Exports, Competitiveness, and Synergy In Appalachian Industry Clusters

A Report to the Appalachian Regional Commission

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Submitted by

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Executive Summary

This report analyzes seven industry sectors pre-selected by the Appalachian Regional Commission on the basis of their importance to the region's economy and export potential. The seven clusters are: miscellaneous plastics parts (SIC 308)*, electronic components (SIC 3670); household furniture (SIC 2510); knitting mills (SIC 2250); medical devices (SIC 3840); industrial machinery (SICs 3540, 3550, 3560, and 3590); and environmental technologies (see appendix for sector classifications). The targets of this analysis are small and mid-sized manufacturing enterprises (SMEs), which have been found to be slow to modernize and hesitant to export. These SMEs cluster, dominate many rural economies, and, with the downsizing of so many large corporations, comprise a potential source of growth.

Three basic assumptions about business practice underlie our study.

1. Businesses tend to cluster (i.e., certain types of businesses are more likely to be found in some areas than others), and this ought to affect policy.
2. Companies clustered in a region are interdependent (i.e., formally and informally rely on each other for information, specialized services, parts, supplies, workers, technologies, and sales)
3. Companies that learn about and use the most advanced and appropriate technologies, invest in the skills of their work force, and either possess or can access specialized expert advice and assistance are more competitive than those that do not.

What is a Cluster?

One definition of a business cluster, as defined by a group of experts assembled under a project supported by the Appalachian Regional Commission, is "a geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialogue, that share specialized infrastructure, labor markets and services, and that are faced with common opportunities and threats" (See Figure 1) More specifically, successful (synergy producing) clusters are characterized by:

- a critical mass of similar, or related, economic enterprises;
- specialized services and infrastructure;
- accessible and rapid exchange of information and knowledge;
- a workforce skilled in and well-informed about the industry;
- competition to keep firms on their toes and spur innovation;
- high rates of new businesses formation to imitate and innovate, fill needs, or diversify; and
- social infrastructure with sufficient trust to enable firms to cooperate and learn from each other.

* SIC refers to the Standard Industrial Classification system (SIC) used to classify each industry in the United States economy. This report uses the system detailed in 1987 Standard Industrial Classification Manual by the Executive Office of the President, Office of Management and Budget, National Technical Information Service, Springfield, VA.

Industry clusters were first noted in Western Europe—particularly in northern Italy where the production of such things as chairs, ski boots, ceramic tiles, and packaging equipment is highly concentrated in distinctive regions. In the U.S., carpet manufacturers near Dalton, Georgia, electronics and computer companies in the Silicon Valley, metalworking firms along the Connecticut River valley, and optics and imaging companies around Rochester, New York are examples of recognized industry clusters. Some of the regions selected in this study are similarly well-known and often cited as clusters: hosiery firms n North Carolina's Catawba Valley (see Figure 1) and furniture companies in Northeastern Mississippi. But even where clusters are less obvious and in less concentrated, businesses tend to locate near compatible and similar businesses—their suppliers, customers, partners, and even competitors—to take advantage of specialized services, information, and resources; economies of scale; and strength of numbers.

Research Questions

Our assumptions stimulated a series of research questions about the exporting and export capabilities, competitiveness issues and the intensity and impacts of interdependencies and connections of SMEs. Do small and mid-sized companies—where they are most concentrated in areas of the ARC—interact and take advantage of their complementary strengths and potential economies of scale? Do they in fact think and act for their collective advantage as a cluster and do they produce synergy?

To learn more about the ways in which companies function as a system, the research team defined specific geographic areas where firms were found to be most highly concentrated. These were Greenville-Spartanburg, South Carolina (industrial machinery); Pittsburgh, Pennsylvania (medical devices); Binghamton, New York (electronic components); Erie, Pennsylvania (plastic parts); Chattanooga-Oak Ridge, Tennessee (environmental technologies); Tupelo, Mississippi (household furniture); and Hickory, North Carolina (knitting mills). Many of these "cluster hubs" can trace their beginnings to either (1) a technological innovation or (2) a branch plant location, followed by (3) entrepreneurial energy of employees who see opportunities for new or competing market niches and start their own companies. Researchers interviewed ten exporters, ten non-exporters, and six support services to learn about sources of information and assistance SMEs used, perceptions of competitive advantages, obstacles to exporting, geographic advantages, forms and levels of interaction, and export performance.

