting firm, has published *Researching Markets, Industries, and Business Opportunities*. While hardly definitive, it can give the team a running start in its search for literature and industry experts. Gale Research, Inc. of Detroit, Michigan publishes literally dozens of directories listing sources of literature, data, institutions, and subject experts. Appendix B reviews some general resource categories. Several appear in Figure 13.

STATISTICAL DATA ANALYSIS

In accord with the principle "In God we trust; all others bring data," a second and equally important task is an independent statistical analysis. Data analysis helps to create an historical documentary of how an industry—however defined—has evolved over the last twenty to thirty years. The documentary would include an overview of physical flows (e.g., changes in employment), financial flows (e.g., changes in profitability), industry organization (e.g., number of establishments, industry concentration), working conditions (e.g., wages, benefits), and foreign trade (e.g., imports and exports).

Figure 14 contains a list of industry characteristics a team might develop for the historical documentary, and for which at least national-level industry data exist. Some are basic data elements relevant to any study; others are derived from experience or from the state industry studies reviewed. The list is not exhaustive, and the data elements can yield any number of

Figure 13: Major Literature Sources**U.S. Public or Quasi-public Sources:**

Previous in-state studies

Federal agencies

Department of Agriculture

Department of Commerce

International Trade Administration

Economic Development Administration

Bureau of the Census

Bureau of Economic Analysis

Department of Education

Office of Educational Research and Improvement

Department of Labor

Bureau of Labor Statistics

Employment and Training Administration

Environmental Protection Agency

Federal Trade Commission

International Trade commission

National Academy of Sciences

National Research Council

Securities and Exchange Commission

National Technical Information Service (NTIS)

U.S. congressional hearings and legislation

Congressional agencies

Office of Technology Assessment

Congressional Budget Office

Congressional Research Service

General Accounting Office

Academic publications

Foundations

Research organizations

BITNET and INTERNET

Foreign and International Organizations:

World Bank

Organization for Economic Cooperation and Development (OECD)

Private Sources:

Trade associations

Trade periodicals

Financial institutions

Consultants

Labor unions

additional ratios. Selecting which variables/ratios to use will depend, of course, on the purpose of the study and the resources available.

Beyond its descriptive utility, an historical documentary has many advantages. It can indicate how a state industry has fared over time compared with other domestic and foreign regions. It can indicate how the industry has performed relative to other domestic industries—a comparison, some argue, that is a more accurate measure of competitiveness than performance against the same industry in other countries. A documentary also helps address the issue of whether or not an industry has a tendency to cluster within a state or region, and if so, whether the cluster is strengthening or weakening.

It would be valuable to develop an historical documentary for major competitor nations, although for most study teams, this task is beyond its resources. Alternatively, the team may be able to identify experts on major competitor countries who can compare domestic and foreign trends.

Historical data can prevent a study team from focusing on only a few years' experience and then jumping to false conclusions about industry trends. While short-term trends are easier to measure and of more immediate concern, they may paint a deceptive picture of how the industry has been evolving. Independently assessing data also provides an invaluable "screen" through which the study team can assess the relative validity of statements and data series uncovered in the literature review. Moreover, screening can help the team gauge the credibility of the remainder of the analysis associated with these statements and data series.

A multitude of potentially useful data sets exist, although time and resource constraints will limit the team's access. Appendix C reviews some of the major databases that are publicly available. These contain information on a wide range of industries. The study team may wish to supplement these with specialized industry data from private sources, such as trade associations, unions, academic institutions, industry consultants, and securities and investment firms. It will also uncover relevant data sources in its literature review.

A serious obstacle to developing an historical documentary is that state-level data for key indicators (capital stock, real investment, exports) may not be available because the U.S. Bureau of the Census suppresses them to protect business confidentiality. In their absence, national-level data may have to suffice. Field research will then have to assess how closely state industry trends parallel national movements.

Figure 14: Data Elements to Support Historical Documentary**Physical Flows**

Real shipments
 Total employment
 Production workers
 Real multifactor productivity growth
 Real value-added per employee and per production worker hour (labor productivity)
 Real capital stock
 Real investment in plant and equipment
 Capacity utilization rates
 Technology utilization and diffusion rates for major new technologies
 Raw material and energy usage and price

Financial Flows

Profitability ratios (return on equity, sales, or assets)
 Debt/liability ratios (debt/equity, liabilities/assets)
 Payroll as a percent of value added/shipments (measures of labor intensity)
 Investment as a percent of shipments/sales
 Research and development expenditures as a percent of shipments/sales

Industry Structure

Number of companies, number of establishments
 Distribution of establishments by size (% with more than 1,000 employees, 500, etc.)
 Firm concentration ratios (% of value-added/employment in top 4, 8, 20, 50 firms)
 Establishment concentration ratios (% of establishments accounted for by top 4, 8, 20 firms)
 The extent of vertical and horizontal integration across industry activities
 Business failure rates
 Product specialization and coverage ratios
 Distribution of sales by major class of customer (final consumer, retailer, other manufacturer)

Labor Force Characteristics and Conditions

Real average hourly earnings of production workers, of salaried workers
 Employee benefits
 Worker demographic traits (education, sex, race, ethnic background)
 Level/rate of worker displacement and post-displacement experience of dislocated workers

Foreign Trade

Imports as percent of domestic consumption
 Exports as a percent of sales
 Geographic origin of imports by country/region
 Destination of exports by country/region
 Measures of revealed competitive advantage (RCA)

A practical guide to data analysis techniques is *Understanding Your Local Economy: Using Analysis to Guide Local Strategic Planning*.¹ Written by NCI Research with support from the state of Michigan and the Economic Development Administration of the U.S. Department of Commerce, it "distills the experience of NCI Research and the [state of Michigan] Center for Local Competitiveness in providing economic analysis services to a variety of communities that have undertaken strategic planning efforts in recent years." It also presents a series of modules to help study teams structure their data analysis.

Industry Models and IMPLAN

Another useful data analysis tool is the industry model. Models can be helpful in understanding how related activities interact, especially how changes in an industry may affect the local economy, or how changes in the national economy (changes in interest or tax rates) may affect the industry. One well-known source of modeling expertise is The WEFA Group (formerly Wharton Econometrics), providing customized industry analysis on a fee basis, as well as PC-based state and industry models with which a team might work. Another is DRI/McGraw Hill. State econometricians would be familiar with other firms providing similar services.

A modeling tool a team might find especially useful is IMPLAN (Impact Analysis for Planning), a microcomputer-based, input-output model software package developed by the Forest Service of the U.S. Department of Agriculture. IMPLAN permits a study team to assess the regional effects of a change in demand for a product. The model can make such estimates for a state, individual counties, or customized county groupings.

IMPLAN gives teams a way of quickly gauging how much new employment or income an increase in product demand will generate. These increases can differ dramatically from industry to industry, because some industries create more jobs per unit of output, have stronger linkages to the local economy, pay higher wages, or are more likely to bring new income into the region. Needless to say, this is an important issue to consider when choosing the best way to invest state program resources.

For example, Economic Research Service (ERS) researcher Dennis Brown has recently used IMPLAN to estimate the effects of a hypothetical \$100-million-dollar change in demand for processed poultry and red meat on employment and income in several different substate regions. According to IMPLAN, he found that a \$100-million-dollar increase in demand for poultry

¹See NCI, *op. cit.*

produced in the five-county area around Harrison, Arkansas, would add 771 direct jobs to poultry processing industry in that area. The increase in direct employment would also create jobs indirectly in industries that provide supplies to poultry processors, and another 404 jobs from the effects of workers spending their new income at other local establishments, such as gas stations and grocery stores (an example of induced employment).²

IMPLAN thus provides a rigorous way to estimate how a particular policy goal might affect local economic activity. For example, if a team sets as an objective a \$100-million-decrease in state toy exports, it can credibly quantify the increase in state jobs and income resulting from achievement of that objective. Perhaps more important, IMPLAN can help assess the relative effects of different policy outcomes. For instance, does expanding poultry output in the state have a greater impact than expanding output in the apparel or furniture industries?

As a cautionary note, any econometric finding should be greeted with a healthy dose of skepticism. Alan Greenspan, chairman of the Federal Reserve Board, was recently quoted as saying that, in recent years, econometricians' forecasts of even the aggregate growth of Gross National Product have been unreliable. Estimating the effects of expanding industry output in a state or region is a still more difficult task. In addition, because of confidentiality problems with Census data, IMPLAN relies on estimates of many data cells in calculating impact. It is highly recommended, therefore, that study teams involve industry personnel and other experts to assess the credibility of IMPLAN and other models, the assumptions on which they are based, and the results they generate.

The IMPLAN Regional Purchase Coefficients and Direct Requirements Matrix

IMPLAN contains two measures of how deep the linkages are among related sectors in a study area. The first is the regional purchase coefficient (RPC), or an estimate of "the proportion of total study area commodity requirements that are purchased from sources within the study area." Let us assume the demand for knit fabric in the study area comes from three plants producing knit outerwear. The RPC for knit fabric would indicate what percentage of the required fabric at these three plants comes from plants within the study area. An RPC of .2 would represent a much greater share of fabric inputs originating in the region than would an RPC of .2.