The research team also analyzed national and regional (ARC states) export data and trends for recent years. Most of the region's states export at a rate below the national average, and most are experiencing growth in exporting—especially of manufactured products—at a rate above the national average. Thus, most ARC states are making progress toward the region's goal of bringing its export performance up to the national average. Southern ARC states posted the fastest rates of growth in the value of manufactured exports.

Findings

The interview surveys and analyses led to the following findings.

- Exports are considered important to firms' future business performance. Even though many exporters only export a small fraction of their total output, more than half rated foreign markets as "very important" to their business and another 20 percent rated it as "important."
- Exporters relied slightly more on private sector for trade leads than on the public sector. Export consultants and agents were the most frequent source of general leads, but customers themselves were the most frequent source of specific leads, especially for environmental technology companies.
- Among ten potential barriers presented to companies and services, all classes of respondents ranked "lack of information" very high. Exporters ranked "getting paid" as their largest obstacle, while support services ranked it last and non-exporters, well below average. Trade barriers was ranked third among exporters but last among non-exporters, and eighth among support services. Foreign regulations, not explicitly included on the survey instrument, nevertheless was also mentioned frequently by firms.
- The criteria firms selected as their primary competitive advantages varied by cluster, but overall quality ranked highest among both exporters and non-exporters. "Quality" ranked particularly high in the knitwear and plastics clusters, while "reputation" and "customer service" were ranked highest among industrial machinery exporters and non-exporters, both of whom work closely with users to customize products to their needs.
- Working capital was more problematic than investment capital for SMEs. Responses to access to investment capital were split, with a third rating it as a very large problem, a third as no problem, and a third in the middle. It was of most concern to the industrial machinery and electronics components clusters, where all but two firms rated investment capital needs high and two-thirds rated working capital needs high.
- Trust is assumed by many observers of industry relationships to be an important factor in the strength of a cluster. High levels of trust increase opportunities for firms to take advantage of their collective capabilities and knowledge. Firms' ratings of trust were dichotomous, with half rating trust "above average" and half "below average." Support services tended to rate it higher than average.
- Among location advantages of firms in clusters, proximity to suppliers and customers ranked first, industry specific skills of the work force ranked second, and good distribution channels ranked third. Support services placed distribution channels first, skilled work force second, and access to R&D and technical assistance, third (which SMEs ranked next to last).

Opportunities for Improving Export Performance and Competitive Advantages

- **Overcoming SMEs' difficulty in "getting paid"** Community banks are likely to know local industries best but have little expertise in exporting. A number of niche export finance intermediaries are emerging to target small and mid-sized exporters. Cluster would benefit from help in connecting the new-to-export companies with community banks that are familiar with and accessible to SMEs.
- **Reducing unit costs of international marketing and sales:** Expense was cited as a major barrier to entering export markets. A suggested action is to develop a cadre of skilled brokers and offer incentives for export cooperatives or networks.
- **Increasing participation in trade shows**: Overseas trade shows, though costly, are important sources of sales leads. A suggested action is to organize groups of small and mid-

sized companies to attend trade shows together, sharing costs of booths, or simply gathering information and making contacts that would be shared with others in cluster. Reverse trade missions could bring delegations from other countries to visit the cluster allowing it to become more familiar with its products and capabilities and develop personal relationships.

- **Emphasize design**: Although design ranked high among competitive factors, it is given little emphasis and short shrift by educational programs and services. Colleges ought to play a key role in integrating design into technical curricula and support services ought to include specialized design firms.
- **Improving education and information about export procedures and foreign market requirements**. These services exist in most states but are not easily accessed by rural or remote companies. One suggestion is assistance to SMEs in making greater use of telecommunications, both for education and information.
- **Identifying and targeting gaps in cluster**. View the cluster as a system and look for disruptions in or impediments to the flow of information and business transactions or between firms, weak elements such as lack of important suppliers or industry specific training. Then look for strategies that improve the entire systems.
- **Improving flow of expert information to SMEs**: One of the major weaknesses in most of the systems analyzed is use of public sector services. Responses from businesses suggest a dearth of specific, niche-market oriented information companies need to export—best obtained from experts in the industry. Regional brokers could help SMEs locate the information or, if unavailable, contract for and partially subsidize the studies, and put together companies with similar needs to share the information costs.
- **Merging export/marketing programs with technology diffusion/business assistance programs that target clusters**. SMEs have considerable trouble sorting out and evaluating the multitude of technical assistance programs at their disposal. A "one stop" agency—a long sought ideal of many public agencies—might be more effective if organized around industry rather than function. Community colleges may be well positioned to serve in this capacity and broker specialized services for a cluster.
- **Encouraging networking.** Although there is no long-standing and well-patterned "habits of cooperation" among firms in most regions, many see a potential for creating new mechanisms to allow firms to explore opportunities for joint export development. While many of these firms do compete with each other in regional markets to supply larger customers, a large number have differentiated themselves with their special capabilities over the past few years, thus increasing the likelihood of cooperating on mutually beneficial issues.

Highlights of Clusters

A. Environmental Technologies in Eastern Tennessee

- The environmental technologies (ET) cluster in East Tennessee is concentrated in Oak Ridge, where firms have located to be near Department of Energy (DOE) clean-up sites and the Oak Ridge National Laboratories, but with smaller concentrations in Knoxville and Chattanooga.

- The world market for environmental technologies is estimated to be $400 billion in 1994, and is projected to grow by some $100 billion by 2000. The U.S. accounts for about 40 percent of the total.
- The best market opportunities for remediation technologies in the next five years are Germany, Mexico, South Korea, and the most promising new markets over the next ten years are China, India, and Brazil. Exporting firms surveyed, mentioned mainly sales in Russia, Central Europe, and Southeast Asia.
- Export sales provided about six percent of 1994 revenues for U.S. environmental technologies firms, with about five percent of ET industry revenues in ARC states. In both the U.S. and ARC states, exports contributed about one percent of total export revenues. The most active ET exporting countries, Germany and Japan, earned 30 and 24 percent, respectively, of revenues from exports.
- The Oak Ridge ET cluster has capacity to manage and remediate radioactive and mixed hazardous wastes and decontaminate and decommission nuclear facilities that is unmatched in the world. Chattanooga has unique expertise in electric vehicles.
- In Oak Ridge, a government-dominated market has shaped the development of a cluster where firms cooperate with each other and partner on most projects. Yet there are few local sources of business services and capital.
- Branch offices of larger ET firms have shown limited interest in exporting from East Tennessee sites. The relative isolation of the East Tennessee location is a disadvantage for exporting as is the high cost of marketing abroad. Smaller firms look to export sales to help mitigate cutbacks in DOE contract work. The cutting edge technology and highly skilled work force in East Tennessee are advantages for exporting.
- Industry associations lead efforts to increase non-local marketing, including reverse trade missions to reduce the cost of international marketing. But these efforts are new, and the associations have limited resources.

B. Plastics Parts in Northwestern Pennsylvania and Ohio

- The global market for U.S. plastic products has grown substantially in the past three years. Yet exported products remain a relatively small percentage of overall industry shipments because most plastics parts companies make sub-assembly parts and sell to large original equipment manufacturers. Most firms that do export tend to be large, international and vertically integrated companies but percentage of their products exported is quite low. Many other plastic parts are exported indirectly as a part of another product.
- The most promising market for U.S. plastics are Canada and Mexico due to the close proximity and interrelated markets of those two countries. The implementation of trade agreements will further increase shipments to these markets. The U.S. enjoys a trade surplus of approximately $1.5 billion in plastic parts. Canada, Taiwan, China and Japan are the biggest exporters of plastics to the U.S.
- The plastics part cluster is centered in Erie, Pennsylvania and includes eight counties in Pennsylvania and four in Ohio. Overall, the ARC region is not as strong in plastic as the Northeast and the Midwest. In Erie, however, it has one of the nation's leading centers of plastics production. Erie is the birthplace of the plastics processing technique "injection molding" and most plastics parts firms specialize in this type of operation. This process is

primarily used to produce sub-assembly parts for large original equipment manufacturers (OEMs).