²Brown, Dennis, *Changes in the Red Meat and Poultry Industries: Their Effect on Nonmetro Employment* (Washington, DC: U.S. Department of Agriculture, Economic Research Service), Agricultural Economic Report No. 665, March 1993.

An industry study team can use these data to understand the extent to which industry clusters exist in a region, and how deep these clusters are compared with a national industry profile based on the U.S. input-output table. In our knit clothing example, low RPC values may suggest that the knit fabric industry of a particular county is shallow compared with the U.S. industry profile. Adding surrounding counties and recalculating RPCs may show, however, that while the original county relies heavily on imports of knit fabric, much of that fabric originates in surrounding counties. The area's knit outerwear cluster is, therefore, much deeper than a county-level analysis suggests.

Conversely, a study team may find that producers bring in most of the fabric from outside the region. In this case, the team may decide to explore the feasibility of deepening the knit outerwear cluster by promoting greater regional knit fabric output. Of course, the team must try to discover why fabric is brought in from other regions, since there may be good reasons for this pattern. Be that as it may, RPC analysis will suggest which issues need to be investigated further.

Similar, though distinct, measures of local linkage strength are the IMPLAN "Aggregate Regional Direct Coefficients." Of every dollar a local industry spends on production inputs, the coefficient provides an estimate of how much is spent locally. For example, a coefficient of .30 would indicate that for every dollar a local industry spends on production inputs, it spends 30 cents on inputs from other local industries. The difference between the sum of local purchases and \$1.00 is how much the industry spends for production inputs outside the study area.

IMPLAN also provides an industry-by-industry breakdown of the total amount spent locally. These data tell us, for instance, how much local knit outerwear plants spend on locally produced knit fabric for every dollar spent on inputs.

Literature review and data analysis, while valuable, are but a start in crafting the kind of analysis needed to make substantive policy choices. As the New York Hudson Valley study notes, "Regional strengths are difficult to assess quantitatively, so they must be assessed qualitatively." Consequently, a study team must make additional efforts to collect information from people in the industry and other informed industry observers. It is hard to overemphasize the importance of contacting as many people in the industry as possible, particularly if the study is not industry-driven. At any given time, the only people who may be up to date on industry conditions and trends are those within the industry itself.

IDENTIFICATION OF ISSUES

A first step in approaching interviews is to identify which issues need closer examination. Literature review and statistical data analysis will point to salient industry characteristics and trends. They will also isolate important issues about which analysts disagree or are uncertain. A study team should focus its initial field interviews on this set of issues.

In the course of the interviews, a team can expect new issues to emerge. It may find that issues believed to have little importance, or broad acceptance, are either significant, or controversial, or both. Nonetheless, the logical and only practical way to begin structuring field interviews is to delineate key areas of uncertainty or discord.

It is helpful to ask a few industry experts to review prospective issues prior to undertaking the first interview. Experts can flag issues that are more marginal or certain than the team believes, and identify other important issues as well. This step can save a great deal of time and confusion later on by helping the team ask focused and informed questions.

If the private sector is directly involved in the study, the need for review is reduced or eliminated. If, however, the study is not industry-driven, and the team includes no industry members, it is useful to conduct a first round of interviews with public-sector personnel who deal regularly with industry firms.

Until recently, industry expertise in the public sector was sparse, and seldom found in state government. Over the past decade, however, many states greatly expanded the scope of their business assistance programs in response to the economic crises of the 1980s. This expansion has put hundreds of state government personnel in daily contact with private firms in many industries and all regions of the country. In fact, some of the people with the best overview of on-the-ground industry conditions now work for the public sector.

In manufacturing, for example, over two dozen states currently operate industrial extension services. Many extension agents have prior managerial experience in manufacturing and have worked, collectively, with thousands of firms in a broad range of industries. This expertise will continue to grow if the Clinton administration launches an aggressive effort to modernize U.S. manufacturing.

A study team may tap other public resources as well. These include the staffs of other state business assistance programs (industrial recruiting, training, small business financing);

university researchers who have studied or otherwise have regular contact with industry firms; personnel at federal agencies who track industry trends (U.S. International Trade Commission, U.S. Department of Commerce, Office of Technology Assessment, and the Congressional Budget Office); or staff at state and federal regulatory agencies who administer relevant programs. Local economic development and training personnel may also be useful resources depending on the nature and frequency of their interactions with the industry.

Once a team has tapped public-sector expertise, it may also identify selected private-sector personnel to review its list of issues. Members of the team may know people in the industry whom they can contact at this stage of the work. If a team has neither private-sector linkages nor an informal way of making industry contacts, it may begin by contacting major trade association(s) and unions. These organizations normally employ individuals with many years of experience whose jobs demand an understanding of current industry issues. Such officials also will have extensive contacts with individual firms, and may further refer the team to a few knowledgeable experts who will be receptive to the team's approach.

These first contacts with trade associations or unions can be made at the same time the team is seeking out public-sector expertise. It may be prudent, however, to wait until team members have talked with a number of the most informed public-sector individuals, whether in- or out-of-state. A private official may not take the team seriously if its members appear unprepared or misinformed.

If a team has no private-sector contacts, another way of reviewing the list of issues is to hire an industry consultant. In a matter of hours, an experienced consultant can help a team focus its investigation. This option is potentially more costly, but may prove a good bargain. Some consultants may provide their services free, partly as a public service and partly as a marketing activity. Even when the private sector is already participating in the study, hiring a consultant for a few hours may be useful in getting a broad overview of industry conditions and trends.

Focus groups also may help refine the issues list, following the example of the Northwest Policy Center in its study of the Oregon wood products industry. Focus groups are clearly a more expensive way of accomplishing this task than selective review by a few key individuals. On the other hand, focus groups are less expensive than on-site interviews in soliciting detailed industry information. For a team with neither the time nor the budget for a substantial number of field interviews, focus groups provide a viable alternative.

PRETEST OF THE INTERVIEW QUESTIONNAIRE

If the team decides to carry out interviews after identifying salient issues, it should undertake a handful of on-site, pretest interviews at selected firms. These visits will refine issues further, give interviewers some practice with the survey questionnaire, and give team members a chance to learn about the on-the-ground operating environment of a typical plant. Private-sector team members and other cooperative industry officials may help arrange visits to participating or otherwise accommodating firms to view their facilities and talk informally with some of their key personnel. Public-sector business assistance personnel may also be able to arrange visits with private firms to pretest the questionnaire.

EXPANDED FIELD INTERVIEWS

Initial visits will help the study team expand its contacts with industry firms and other organizations. In moving to the next level, the team must decide how many contacts to make, who to contact, and what method to use in conducting interviews. On page 108 of *Understanding Your Economy* by NCI Research, there is a list of several comprehensive guides to survey research. The discussion here treats a narrow subset of many possible issues.

How Many Interviews Should the Team Plan to Do?

This question is the easiest one to answer. Textbooks notwithstanding, the operative rule for how many interviews to perform is "as many as you can afford." If the team has the resources to reach a minimum of 50 to 100 firms, it may be worthwhile to construct a representative (randomly selected) industry sample with the help of a researcher experienced in sampling design. The sample may lead to a more balanced picture of an industry by including a wide variety of firms. It also may increase team confidence in its findings.

On the other hand, such an approach may entail substantial time and expense beyond the interviews themselves. Developing an up-to-date list of firms for the sample is time-consuming. Further, the number of required interviews can multiply quickly if several different activities (yarnmaking, fabric production, clothing production, retailing) are included in the definition of the industry, and the team wishes to learn about each activity. To have any confidence that firms in the sample are truly representative, the team must interview a minimum number (twenty-five to thirty) within each activity.

Whom Should the Team Interview?

If at all possible, the study team should be sure to interview some firms from each line of activity in the industry. In industries where SMEs constitute a significant share of capacity, the team should distinguish between large, multiplant, often multinational firms, and SMEs, also preferably within each activity. As discussed earlier, the problems and opportunities of these two kinds of firms will differ substantially, as will the list of relevant issues.

Even if the study team has not included them in its definition of the industry, it is desirable to interview firms that sell to or buy from the industry, such as equipment suppliers and retailers who distribute the product. Particularly valuable are customers and suppliers who purchase from or sell to both domestic and foreign firms, as they have unique ability to compare domestic and foreign performance in specific product lines. Given the likely resource limitations and an almost total absence of good, publicly available comparative data, customers and suppliers may prove to be the team's only source of such information. Customers also may be able to compare the performance of competitors in other states relative to in-state producers.

Rapidly growing firms are another potential group of interviewees. They may provide insight into successful strategies and the kinds of assistance successful firms feel might be most useful to them.

Some firms will decline to participate in interviews, while others will cooperate as a public service as long as the interviews are not unduly time-consuming, and their purpose is nonthreatening. Over the past few years, many states have successfully involved several dozen firms simultaneously in various types of industry studies, and prospects are good that a serious state effort will meet with similar success. Again, the greater the number of team members from the industry, or with good industry contacts, the easier the task of involving still other firms.

A thorny problem may arise if a particular group of firms is driving the study, and the results are to remain confidential. Firms outside the study group may refuse interviews because they feel uneasy about disclosing information about their operations to competitors. There is no way of knowing beforehand whether this will be a problem, and, if it is, there is not much that can be done about it.