- The major impediment to exporting is both lack of unique, completed products and general lack of interest in foreign markets among company owners, especially those who operate SMEs. Most firms are able to stay competitive within a 300-mile radius and have little interest in expanding beyond that region.
- The area possesses several resources aimed specifically at helping plastics firms become more competitive, including a federally funded manufacturing extension center, but very few concentrate on export promotion.
- If this cluster of plastics firms continues to produce mainly sub-assemblies and parts, there may be little potential for exports. The best hope for those that do want to export is in NAFTA members Mexico and Canada. There also may be potential for some larger plastics firms to export, as large, multi-national corporations seek one global supplier for various products.
- The only way to increase the export potential of small and medium sized plastics firms may be to offer assistance in developing unique products that could be sold directly overseas and to encourage firms to tap directly into the Mexican and Canadian markets, where sub-assembly plastics parts might be needed.

C. Medical Equipment and Supplies in Southwestern Pennsylvania

- The U.S. medical equipment and supplies industry constitutes one of the United States' strongest exporting industries, with 23 percent of all products manufactured in the U.S. heading to foreign markets. The U.S. has 59 percent of the world market. Three reasons for this success are the U.S.' reputation for high quality, its cutting edge technologies and new discoveries, and its service.
- The most promising markets for U.S. medical products are Latin America, Japan, the rest of Asia, and the European Union. The U.S. possesses 21 percent of Japan's total market share, 62 percent of Canada's, 25 percent of France's and 20 percent of Brazil's.
- The ARC region is not particularly strong in medical devices. Most clusters within the industry are near large medical centers and research universities, which are not prevalent in the Appalachian region. Pittsburgh, with two strong research universities and large hospitals, had the highest concentrations. Medical devices firms also are found in the eight surrounding counties.
- Although this area has the strongest medical device firm presence in the ARC region, it is home to a below-average concentration of firms and employees compared to the U.S. Further, local companies make a wide range of products and have no special market niche. Thus, it does not meet criteria for a "cluster" based on either concentration or interdependencies. Because of the small size of the cluster, there are few services in the area that specifically cater to the unique needs of medical device firms.
- The few large companies in the area already export heavily, but because so many of the smaller firms provide local hospitals with fitting devices for specific patients, they are not good candidates for exporting.
- In general, most firms that want to export are already be doing so. Most of the steps that could be taken to increase the level of exporting among these firms would be regulatory

reforms by the U.S. Food and Drug Administration or by foreign nations. Firms cited stringent foreign requirements as a major impediment to increased exports.

- If Pittsburgh wants to build a true medical device cluster, it will have to successfully recruit a number of large firms to add to the few that already operate in the area might be an appropriate strategy and look for ways to develop a supplier base, a long-term strategy. Given that smaller companies often spin out from larger ones, the location of a few industry giants could also spawn new and vibrant SMEs.

D. Knitting Mills in North Carolina and Virginia

- The knitting mill cluster in North Carolina/southwest Virginia/northeast Tennessee produces hosiery, knit outerwear, knit underwear, and knit fabric. More than 130 companies employ almost 20,000 people in a 20-county area.
- Global markets are significant for niche knit products, including branded items, specific use products (such as athletic or medical goods), and products with a strong design component. "American Casual" style apparel and textiles are increasingly popular in Japanese and European (particularly the United Kingdom) markets.
- The U.S. faces stiff foreign competition from low-wage countries in high labor content knit products that must be cut and sewn, such as sweaters and shirts. The U.S. has a stronger competitive position for low labor content goods, such as hosiery and knit fabric. The quality of U.S. yarns and fibers used in high end products represent a competitive advantage. ARC knit producers are, on the whole, as competitive as the average U.S. firm. Within the textile and apparel industries, knit goods is one of the most competitive sectors in export markets. Firms are fairly technologically advanced.
- The cluster is comprised mostly of hosiery companies (55 percent of employment), followed by knit outerwear (26 percent), and knit underwear (9 percent). Since the South produces most of the nation's textiles and apparel, the cluster is located within an even larger concentration such firms.
- Most hosiery firms produce basic "commodity" goods that are not export appropriate. Strong foreign competition exists for "cut and sewn" knit products. As a result, most firms are small and have little marketing capabilities and are unaware of how to find and sustain exporting relationships. Companies must currently self-finance export activities.
- Export potential exists for some, but not the majority, of firms in the cluster. Realizing this potential will take more tailored and more easily accessible information about export markets and better economies of scale to pay for costs associated with exporting. Many firms are now receptive to the idea of entering export markets due to consolidation of U.S. retail markets and overcapacity within the sector.
- The cluster is a mature production system with strong support services, and cooperation among companies is fairly common. Good distribution and transportation infrastructure support exporting efforts.

E. Electronic Components in New York

- The ARC is relatively weak in terms of electronics, with export growth well below the national average. Among ARC states, New York has the highest level of employment in electronics components and a major cluster is in the Southern Tier of New York and the

cities of Binghamton, Johnson City, Endwell, Endicott, and Vestal. York's electronics cluster is fairly diverse with one of its unique features being linkages with ceramics firms in the western part of the region.

- The global market is highly competitive, price sensitive and mainly for commodities. Competition in the electronics industry is fierce, and to be successful a company must have superior technology and/or be highly price competitive.
- The greatest export potential for U.S. electronics components is in markets that are sophisticated and require high levels of technology, such as semi-conductors. The primary customers for electronic components are large, multinational firms that have facilities in countries with few regulations and relatively inexpensive labor costs. Primary markets for U.S. electronics include Canada, Mexico, Singapore, Japan, and Taiwan.
- The cluster has is a strong base of technological support for firms, including particularly strong programs of basic and applied research and development in electronics "packaging" (the physical environment in which chips are contained and operate). Firms view the region's labor force as a significant competitive advantage.
- Larger firms have a great deal of expertise in export sales. A few small electronics firms in the Southern Tier have become adept exporting, but most do not. Most supply components and sub-assemblies to larger firms who may export them as fully assembled products.
- A major barrier to exporting among non-exports is that they are assembly "job shops" or contract manufacturing facilities who view themselves as too small and locally linked to have export capability. Other firms, such as coils and transformers businesses, do not compete because of the enormous price competition from firms in low-wage rate areas.
- There appears to be significant opportunities to expand exports, especially from firms who had been content to service domestic and regional markets. Much of this potential comes from firms beginning to apply their specialized capability in electronics packaging.
- Rather than generic export assistance, it appears that the most rewarding export promotion strategy would be to develop a consortium of exporters and non-exporters who would seek to develop joint marketing and market servicing capabilities in target countries.

F. Household Furniture in Alabama and Mississippi

- This "cluster" is actually two distinct and independent clusters that grew out of the hard work of early entrepreneurs. Northwest Mississippi is home to 318 firms with almost 50,000 people and specializes in upholstered pieces. Northeast Alabama has 205 firms with 15,000 people specializing in solid wood pieces.
- Overseas markets are importing more American furniture, buying $1.3 billion in 1995. The ARC region has contributed a major share of the growth in U.S. furniture exports. Firms believe exporting is very important to the future of their industry. The best sales prospects are Canada and Mexico (NAFTA), Japan, the Middle East (Saudi Arabia), and emerging markets in Latin America
- The niche of both clusters are quality-oriented, promotional (low cost) furniture—solid wood in Alabama and upholstered furniture in Mississippi. The cluster's competitive strengths are in price, design, and access to quality raw materials and suppliers within the local area.
- Promotional furniture is being exported to targeted customer groups abroad, but firms pursue a "passive" approach of order taking from buyers at domestic trade shows. Companies with full-time export staff who travel abroad are most successful.

- Barriers to exporting cited by companies were lack of specific market and customer information. And, lack of skilled labor was cited by a large number of respondent companies as a major impediment to both domestic and export performance.
- The potential to produce and grow via exports is much greater than currently realized. Firms export, on average, less than three to five percent of total sales.
- To realize the clusters' full potential the region must increase worker skills to operate advanced machinery. Firms must commit resources to hire specific staff, seek out foreign markets and export.