One way of persuading firms to participate in an industry-driven study is to promise them the study results. Thus, they benefit from the analysis in exchange for an interview. This exchange is not as trivial as it might appear. A similar industry analysis would cost the firm tens of thousands, if not hundreds of thousands, of dollars to commission. At that price, the typical

firm would choose not to carry it out. The fact that a group of industry firms is leading the study effort will likely enhance the study's appeal to other firms the team wishes to interview.

To improve private-sector participation, a team might also consider approaching an industry association to cosponsor the interviews. An industry association might agree to do so if its priorities coincide with those of the team. In such a situation, industry response might improve significantly. In developing the survey, the team would work closely with the association to draft a questionnaire and identify potential interviewees.

Labor Union Personnel. Study teams should also seek to interview labor union officials or researchers. Unions generally operate nationwide, or even internationally, and have a broad industry overview. In addition, they often provide perspectives on labor force and other issues that a team may not obtain by interviewing individual firms.

Consultants. Consultants who work regularly with the industry are another potential source of information. Every industry has at least several consulting firms with good reputations and expertise in industry matters. A number of states have hired consultants to direct or conduct industry studies. Consulting organizations include SRI International, Telesis, Battelle, Coopers and Lybrand, DRI/McGraw Hill, Kurt Salmon Associates, McKinsey and Company, Kennedys, Leventhal and Company, the Corporation for Enterprise Development, the National Association of State Development Agencies, the University of Massachusetts, the Urban Center at Cleveland State University, the Northwest Policy Center, and the Georgia Institute of Technology.

Financial Analysts. Wall Street and other securities analysts also specialize in one or more industries. As noted in Chapter II, their job is to develop detailed knowledge of individual companies, particularly those that are publicly traded, and factors that influence industry performance. While some analysts will have a very short-term focus, those who have followed an industry for many years may have broader and longer-term perspectives on industry problems and opportunities. A long-term outlook is more relevant in developing policy options. An efficient way of identifying prominent industry analysts is to refer to the annual "All American Research Team" in the periodical *Institutional Investor*. The team includes well-respected analysts by company affiliation and industry of expertise.

How Should the Team Conduct the Interviews?

The on-site interview is the best way to gather information from firms. Compared with the alternatives (telephone surveys, mail surveys, and focus groups), on-site visits provide a better sense of a firm's operations, and establish personal contacts more successfully. On-site interviews

however, are more expensive, and cost may restrict their use. A team might compromise between cost and the number of contacts by supplementing on-site visits with telephone interviews. For example, a set of twenty-five to thirty on-site interviews will narrow the range of issues, refine the list of questions, and give team members some feel for the physical production environment. Telephone interviews with additional interviewees would follow, and would be cheaper and more easily arranged.

Telephone interviews are typically much shorter than on-site discussions because a visit to a plant will be treated more generously and patiently than an impersonal telephone call. A team may wish to structure telephone inquiries to address the most important unresolved issues first. If the interviewee seems willing, the interviewer might then pursue lower priority issues.

A team also may use telephone interviews to reach firms that were not well-represented in the site visits. The Telesis/Port Authority study divided its resources between 300 in-person interviews with owners and managers of key manufacturing firms, and about 1,000 telephone interviews to expand coverage to smaller firms. Also, for whatever reason, a team may be unable to visit firms in a particular line of business. Telephone contacts can address this deficiency.

Mail surveys are not recommended for industry studies because private-sector response is often very low. Businesses will be more likely to talk for half an hour on the phone, or agree to a site visit, than to fill out a form. Only one industry study mentioned a mail survey—a canvass of 554 in-state public officials. The response rate was 12 percent, which, the report notes, is “. . . 4% better than the average 8% response rate for mail surveys.” The response rate for a comparably sized survey of private businesses would undoubtedly have been lower.

Low response rates to mail surveys would prevent the team from knowing how representative the results are. Mail surveys, in fact, may produce very misleading results; yet they still require a significant amount of contact to coax firms to fill out the form, follow up uncompleted questions, or clarify a written response.

Unlike mail surveys, in-person or telephone interviews provide the give and take needed to develop a full response, or to move spontaneously into areas not included in the questionnaire. They also provide subtle, but important, information such as tone, inflection, parenthetical remarks or pregnant pauses, which mail responses inherently lack.

A possible exception to the rule is when a team is able to undertake a mail survey in conjunction with a major industry association. As with a co-sponsored interview process, the

team would work closely with the association to draft a joint survey instrument and carry out aggressive telephone follow-up.

OUTSIDE REVIEW

Once a team has completed its literature review, data analysis, and field interviews, the next step is to develop a first draft of the analysis. If the study is to be publicly available, the team should circulate the draft widely for review. It is rarely possible to do enough reading, conduct enough analysis, and talk with enough people to be certain that findings are correct. An outside review is a safeguard against mistakes that undermine the team's credibility or point the policy process in the wrong direction. In contrast, if the team has confidence in its analysis, it will bring a strong sense of conviction to help the state develop goals, objectives, strategies, and programs.

A team can use an outside review to expand the scope of its contacts to firms not previously interviewed. Many public- and private-sector industry experts, for whatever reason, may not have participated in the process as yet. These individuals would be good candidates to review the draft. Other public officials—both elected and non-elected—with some stake in the policy process will become involved at some point. A request to review the team's first draft is both a courteous and potentially useful gesture. Finally, once the team receives and incorporates comments on the draft, public hearings can be used to solicit additional feedback and involve local businesses and individuals. Hearings not only improve the product, but also publicize and build support for subsequent efforts.

CONCLUSION

Industry studies are tools for informing public policies and programs to enhance the competitiveness of key state industries; they also build support for these efforts. Thus, industry studies are important from both a substantive and political point of view.

Today's world is changing rapidly, however, in important and fundamental ways. GATT or NAFTA may quickly and significantly alter the competitive position of a state industry. Such shifts may make some facets of an earlier study less relevant or current. Inherently, an industry snapshot at a single point in time cannot capture the ebb and flow of industry evolution.

A single industry study, then, is but a first step towards developing the capacity and knowledge base for sound, long-term strategies to enhance competitiveness. States that pursue these strategies will find it necessary to stay on top of industry trends. Indeed, industry studies offer a systematic and timely way to gauge when some facet of a program has become less relevant, when another may be more useful, or when, in fact, wholly new circumstances warrant wholly new initiatives.

APPENDIX A

TRACKING PERFORMANCE IN ARIZONA INDUSTRIES

CLUSTER STRENGTH

. . . As part of the ASPED process, SRI identifies nine clusters of economic activity in Arizona at various emerging, expanding, and transforming stages. Federally collected data on the service and manufacturing industries in each cluster can be organized to shed light on important competitive dimensions . . . and how they compare to national averages.

Cluster employment concentration (Source: County Business Patterns, U.S. Bureau of the Census). This indicator reflects the relative strength of a cluster by measuring the degree to which buyers and suppliers are represented in the state. High employment concentrations across linked industries and export-oriented industries within a cluster indicate that a high-degree of value added is occurring within the state.

Input-output analysis (Source: SRI International/DRI-McGraw Hill proprietary methodology). State input-output tables can reveal valuable information about the strength and evolution of each cluster, such as the multiplier effect of specific global-linkage industries, the nature and degree of buyer-supplier relations, and the proportion of cluster value added occurring within the state.

Cluster earnings per employee (Source: County Business Patterns) are a reflection of the quality of jobs found in each cluster and can reflect skill proficiencies and deficiencies.

Cluster earnings growth (Source: County Business Patterns) measures a cluster's ability to provide more value added through increased productivity and quality compared with national averages for the same cluster industries.

Cluster employment growth (Source: County Business Patterns) reflects the relative health and direction of each cluster.

New business starts as a percentage of total cluster establishments (Source: Cognetics, Inc.). This measure reflects a cluster's ability to regenerate and adapt.

INDICATORS OF ECONOMIC CAPACITY

The following indicators reflect state capacity to support dynamic, globally competitive industry clusters. . .

Human Resources

It takes an increasingly skilled, educated, adaptable, and innovative work force to keep pace with changing markets and technologies. The following indicators measure critical aspects of state education and training efforts:

Average expenditures per pupil, elementary and secondary institutions (Source: Estimates of School Statistics, National Education Association). These measures reflect a state's commitment to investing in its future productive assets: well-educated and creative employees.

High school graduation rate (Source: State Education Statistics Supplement: Student Performance & Resource Inputs, Office of Planning and Budget, U.S. Department of Education). This measure reflects state ability to provide an interesting and attractive education environment.

National Assessment of Educational Progress (NAEP) score (Source: U.S. Department of Education, beginning in 1992). NAEP will be collecting comparative assessment data for a variety of subjects for high school students over time, beginning in 1991 with mathematical assessment. This indicator is preferable to ACT rankings, which are specific to a self-selected group of college-bound students.

ACT College Entrance Exam score (Source: State Education Statistics Supplement: Student Performance & Resource Inputs, Office of Planning and Budget, U.S. Department of Education). This indicator reflects certain skills of a state's population of college-bound seniors and can be used to reveal relative improvements or declines in group performance over time.

Average state expenditures per FTE student at public institutions of higher education (Source: State Profiles, Research Associates). This indicator represents the degree to which a state considers higher education as a public-sector priority.