G. Industrial Machinery in North and South Carolina

- The industrial machinery cluster is centered in the Greenville/Spartanburg area of South Carolina but extends into Western North Carolina. This highly differentiated cluster produces a wide range of machinery, with the greatest concentrations in automotive and textile machinery. It is composed predominantly of small and mid-size firms and is noteworthy for its high percentage of foreign-owned firms. The cluster is competitive, technologically advanced, and constitutes one of the leading machinery clusters in the U.S.
- Industrial machinery has high export potential, and the majority of final equipment makers are already exporting. However, a significant portion of industrial machinery firms are tool and die or other small job shop operations, performing custom work to order and with less possibility of exporting. Thus, there is more potential to raise exports by helping small and mid-size firms penetrate new markets and expand sales to existing markets than helping current non-exporters to export.
- The U.S. is highly competitive in industrial machinery and exports industrial machinery to all of the world's markets, with the majority going to Canada and Western Europe. But the best mix of prospects varies substantially depending on the specific type of machinery produced. Europe, Japan, and certain former Soviet states provide serious competition for specific kinds of machinery.
- Firms in the Greenville/Spartanburg area and service providers alike reported that exporting is an important and growing part of their strategy. The main barriers cited as impeding more aggressive expansion of exports were lack of market-specific information, lack of export finance and/or concerns regarding international payments, unfavorable policy conditions in target markets and/or subsidies by competing countries, and high costs of international marketing.
- Based on the export orientation of this cluster, its highly competitive position on world markets, and the barriers cited, it appears that this sector offers good potential for further export development. The best prospects for this cluster are: (1) programs to help firms gain better product-specific and country-specific marketing information at lower costs, such as cost-sharing of specialized consulting or trade show attendance by a group of firms and (2) measures to develop better export finance access for these firms, such as collaboration with local banks to improve their linkage to international financing sources.

Findings

This study focused on places in Appalachia where sectors are clustered. Does clustering matter and how does it affect businesses' ability to learn, modernize, and export? It is difficult to make meaningful generalizations that can be applied to other locations because each cluster selected and studied is unique and the way it functions is a product of the type of goods it produces, the customers it targets, and the level of interdependencies among its companies and services (See Table 1).

In fact, the clusters as defined by products and the places with the highest concentrations of companies making those products did not all turn out to be clusters as defined by interdependencies and system characteristics. The medical devices cluster, for example, comprised too few firms with too diverse products and customers and is imbedded in too large an industrial base to be considered a cluster in any sense of the word. Industrial machinery producers are more tightly linked to their customers' clusters than each other, although the smaller supplier firms may constitute a truer and more interconnected cluster. Too little information was gathered about the latter firms to judge their degree of interconnections. Plastic parts and electronics components are clusters of suppliers that achieve external economies as a result of their numbers and are dependent on their customers.

An analysis of two other clusters, household furniture and environmental technologies, revealed that they were each actually two distinct clusters. This illustrates the danger of using only low-level (two- or three-digit) SIC codes to define clusters. Household furniture producers operate as a strong cluster producing upholstered furniture in northeastern Mississippi and a slightly weaker cluster producing solid wood pieces in northern Alabama. In Tennessee, the cluster around Oak Ridge concentrates on nuclear energy and waste and the cluster around Chattanooga on conventional manufacturing environmental problems. Knitting mills as an entire sector is not a cluster but its largest component, hosiery, is a very complex cluster, again illustrating the problem in using three-digit or lower SIC codes. Hosiery firms are tightly linked to each other but not nearly as tightly to other types of knitting mills.

In only three of the clusters do concentrations and connections appear to improve firms' interest in and ability to export. Knitting mills (hosiery), furniture, and environmental technologies are favorably affected by collective marketing and/or better access to information. Electronic components has the potential to benefit from such activities but does not yet. Industrial machinery markets are too diverse and customer specific, and are dependent on customer relationships. The medical devices cluster around Pittsburgh, as defined by current members, is tied to local customers, and plastic parts has little potential because its capabilities are too ubiquitous and readily replicable locally.

Despite the individuality of the clusters, the accumulated knowledge does lead to some findings about export potential. Each cluster has some but not all of the strengths necessary for success in exporting, and therefore each has areas in which it can improve its performance—if it so chooses.

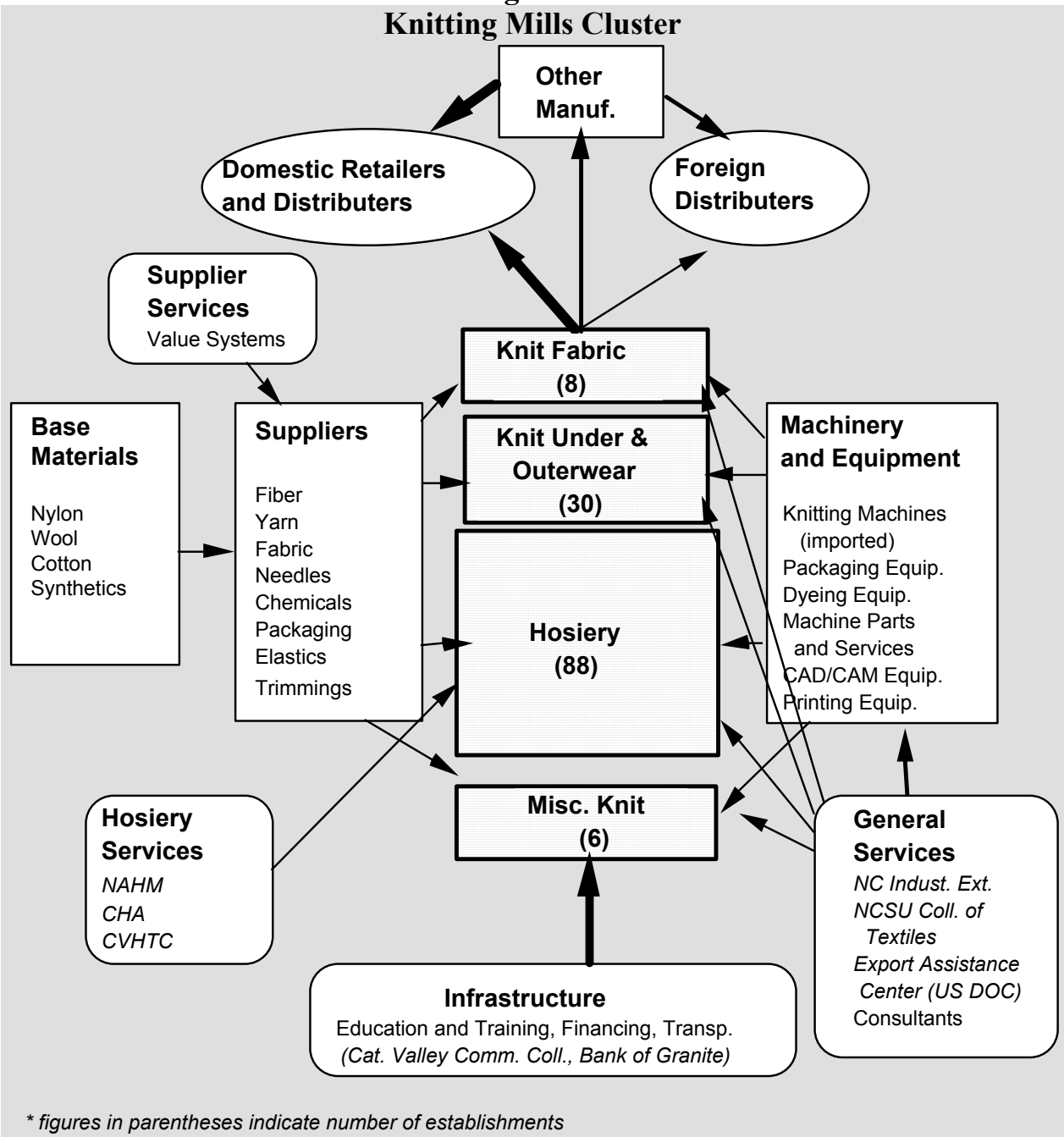
- Clusters that are mainly suppliers of larger firms (e.g., plastics parts and electrical components) are less likely to export than those that sell to final users (e.g., industrial machinery and household furniture).
- Clusters that compete on design or innovation (e.g., environmental technologies and industrial machinery) are more likely to have a future in exporting than those that compete on the basis of lowest price (e.g., plastics parts and knitwear).
- Clusters that are internally networked and can take advantage of external economies of scale (e.g., hosiery and environmental technologies) are more likely to be able to export and adopt new technologies than those that are not (e.g., medical devices).
- Clusters that are composed of larger companies (e.g., industrial machinery and are more likely to export than those comprised of small companies (e.g., knitting mills and .
- Clusters with strong and specialized support services—especially those with marketing expertise, (e.g., hosiery and plastics parts)—are more likely to export than those with fragmented or generic services (e.g., medical devices and industrial machinery).
- Clusters with pro-active companies that seek out markets (e.g., industrial machinery and environmental technologies) are more likely to export than those that are "order takers" (e.g., household furniture)
- Within clusters, firms that are more technologically advanced (often the larger SMEs) are more likely to be exporters than the less advanced firms.