Technology

The state system of public and private institutions that conduct, develop, and transfer new technologies has become one of the critical ingredients for global competitiveness. Clusters that succeed in today's economy produce technology-intensive products and services that change so quickly that they are obsolete before they can be routinely mass-produced by foreign, low-wage competitors. Certain aspects of a state technology effort can be monitored using the following indicators:

Federally sponsored R&D per capita (Source: National Patterns of R&D Resources, National Science Foundation). This indicator represents state ability to capitalize on its research reputation and facilities to attract federal research dollars.

Industry R&D per capita (Source: National Patterns of R&D Resources, National Science Foundation). Industrial R&D is in many respects a key determinant of state ability to sustain a high rate of innovation and technological advantage.

Patents per capita (Source: Technology Assessment and Forecast Reports—All Technologies, County and State, U.S. Patent and Trademark Office). This measure can represent a state's rate of innovation; however, states with a high concentration of corporate headquarters receive disproportionate credit for innovations that were developed in laboratories in other states.

Scientists and engineers in the work force (Source: U.S. Scientists and Engineers, NSF). This indicator is a measure of state capacity for innovation and change—an essential trait for global competitiveness.

Capital

The following indicators reflect the availability of capital to meet the needs of new, expanding, and restructuring firms.

Commercial bank deposits per capita (Source: Federal Deposit Insurance Corporation, Division of Research). This measure reflects the availability of capital to support the financial needs of businesses.

Ratio of total loans and leases to total bank equity (Source: FDIC). This reflects the aggressiveness of Arizona banks in providing loans to consumers and businesses.

Venture capital fund disbursements per capita (Source: Venture Capital Yearbook, Venture Economics). As a measure of the relative amount of risk capital available, this indicator reflects state capacity to support businesses in an early stage of development. Furthermore, a high degree of venture capital activity is indicative of a fast-growing economy with greater investment and job opportunities.

SBIR awards per capita (Source: Office of Innovation and Research, Small Business Administration). This indicator reflects the degree to which the state is oriented toward supporting new businesses.

From the state of Arizona, *Creating A 21st Century Economy: Arizona's Strategic Plan for Economic Development, Volume 1: Strategic Plan*, (Phoenix, Arizona: Arizona Department of Commerce), January 1992, pp. VIII-4 to VIII-8.

APPENDIX B

RESOURCE CATEGORIES FOR LITERATURE REVIEW

In this appendix, we review some of the major sources a study team may use in conducting a search for relevant publications.

PUBLIC OR QUASI-PUBLIC SOURCES

We refer here to two types of entities. The first includes public-sector agencies, whether local, regional, state, federal, or international. While technically not part of government, the second category includes entities that conduct activities intended to serve public purposes, such as research to inform the legislative process.

Previous In-state Studies

An obvious starting point is a review of previous work (studies, hearings, or conference proceedings) by state executive agencies, legislatures, regional or local governments, task forces, commissions, or consultants hired by the state. In any state, a variety of documents will lay out previous research and thinking on industry conditions and trends. For example, a recent effort by the state of Wyoming to develop an economic development strategy identified over two dozen documents prepared over the preceding decade, including data and analysis of the state economy. Figure 15 lists several recent reports on the Ohio aerospace industry that provided background for a recent state study.

The extent of previous efforts will vary from state to state, and not all previous work will inform the analysis. Much of it may be irrelevant or out-of-date, with insufficient data support, faulty analysis, a lack of focus on the industry of interest, or other weaknesses. Nevertheless, a state that is about to launch a major industry study would be wise to look carefully for previous work and draw from it whatever may be useful.

Federal Agencies

Many federal agencies, often in response to congressional requests, periodically undertake studies of specific industries or public programs, such as small business financing, training, or research. Others may do so as part of their normal regulatory functions. For example, market studies performed as input to Federal Trade Commission antitrust proceedings, or industry analyses by the U.S. International Trade Commission (USITC) in support of proposed trade sanctions, may contain rich detail on current industry conditions and trends. If environmental regulation is important to the industry study, an Environmental Impact Statements (EIS) issued by the pertinent regulating agency or agencies can quickly bring a team up to speed on the issues

involved. The EIS may, in fact, contain other useful information about the industry. For relevant material, the team might review the publications of agencies listed in Figure 13.

The USITC and the U.S. Department of Commerce (DOC) also maintain staff with varying levels of expertise in specific manufacturing industries. The annual *Industrial Outlook* of the DOC presents recent data on industry trends in several hundred industries, and, most important, identifies a specific industry analyst at DOC who can help locate other sources of information in Washington. Many people who have tried to find information in Washington without a good initial contact will readily testify to the utility of having one.

U.S. Congressional Hearings

Congressional committees frequently hold hearings on industry conditions or business assistance programs. Transcripts of hearings are available through committee offices, accessible through the Capitol Hill switchboard. Legislative staff for state senators and congressional representatives may be able to identify, or locate someone who can identify, committee(s) that are holding relevant hearings. A team can also obtain copies of pending legislation pertinent to the industry through these offices and committees. Beyond the hearings, additional staff analyses may also be available.

In many cases, congressional hearings will provide a useful feel for salient industry issues by chronicling what various stakeholders (e.g., trade associations, labor unions, individual firms) say about matters the committee is considering. Simply knowing the advocacy position of various constituencies on important policy issues helps the team anticipate how various groups may respond to state policy proposals. Congressional hearings may also contain analysis or data helpful to a more fundamental understanding of industry conditions, or they may discuss policy proposals the team might apply in its state.

Academic Publications

Academic articles in economics, business, and other social science journals can also be valuable sources of background information. A standard reference guide to this economic and business literature is the *Journal of Economic Literature*, a quarterly containing an updated bibliography of articles published recently in the leading professional journals. The rough equivalent for the sociology literature, which may be germane to such issues as demographic or labor force trends, is *Sociological Abstracts*. Another, more expansive bibliographical source is the *Social Science Citation Index*.

Figure 15: Ohio Aerospace Bibliography

The Center for Urban and Public Affairs, Wright State University. *Directory of Miami Valley, Ohio Aerospace Companies*, January 1992.

Dayton Area Chamber of Commerce, Dayton Development Council, Aerospace/Aeronautics, n.d.

Dockery, Jane L., The Center for Urban and Public Affairs, Wright State University, *Miami Valley-Dayton, Ohio Aerospace Retention and Expansion Report*, forthcoming publication.

Gallagher, Peg. Greater Cleveland Growth Association, *Aerospace Industry Prospects For Greater Cleveland*, July 1992.

Premus, Robert. "Ohio Aerospace Sector," in Wald, Keith and Blair, John P. (eds.), *Manufacturing Development Policy and Ohio's Economic Future*. (Dayton, Ohio: The Wright State University Press), 1991.

Walker, Lois E. and Shelby E. Wickam. *From Huffman Prairie to the Moon: The History of the Wright Patterson Air Force Base*. (Washington D.C.: U.S. Government Printing Office), 1986.

Wright-Patterson Air Force Base, *Economic Resource Impact Statement*, September 1991.

From Ohio Department of Development, Data Users Center, *The Ohio Aerospace Industry*, (Columbus, Ohio: Ohio Department of Development), Business and Industry Series, January 1993, pp. 56. Jim Kell, principal analyst.

In-state university faculty also may have conducted, or may be conducting, industry studies, sometimes of the in-state industry itself. They may also be able to identify academics in other states or countries who have authored industry analyses. Finally, a large and growing number of on-line computer search services permit users to do keyword searches through thousands of domestic and international academic publications.

Foundations

Many foundations fund research on a broad range of public policy issues. Their reports are done frequently by experts in a given field, and the topics treated are diverse. A review of recent directories of foundations will indicate which foundations may have funded research relevant to the team's study. The focus of foundation research changes periodically, so use of a current directory is encouraged.

Research Organizations

Aside from consultants, a wide spectrum of research organizations exist that may regularly publish relevant and informative material. These organizations often analyze public policy issues, and in so doing, may develop industry- or program-specific information. Chapter 7 of *Researching Markets* provides a list of think tanks that Washington Researchers staff has found to be “especially cooperative in sharing information and providing referrals.” Several other research organizations have found new prominence under the Clinton Administration and thus may be very up-to-date on industry or public program issues. These include the Progressive Policy Institute, the Council on Competitiveness, and the Economic Policy Institute, all located in Washington, D.C.

BITNET and INTERNET

An inexpensive but “hit or miss” way of identifying relevant studies is to send a request through BITNET or INTERNET—user-friendly, interactive electronic mail networks that allow people around the world to share information. INTERNET, originally a project of the U.S. Department of Defense, is used by large numbers of individuals from a wide range of international institutions. Users communicate regularly on INTERNET and/or participate as members of user groups organized around a subject area. Most universities and many government organizations have on-line access to both INTERNET and BITNET.

Foreign and International Organizations

At least two international organizations conduct research of potential interest to a study team. The first is the World Bank, headquartered in Washington, D.C. The bank has a publications list of all recent studies, which may include analyses of the industry in question. Bank staff may have done the study, or hired a consultant to do it.

A second resource is the Organization for Economic Cooperation and Development (OECD), headquartered in Brussels but with an office in Washington, D.C. Membership consists of the United States, Japan, and European nations. OECD often reviews and compares policies and industries across members nations. Recent reports include *Competition Policy in OECD Countries*, *Industrial Policy in OECD Countries: Annual Review*, *Labor Market Policies in the 1990s*, and analyses of various industries: advanced microelectronics, biotechnology, iron and steel, and pulp and paper. Comparative information on program structure in different countries is particularly scarce; OECD reports and staff members may thus prove a good entree to exploring alternative approaches in a specific program area.

Every country also has governmental, academic and private sources of industry information. If a team wishes more information on a specific country's industry, the quickest access to these sources is likely to be a researcher, either in-state or elsewhere, who specializes in that particular country, industry, or both.

PRIVATE SOURCES

Trade Associations

Many industry trade associations publish reports on industry issues. Executives from member firms may have participated in writing these reports, and the reports may thus be current and informative. Almost every industry will have some sort of national association. These institutions will vary, however, in how much of their resources they devote to such reports; for some, their primary mission is liaison with federal and state legislative and regulatory personnel. Several directories of trade associations exist to help a team identify relevant ones. The larger industry firms will also know which associations are important within the industry.

Trade Periodicals and Other Business Publications

An excellent information source is trade periodicals, which focus on one or more related industries. A review of issues published in the last three to five years can provide a good sense of what issues are "hot" within the industry, information on a wide range of technical topics, and profiles of industry firms. Authors of articles in these publications can prove valuable sources of additional information. Industry or trade association personnel will know which periodicals are the most widely read. Periodical circulation is another useful indicator. *The Standard Periodical Directory*, published by Gale Research, lists U.S. and Canadian trade periodicals among its entries.

Publications such as the *Business Periodicals Index*, published by H.W. Wilson Co., list other business-related articles in less specialized publications. The index is available in most libraries. Indexes of articles in major newspapers, such as the *Wall Street Journal* and *New York Times*, are also available.

Financial Institutions

Industry studies by financial institutions that invest money directly, or evaluate opportunities for others, are additional sources of information. These studies inform investment decisions and may be available on a subscription basis from the sponsoring institution. Unfortunately, these studies can be expensive, focused on the short-term, or both.

Consultants

Some industry consultants also perform and publish industry analyses for public clients or general sale. If available, these too can provide valuable background material. Trade association personnel will generally know who is best known or most widely consulted. Also, *Consultants and Consulting Organizations Directory* from Gale Research provides basic information on over 17,000 individuals and firms providing consulting services, including services offered and typical clients.

Labor Unions

Labor unions frequently maintain research departments or support other research organizations. If, for some reason, in-state individuals do not know which unions are relevant, trade association listings also may include various unions. Individuals at AFL-CIO headquarters in Washington, D.C. will know which unions are relevant, as would industry trade associations.

APPENDIX C

SOURCES OF STATISTICAL DATA

The Washington Researchers publication *Researching Markets, Industries and Business Opportunities* references thousands of useful sources of industry-specific data. It is impossible to predetermine which ones will be relevant for a particular study; nor would this handbook permit us to review even a large subset. We content ourselves with highlighting a number of (mostly public sector) data sources that virtually all teams should consider. These may collectively provide much of the data a team will ultimately use; however, one or more technical features of each database may limit its usefulness in important ways.

U.S. BUREAU OF THE CENSUS DATA ON MANUFACTURING

The Census Bureau is home to the most comprehensive data available on U.S. manufacturing. We review several of its databases below.

The Census of Manufactures and the Annual Survey of Manufacturing

The best-known sources of information on U.S. manufacturing are the *Census of Manufactures*, published every five years, and the *Annual Survey of Manufacturing*, published in intervening years. Data from the *Census of Manufactures* are more accurate because the census surveys all manufacturing firms, while the *Annual Survey* is a sample of these firms. The survey is nonetheless of high statistical quality, in part because it covers the largest manufacturing firms, which collectively account for about two-thirds of total manufacturing employment. The last published census is for 1987, but 1992 census data should be available in 1994. The last published *Annual Survey* contains 1991 data.

The *Census of Manufactures* "Industry Series" present national-level data for all four-digit manufacturing industries regarding the numbers of companies and establishments in the industry, employment, payroll, supplementary labor costs, hours worked, assets, capital expenditure, rents, depreciation, inventories, cost of materials and energy, value of shipments, and value added. The "Geographic Area Series" of the *Census of Manufactures* provides similar data at the state- and MSA-levels, as well as for large industrial counties.

The "Geographic Area Statistics" of the *Annual Survey* provide industry data for the state, individual MSAs and selected counties on employment, payroll, hours worked, value added, shipments capital expenditures, inventories, assets, rents, and supplemental labor costs. The *Annual Survey* "Industry Series" contain, for each industry, data on employment, hours worked,

payroll, value added, capital expenditures, costs of materials, labor costs (including supplemental benefits), shipments, and inventories.

The introductions and appendices to these various documents discuss technical data issues, including definitions. All data are available in both hard copy and electronic formats.

A major limitation of the data is that confidentiality requirements often force Census to suppress substate- and/or state-level data for specific industries. Consequently *Census* and *Annual Survey* data may only permit a team to get a feel for what has been going on in an industry at the national level; it may not permit tracking that industry within a state.

Current Industrial Reports

Census also publishes *Current Industrial Reports*, which measure production and inventories of about 5,000 different products on a monthly, quarterly, and annual basis. Reports cover products that meet specific criteria, including total production value, the significance of the product in foreign trade, and its strategic importance. The main purpose of these reports is to gauge, in a timely manner, the general level of activity within economically important industries. Until this year, Census published hard copy of the monthly and quarterly reports. Heretofore, they will be available in electronic format only (CD, diskette, or bulletin board). In addition, an annual compendium containing all annual reports and summaries of monthly and quarterly reports will be published in hard copy each year.

The Productivity Database

As a first step towards compiling relevant data, we highly recommend obtaining a copy of the *Productivity Database*. This database presents U.S. totals for the major data series contained in the *Census of Manufactures* and *Annual Survey of Manufacturing* for each four-digit manufacturing industry over the 1959-89 period.

The database, developed originally by personnel at the Census Bureau, the University of Pennsylvania, Stanford Research Institute (SRI), Inc., and the National Bureau of Economic Research, includes estimates of several other important industry measures, such as real annual investment, multifactor productivity, and real output. While the data are national totals (as opposed to state- or county-level), they can provide a quick yet very penetrating portrait of many important industry trends. Dr. Wayne Gray of Clark University and the National Bureau of Economic Research in Boston has recently updated the data through 1989.

The *Productivity Database* does not contain all information published in the *Census* and *Annual Survey of Manufacturers* summary documents, e.g., detail on what types of energy or materials industry firms purchase and industry inventory levels. It is not, therefore, a complete substitute for the *Census* or *Annual Survey*, even at the national level. On the other hand, it may prove entirely sufficient for a team whose interest in national-level data is getting a good overview of national trends for all or part of the last three decades.

Longitudinal Research Database (LRD)

Another database of potentially great utility is an in-house database of the Center for Economic Studies (CES) of Census Bureau called the Longitudinal Research Datafile (LRD). The file merges establishment-level *Census of Manufactures* data back through 1963 with *Annual Survey of Manufacturing* data since 1972. The result is a wealth of historical data on individual manufacturing plants.

To protect confidentiality, the agency deletes company identifiers in the LRD; in other words, a researcher can only guess which plant a given set of data refer to. Moreover, users must access the file at one of two sites: Census headquarters in Suitland, Maryland, or a new Research Data Center at the Census Bureau's regional office in Boston. To gain access, users must submit a written proposal to CES describing work they wish to do, reserve a date to use the LRD well in advance of on-site use, and pay a monthly user fee. Census personnel must also examine any physical output a user wishes to take from the research site to ensure the data do not violate confidentiality standards.

CES does not accept every project proposed. It is, however, currently interested in encouraging proposals that use its data for regional analysis (such as analysis of state industries). Proposals also have a better chance of being accepted if the researcher will use the new Boston facility, because space is (at present) more available there.

Alternatively, a team can file a request with the Census Bureau for special data tabulation. Census charges for tabulations vary according to the amount of staff work required. It is also a somewhat risky proposition, because it is impossible to know in advance how much of the data Census must still suppress to protect confidentiality.

Despite complications, it is potentially the only source of data available to address certain questions, such as how labor productivity varies between larger and smaller state firms, and between in-state and out-of-state firms; the extent to which individual firms operate in different industries and across states; and how heavily concentrated investment is among industry firms.

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We suggest teams explore the utility of this data source with Census officials when their literature search and data analysis have yielded a preliminary list of issues the LRD might help them address.

The CES is linking other plant- and firm-level data sets from both inside and outside the Census Bureau to the LRD. These data sets include information on work force characteristics, energy use, pollution generation and abatement expenditures, ownership, and research and development expenditures.

Exploiting the tremendous collective scope of these data, CES researchers have a large number of projects under way that examine the general issues of how plants and firms differ in the inputs and technology they use, the products they produce, their ownership structure, and how the relationships among these factors influence firm performance (such as firm growth and wages paid). The *CES Annual Report* provides a very good feel for the types of ongoing work within CES, and the names of analysts to contact in a given research area.

County Business Patterns and Enhanced County Business Patterns

Another important Census data set is *County Business Patterns* (CBP), compiled annually not from primary survey data (as is the *Census of Manufactures*), but from the administrative records for the social security program submitted to the federal government directly from employers. CBP data include county-level detail on employment level, payroll, the number of establishments, and the distribution of establishments by establishment size. They also distinguish employment in auxiliary and administrative functions from production employment. It is the only published source that contains annual county-level data at the four-digit SIC level. Census has scheduled 1991 data for release by early 1994.

One limitation of CBP data is that generally they cover only private, non-farm employment, and in addition, exclude self-employed individuals who employ no other employees (sole proprietorships). However, the exclusion of farm, government, and sole proprietor employment will most likely prove a minor concern to a team focusing on one or more manufacturing industries.

For various reasons, a specific industry total may not correspond closely to *Census of Manufactures* data; this is a generic problem with comparing databases drawn from different sources, even those that appear at first glance to measure similar things. The team may wish to compare *Census of Manufactures* and CBP data for the most recent census year to see where

discrepancies are of sufficient magnitude to warrant further investigation. We would anticipate, however, that this problem will be of marginal importance in most cases.

At both state and county levels, published employment tables also frequently suppress data cells to protect confidentiality. In response, economists have developed "Enhanced" County Business Pattern data sets, with estimates of specific values for suppressed cells.

To my knowledge, the least expensive access to an Enhanced CBP data set is through the U.S. Army Corp of Engineers, the Construction Engineering Research laboratory at the University of Illinois/Urbana. The lab maintains the data on computerized files. First time users must attend a users' conference to become certified in data base use; users then pay additional charges to access the data. Also, National Planning Data Corporation of Ithaca, New York develops and sells Enhanced CBP data.

Enhanced County Business Patterns is probably the most readily accessible source of state and substate data on manufacturing employment for a team that wants annual data at the four-digit level and can accept some degree of uncertainty regarding the accuracy of a specific number. For those who are not comfortable with uncertainty, the state's own ES202 file is an option discussed further below.

On a more positive note, Census does not suppress CBP data showing distribution of industry establishments by employment size. I am aware of no other published data that show, for counties and states, the number and size of plants within each four-digit SIC industry. The state reports issued in the *Census of Manufactures* "Geographic Area Series" do provide unsuppressed establishment size distributions, but only at the two-digit SIC level.

Concentration Ratios in Manufacturing

Concentration Ratios, available for each census year and based on primary data from the *Census of Manufactures*, displays national data on the number of companies and establishments and the percentages of employment, shipments, and value added controlled by the industry's largest firms: the biggest four, the biggest eight, the biggest fifty, etc. These data add much useful information about national industry structure to those in the *Productivity Database* and County Business Patterns.

Financial Report for Manufacturing Mining and Trade Corporation File

This publication presents up-to-date aggregate financial data on the domestic operations of U.S. corporations. Census derives these data, which follow generally accepted accounting

procedures, from a quarterly survey of U.S. corporations filing tax returns. In manufacturing, the reports present income, retained earnings, balance sheets, and various financial and operating ratios for all corporations with assets over \$250,000. Census further classifies these corporations by two-digit industry code and asset size.

The data are for the United States as a whole, and therefore can only provide a broad overview of an industry's financial standing. In the absence of state-level data, they can provide at least a starting point for assessing a state industry's current financial situation.

A major limitation of the data is that Census assigns respondent corporations to an SIC industry according to the activity that earns the firm its biggest share of gross sales receipts. If the corporation is large and operates in several distinct lines of business, assigning the corporation to one two-digit industry can bias industry statistics. This is because the industry's apparent financial condition will reflect performance not only within the industry itself, but also in generically different activities. The two-digit level of detail also raises the same problems of SIC aggregation discussed in the main text. This situation aggravates the assignment problem by including within each industry potentially unrelated or distantly related activities.

Foreign Trade Data

The Census Bureau compiles data on imports and exports using a classification system named the Harmonized Tariff Schedule of the United States (HTSUSA). The HTSUSA is the U.S. version of the international Harmonized System, which most countries have long used, but which the United States only adopted in 1989. Comparisons of current with historical import data must recognize this change, because previous definitions of some product categories are not entirely consistent with those under HTSUSA.

Census Publication FT925 (*Exports, General Imports, and Imports for Consumption, SITC-Rev. 3 Commodity by Country*) provides import and export data by country of origin/destination according to Standard International Trade Classification (SITC) codes, a classification system used worldwide, which aggregates detailed product data into categories similar to SIC codes. At their most detailed level, these codes group products into some 3,000 categories. Many SITC categories differ, however, from the SIC. For more direct comparisons with other SIC-based census manufacturing data, Census also aggregates HTSUSA import data into 450 four-digit SIC-based codes, and export data into 430 SIC-based codes. These data are available on microfiche (Census product IM175 for imports and EM575 for exports).

The International Trade Administration (ITA) of the U.S. Department of Commerce also uses Census trade data to estimate imports and exports of manufactured goods by two-, three- and four-digit SIC code. They are available back through 1972. ITA develops these data in support of Commerce's *Industrial Outlook*, and makes them available on diskette. These diskettes also contain other industry data published in *Industrial Outlook*, including industry shipments, employment, wages, capital expenditures, productivity, and industry structure (including four- and eight-firm concentration ratios).

At the state level, Census obtains data on state manufactured exports from two sources. The first is the *Shipper's Export Declaration*, which Census uses to collect basic export data and which asks, among other things, where the good was produced. The second is *Census of Manufactures and Annual Survey* data, which asks each manufacturing plant surveyed the amount of product exported, and the employment associated with producing the exported product. Census publishes these data in its *Exports from Manufacturing Establishments*.

Census releases Schedule B-based data shortly after the month to which they apply. In sharp contrast, Census publishes the *Census/Annual Survey*-based data with a two- to three-year lag. The latest year of data currently available is 1989; 1990 and 1991 data will not be available until early 1994.

Both data sets have major limitations. Census notes that *Shipper's Declaration* data "denote the state (as reported by the exporter or agent on the Shipper's Export Declaration) from which the merchandise actually starts its journey to the port of export." This may not be, necessarily, the state where "the merchandise is grown, produced, or manufactured nor necessarily the actual location of the exporter, in the case of consolidated shipments." In other words, an unknown degree of discrepancy exists between where an exported good is actually produced, and where the person filling out the form says it started moving to the port of export. For example, a factory in Georgia might produce and ship a product to a wholesaler in North Carolina, which then finds an export market for it. The wholesaler may consequently report North Carolina as the state of export, rather than Georgia.

Census/Annual Survey-based data suffer a converse problem. Here, a plant may not know for certain if a good it produces ends up being exported, or, in multiplant firms, whether and to whom corporate headquarters ultimately exports the good.

As a consequence of these and other problems, the two sets of data show significant (and probably inevitable) differences in state export totals. One major discrepancy, according to

Census personnel, is that coastal port states (e.g., California, Louisiana) have much higher export totals using *Shipper's Declaration* data than they do using the *Census/Annual Survey* data. This suggests that latter more closely reflect actual export production sites, although no conclusive evidence to that effect exists. For some teams, this potential advantage may be offset by the much less timely nature of the data, particularly if the team is interested in trends over time rather than absolute levels.

Despite these limitations, to my knowledge, these are the only federal data that can give study teams some feel for the importance of exports to a given state industry. Alternatively, individual states may have developed their own export databases, and we would encourage a team to check whether or not its state has done so.

The Census' Center for Economic Studies also has an ongoing project examining "the relationship between exporting and state industrial growth, the factors influencing the flows of exports from U.S. regions to specific foreign destinations, the nature of differences in industrial export performance among U.S. state and regions, and structural factors involved in the export decisions of firms." Rodney Erickson and David Hayward of Penn State University are conducting this research.

Industry Research and Development

The National Science foundation (NSF), based in Washington, D.C., publishes an annual *Research and Development in Industry*. The Census Bureau compiles these data from its annual *Survey of Industrial Research and Development*, which NSF has funded since 1957. The survey frame includes all foreign and domestic companies that perform R&D in the United States. The published tables include data on private and federally funded research expenditures in the United States by industry and size of company, and on R&D performed abroad by U.S. domestic companies and their foreign subsidiaries. They also contain data on the number of R&D scientists and engineers by industry.

These are the only industry-level data on R&D systematically collected for manufacturing by Census. Unfortunately, they are only at the national, two-digit level. The latest year of published data is 1989, although NSF should soon release 1990 data. Census is now collecting primary data for 1992 and will provide these directly to NSF.

Characteristics of Business Owners (CBO) Survey Database

This database contains survey data on the demographic characteristics of small business owners and the characteristics of their businesses, and includes separate data on minority and

women owners and businesses. The CES research program on entrepreneurship is using these data to examine how the characteristics of business owners and their firms interact to influence performance and survival. Census staff is currently linking this database to the LRD.

Manufacturer's Shipments to the Federal Government

This Census product presents selected statistics on the number of employees engaged in work related to federal government procurement of manufactured products; the value of, and value added, associated with such shipments; and the portion of these shipments produced by prime contractors. The report draws on survey data collected as part of the *Census of Manufactures* and are the only ones available on manufacturing shipments to the federal government. The report displays separate data for the U.S. Departments of Defense and Energy and the National Aeronautics and Space Administration (NASA). A grand total is shown for all other agencies.

The data are limited in that they are nationwide only. Census personnel believe sample size is too small to permit even a special tabulation of statistically reliable state-level detail. Also, the latest survey (1992) covers only about 80 (of 450) four-digit industries; moreover, all of these four-digit sectors fall within nine two-digit manufacturing industries (chemicals, petroleum products, rubber products, primary metals, fabricated metal products, industrial machinery and equipment, electronic and electrical equipment, and transportation equipment and instruments). Census selected these industries because industry firms did business "extensively" with the federal government, but this criterion may screen out industries of interest to a team.

Finally, Department of Defense procurement dominates the data, accounting for about 90 percent of reported shipments. Much more nondefense procurement thus occurs, which the survey is simply not comprehensive enough to track.

Manufacturing Technology Database

This survey seeks to determine the usage level of seventeen advanced manufacturing technologies by firms in SIC groups 34 through 38 (fabricated metal products, industrial machinery and equipment, electronic and other electrical equipment, transportation equipment and instruments, and related products). Among the seventeen technologies are computer-aided design; engineering and manufacturing; flexible manufacturing cells and systems; computer numerically controlled machine tools (CNC); lasers; robotics; automatic inspection, storage, and retrieval; and computer linkages to customers and suppliers.

The data show adoption rates for each technology, the share of firms that plan to adopt it within five years, and reasons for not using it (i.e., not applicable, not cost effective, other). The document also contains selected information on levels of technology use by various establishment characteristics (industry, size, plant age, product produced, product price).

The latest published data are for 1988; however, Census hopes to release data for 1992 in the first part of 1994. These data offer a point of reference in identifying technologies of particular importance to competitive performance, their diffusion rates, and some of the factors affecting these rates. The results may also provide a benchmark against which a state can gauge the performance of its own firms.

These data are national-level only. A state will still need other state-level data to determine how its own firms compare to the nation as a whole. Also, the Census data do not extend below the two-digit level and cover only the sectors enumerated. These features obviously limit the utility of the data for study teams that require finer levels of industry detail, or whose industry the survey does not examine.

Type of Organization

The *Census of Manufactures'* special subject report, *Type of Organization*, presents summary statistics on each of two categories of manufacturing firms: firms with more than one manufacturing plant (multi-establishment); and single establishment or "independent" firms. These statistics include the number of companies and establishments in each category, employment, shipments, value added, production workers, material costs, and new capital expenditures. The report presents national totals for each category, as well as totals by two- and four-digit SIC industry.

The data supplement those published in *Concentration Ratios* by providing an additional measure of how important larger, multiplant firms are relative to smaller, single-plant businesses. They are, however, national-level only. Further, they do not distinguish among very large firms with many branch plants and firms that, despite ownership of more than one plant, are still relatively small (with less than 500 employees).

Unpublished Plant and Equipment Expenditures Data

The Census Bureau's *Plant and Equipment Expenditure Survey* collects quarterly and annual statistics on actual and planned new plant and equipment expenditures by private, nonfarm businesses in two-digit SIC groups 10 through 80. The Bureau of Economic Analysis conducted this survey prior to 1988, when Census assumed responsibility. The data, though unpublished,

are available on diskette or computer printout. They are in current dollars, so they cannot be directly compared with the real investment estimates of the *Productivity Database* without adjusting for price changes in plant and equipment purchased.

The data have several limitations for a state team studying a specific manufacturing industry. As with the *Quarterly Financial* survey, the data are company-, as opposed to establishment-based, and thus assigning diversified companies to a given SIC industry may substantially bias the data for that industry. Second, as with most other Census surveys, the data are national-level only. Third, the level of industry detail for the manufacturing sector is at roughly the two-digit SIC level, which may not be sufficiently disaggregated. The survey results are, however, the only up-to-date investment data collected by the federal government, as *Census of Manufactures* and *Annual Survey* data are only available with long delays.

THE U.S. DEPARTMENT OF LABOR

The U.S. Department of Labor (DOL) is another important federal source of manufacturing data. Within DOL, several programs provide potentially useful information.

The Bureau of Labor Statistics (BLS) Productivity Data

Prominent among these data are indexes of productivity growth for selected industries that BLS economists develop and publish in *Productivity Measures for Selected Industries and Government Services*. These are probably the most widely cited data on labor productivity growth. In the same publication, BLS also publishes indexes of multifactor productivity growth for selected industries, including motor vehicles, steel, footwear, and tires. Multifactor productivity growth is a broader productivity measure that simultaneously accounts for changes in the amount of labor, capital, and material inputs to the production process. Many economists consider it a better measure of technical progress than the less complex labor productivity index. Substantial differences can exist for a given year or period between the BLS real productivity growth rates (both labor and multifactor) and those of the *Productivity Database* discussed earlier. There has been no systematic effort to reconcile these differences.

Foreign Labor Statistics

BLS is one of the few public agencies that systematically develops comparative data on U.S. and foreign economic performance. Of particular interest to a study team are data on relative foreign and U.S. labor compensation and labor productivity growth rates. These data are available for manufacturing as a whole as well as for broad industry groups within the manufacturing sector.

In looking at relative labor costs, care must be taken to distinguish between hourly compensation at prevailing exchange rates and Purchasing Power Parity (PPP) exchange rates. From the firm's point of view, relative labor cost at prevailing exchange rates is the relevant measure of how its current labor costs compare with those of a foreign competitor. These relative rates can fluctuate widely over even short periods of time in response to exchange rate movements.

PPP exchange rates, on the other hand, compare the relative buying power of a given income. Thus, while U.S. wages may appear much higher or lower than another country's when measured at current exchange rates, this does not mean that U.S. worker real income is similarly higher or lower after adjusting for price differences across countries for food, housing, clothing, and other goods and services. These relationships are more stable than those found using current exchange rates. Unfortunately, the data do not permit comparison of absolute labor productivity levels across countries because available data do not permit calculation of industry-specific PPP rates. As a result, the BLS data show only productivity growth rates.

BLS Employment Projections

BLS regularly develops what are probably the most widely cited long-term (five- to fifteen-year) projections of industry and occupational employment. These kinds of projections are obviously relevant to a study team trying to understand where an industry might be headed, both in size and types of skills required.

BLS conducts an elaborate estimation process to arrive at its final industry and occupational estimates. The process includes independently projecting changes in: 1) size and composition of the labor force; 2) overall performance of the U.S. economy; 3) the composition of final demand by sector and product; 4) interindustry relationships (i.e., how much a given sector buys from and sells to every other); and 5) an industry's occupational requirements. BLS incorporates a tremendous amount of information on demographic and technological trends into this process.

A great advantage of the BLS data is its very detailed level of information, which embraces 250 occupational categories and a similar number of individual industries. Despite their sophistication, they are, nonetheless, only projections whose validity depends heavily on the validity of the underlying assumptions. Part of the task of a study team is to decide whether the underlying assumptions are reasonable, and if so, whether they apply with equal force to state industry trends. BLS facilitates this comparison by trying to make its major assumptions very explicit when presenting its findings.

BLS Reports on Technological Change

BLS conducts a continuing though modest effort to study the implications of important technological innovations within selected industries. BLS researchers review available literature and data, conduct interviews with managers and workers at plants "having recently made a major change in their equipment, products, or methods of production," and seek the opinions of other experts in the field. The resulting reports ". . . describe recent technological developments, indicating insofar as practicable some economic advantages of various types of new equipment, processes or products, their importance in terms of the employee hours engaged in the operations affected, estimated extent of use currently and in 5 to 10 years, and some factors affecting adoption such as the volume of investment and expenditures for [R&D]."

These reports are one of the few sources of federal government information on technological trends within specific industries. Unfortunately, over the last 10 years, BLS has published reports on only about thirty industries and since 1986 has studied no manufacturing industries. Most of the studies before this date were on manufacturing, however, and may provide useful background on technologies currently being widely diffused within the industry of interest.

Current Population Survey

BLS also maintains the *Current Population Survey* (CPS), a source of official government statistics on employment and unemployment. The Census Bureau gathers the primary CPS data for BLS in interviews with a national sample of about 57,000 households. BLS then analyzes the data and publishes both monthly information on employment status and annual data on a broad range of other personal characteristics. CPS data include detailed information on the industry and occupation in which the interviewee is employed. Other data elements include hourly earnings, other sources of income, education, and recent labor market experience. BLS uses these sample data to make national- and regional-level estimates for each variable. Collectively, CPS data can delineate a rich, up-to-date portrait of labor force characteristics.

Unfortunately, CPS state-level sample sizes for all but the largest dozen or so states are insufficient to generate reliable state-level estimates for any one year. Pooling three or more years' data may yield a useable state profile. For example, a team might analyze three years of pooled data to get a snapshot of state work force characteristics. To analyze work force trends, it might then compare the results with those obtained from pooling a previous three-year period.

Displaced Worker Survey

Every two years beginning in 1984, the *Current Population Survey* has asked adult interviewees if they have lost a job in the previous five years as a result of plant closings, employers

going out of business, layoffs from which the interviewees were not recalled, or similar reasons. Workers replying "yes" then answer questions about their former jobs, their labor market experiences following job loss, and if reemployed, about their current jobs. These *Displaced Worker Survey* (DWS) data are the only ones that systematically track the recent post-displacement experience of a large, nationally representative sample of dislocated workers.

Because of sample size limitations, analysts consider the sample results at even the two-digit SIC level substantially less reliable than those for broader economic aggregates, such as "all manufacturing." If either industry adjustment or training interest the team, however, the DWS may provide the only readily available information on the level of displacement in a given industry, and the post-displacement experience of affected workers. The U.S. Department of Labor has published analyses of these industry-specific data.

Job Training Partnership Act Title II-A Training Data

The U.S. Department of Labor maintains a database of state-provided data on training activities under the Job Training Partnership Act (JTPA) Title II-A program for the economically disadvantaged. Each state collects its own data from its Service Delivery Areas (SDAs), local, typically multi-county, administrative unit of the JTPA system. These data describe the characteristics of individuals entering the program, the cost and length of the average training period, and some measure of post-training experience, such as whether or not the trainee obtained a job, and if so, how much the trainee earned. For a study team interested in training programs as a component of its analysis, these data can provide an indication of performance and outcomes.

The federal government does not compile state-level data for other federally funded programs, such as the JTPA Title III program for dislocated workers or the Trade Adjustment Assistance program; however, these data should be available from program officers in-state. Data for the state's own (nonfederally funded) training program(s), such as customized job training, should be similarly available.

OTHER FEDERAL AND STATE DATA SOURCES

ES202 State-level Data

Federal law requires each state to maintain an ES202 unemployment compensation (UC) database. Individual employers submit to the state a UI Contribution and Multiple Worksite Report, which contains information on the firm's employment, payroll, location, and four-digit SIC code. Each state, after editing, coding, and summarizing the raw data, submits them to BLS. BLS, in turn, further edits the data, and publishes, in *Employment and Wages*, state and national

employment totals and average wage levels by broad industry division, major industry group, and detailed four-digit industry.

A team may use its own state's data to study such disparate industry characteristics as wage levels, the location of firms in particular industries, differences in size and growth rates among firms, and the relative importance of firm births, deaths, expansions, and contractions in explaining industry employment trends. Such data may become particularly useful if the targeting of specific types of firms becomes relevant to program formulation (e.g., new firms with high rates of growth). It can also use the BLS published data to compare in-state trends with those in other states.

More generally, the ES202 files are the only source of annual state- and county-level employment and earnings data other than *County Business Patterns*. They have the distinct advantage of not suffering the suppression and estimation problems inherent in the CBP and Enhanced CBP files. Each state also has ES202 data compiled in accessible form, because it must report them regularly to the Bureau of Labor Statistics, the U.S. Department of Labor.

As with all databases, however, the ES202 file has its problems.¹ A team may be unable to access data because of confidentiality. This is not universally—or even commonly—true, and we are aware of several states that have used these data for analysis. Second, the data have technical limitations for which the team may need to adjust. For example, some companies report aggregated data for all their plants in one form, which makes it impossible to determine how their employment is distributed across counties. Resolving these limitations can cost a great deal of money (several hundred thousand dollars). The quality of the primary data also will vary from state to state; the poorer the original quality, the greater the cost of adjustment.

In some states, other analysts, for their own research, may already have adjusted the data and put them into an accessible and more useable format; or a team may not be too concerned about technical problems if it wants a general overview of industry evolution. The less demanding the analysis, the lower the cost of using the data. On the other hand, if a state plans on doing a number of industry studies, an investment in cleaning up the data for those industries

¹For a detailed discussion of data uses and limitations see White, Sammis B. et al., "ES202: The Data Base for Local Employment Analysis," *Economic Development Quarterly*, Vol. 4, No. 3, August 1990, pp. 240-253.

may prove worthwhile. In any event, a useable ES202 file can provide insights into state industry structure and trends that may be superior to those from any other resource.

Securities and Exchange Commission (SEC) Annual Company Reports

The Securities and Exchange Commission (SEC) maintains legally required annual reports (10Ks) from firms whose securities trade publicly. Besides basic financial information, these reports often discuss recent company activities and industry trends. They are a good first step in learning about publicly traded firms within an industry. Information from SEC filings is now available on-line or in optical disk format. As with Census Bureau financial data, a limitation of SEC data is that companies are not required to break out financial information by specific types of products or lines of business. Consequently, separate data on the activities of a diversified firm may not be available. This disadvantage should not deter a team from reviewing the documents, since there is no way to know beforehand whether it is, in fact, a problem.

Census of Population

The Census Bureau conducts the *Census of Population* every ten years and is now releasing information from the 1990 census. Data include information on industry of employment, occupation, labor force status, income level, gender, and race. Two kinds of data are generally available, both in electronic format. The first represent county-level aggregations of individual data elements (total number of precision production workers in the county, or total number of blacks), and selected cross-tabulations (number of black precision production workers). These data, however, often suffer the same confidentiality problems as other Census databases, particularly in cross-tabulations of one demographic characteristic with another (e.g., number of precision production workers by race).

In the 1990 data, however, Census is for the first time employing a statistical procedure it terms a "confidentiality edit," which allows a value to be published for each such cell while still protecting confidentiality. According to Census personnel, the published value, while not the exact value, will still provide analytically useful information.

A complement to the county-level data is the Public Use Microdata Sample (PUMS), a sample of records from all households living within a multicounty area. Data analyses not permitted by county-level data, such as cross-tabulations, can be performed for multicounty units by using the PUMS samples.

The PUMS data sets avoid the confidentiality problem because the PUMS sample size is no more than 5 percent of area population, and the total area population from which Census

draws the sample must be at least 100,000 people. While the PUMS data cannot help a team interested in county-level analysis, it does allow much greater freedom in drawing meaningful inferences about a given substate area.

Internal Revenue Service (IRS) Tax Return Statistics

The Internal Revenue Service publishes annually the *Corporation Source Book*, which presents detailed income statement, balance sheet, and tax and investment credit items by major and minor industries and size of total assets. The report underlies the less detailed IRS Publication 16, *Statistics of Income--Corporation Income Tax Returns*. The most recent published *Source Book* contains 1990 data, with the next edition (for 1991) scheduled for publication by end of 1993. The latest *Statistics of Income* contains 1989 data.

The IRS uses a slightly modified 1974 Enterprise Standard Industrial Classification system, which is similar in concept to the SIC codes but is used to classify companies instead of establishments. This system, at its most detailed level, contains 72 codes for manufacturing, which places the level of industry detail somewhere between the SIC two- and three-digit level. IRS assigns a firm to a particular industry if that industry accounted for the "largest percentage of total receipts." Data from diversified firms can therefore bias the data for a specific industry. The importance of this problem will obviously vary according to the percentage of industry market share controlled by a diversified firm or firms.

As with many other federal government data sources, the data are national-level only. IRS personnel indicated that both technical and confidentiality constraints preclude issuing reliable state-level information.

Federal Trade Commission (FTC)

The FTC has two bureaus, the Bureau of Economics and the Bureau of Competition, which may be useful to a team study. The Bureau of Economics employs economists who specialize in various industries and inform FTC regulatory rule making and litigation. Part of this support can include special reports on specific industries.

The Bureau of Competition has primary responsibility for litigation and participates jointly in rule-making procedures with the Bureau of Economics. Documents related to litigation may or may not become publicly available depending on the nature and outcome of litigation. Assorted documents related to rule making will often be available to the public once the Commission begins the public process of proposing and issuing final rules.

In general, probably the best way to approach the FTC is to contact the Bureau of Economics and ask for some one who will know if the FTC has staff with relevant expertise or has published documents in recent years related to the industry of interest.

SELECTED PRIVATE SOURCES

Many specialized private data sources exist, and a team should definitely turn to these if publicly available data leave important gaps. Two private sources are worth mentioning, because industry studies routinely use them.

Dun and Bradstreet

Dun and Bradstreet sells data from its file of establishments with credit ratings. Of particular note, the file indicates whether the establishment is the only one owned by the firm, is the headquarters of a multi-establishment firm, or is a branch plant of a multi-establishment firm. In cases where one company is a subsidiary of another, the file also identifies the parent corporation. Dun and Bradstreet can classify establishments on as detailed a level as the eight-digit SIC code. Data include, for each establishment, sales volume and employment, and for most records, the names of key decision makers (e.g., the chief executive officer). Data also provide birth and death rates of establishments within a given industry. Birth rates are one important indicator of local industry strength, and the Dun and Bradstreet data are one of the few sources that provide geographically comprehensive information on birth rates in manufacturing industries.

Company Documents

Besides SEC 10-K submissions, a variety of other documents may provide data on individual firms. These include (non-10k) annual reports the company may have issued, product literature, company histories, proxy statements, prospectuses, press releases, and even promotional materials to help recruit workers or clients.

Other private sources will be available, often for a price, to supplement or fill holes in the data a team is able to obtain. Various industry researchers, private sector organizations such as trade associations and unions, financial analysts and/or industry firms will be able to identify what private sources exist to meet the needs of study teams.