Finally, for the benefit of future cluster analyses, it is important to note that three-digit SIC codes do not adequately classify clusters. Some are too broad (i.e., hosiery is a cluster but other knitting mills in SIC 225 are dissimilar and unconnected); some are too restrictive (i.e., they miss vertically integrated clusters where suppliers are part of cluster); and some are too new and undefined by product (i.e., environmental technologies).

Table 1
Summary of Cluster Characteristics

Cluster	Main Customer Base	Specialized Services & Infrastructure	Export Performance	Export Potential	Synergy	Competitive Advantage	Export Prospects
Electronic Components (NY, PA)	Large final producers	Strong technology services; private support services	Fairly high among high-End and specialized producers	Strong for specialized products	Significant but informal cooperation	Labor skills; "niche" capabilities	Strong base exists to support export expansion efforts
Environmental Technologies (TN)	Government	Two industry associations; federal labs; university expertise; training programs	Minimal but growing recognition of need to export due government cutbacks	Very strong particularly for nuclear cleanup as environmental concerns rise	Firms highly competitive but form partnerships for specific contracts	Highly skilled labor; Specialized facilities; Cutting edge products and services	Strong if firms Broaden horizons and build infrastructure to overcome locational disadvantages.
Household Furniture (AL, MS)	Retailers	Showrooms; technology centers	Minimal	Strong in newly developing economies	Informally networked to share resources, solve problems	Price; access to raw materials	Good if firms overcome passive marketing and network to share costs
Industrial Machinery (SC, NC)	Manufacturers	Technical colleges best source	High among mid-sized firms; low among small suppliers	High	More tightly linked to customers' clusters than each other	Technologically advanced; internationally competitive	Expansion possible with more support services in place
Knitting Mills (NC, VA)	Large retail chains	Technology center; active trade association	Small, individual efforts	Strong for high-end, branded goods with low labor content	Hosiery intensely networked; collective identity	Design, quality; strong suppliers	Good for firms with appropriate products (relatively few firms)
Medical Devices (PA)	Hospitals and physicians	None	Virtually none	Very high for sector overall, but low for firms in cluster	No interdependencies	Firms are too dissimilar to jointly characterize	Insufficient concentrations; Inappropriate products
Plastics (PA, OH)	Manufacturers	R&D at local university; dedicated extension services	Moderate among larger firms; minimal among small firms	Limited because most products are not export appropriate	Substantial linkages among firms; regional cluster identity	Skilled labor; sector expertise; price and quality	General lack of interest in exporting

Figure 1
Knitting Mills Cluster



** figures in parentheses indicate number of establishments*

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This project was a team effort, with the Alabama International Trade Center (AITC), the Kenan Institute for Private Enterprise (KIPE), and Creative Strategies, Inc. (CSI) playing key roles. Pat Dusenbury of CSI did the trend analysis for the ARC states and national overviews and analyzed environmental technologies; a team at KIPE led by Jennifer Bremer and including Barbara McMurray and Kathleen McDevitt contributed the cluster specific export analyses in the appendices to the individual case studies and analyzed industrial machinery; and Brian Davis at AITC helped identify exporters in all clusters and analyzed the household furniture clusters. RTS principal Brian Bosworth and RTS staff members Daniel Broun and Cynthia Liston carried out the other four cluster analyses. Each brought a different perspective to the project—particularly with respect to trade issues—that complemented RTS' experience in industrial competitiveness issues and programs. In addition, Pat Dusenbury and Cynthia Liston contributed to and edited the final report.

A number of others also contributed to the study. University of North Carolina graduate student Theodore Noell did most of the data analyses and mapping of employee and establishment concentrations. Richard Bell conducted the interviews for the plastics and medical devices clusters and Robin Alpaugh did the same for the electronic components cluster.

Within the clusters, Paul Fogleman, executive director of the Carolina Hosiery Association was extremely helpful, setting up interviews at his offices and providing a history of the hosiery industry. Tom Trevor of Chattanooga State Technical College assisted in arranging interviews with environmental technology firms in his area.

Finally, Carol Conway of the Southern Growth Policies Board provided us with a great deal of useful background reports and materials plus advice at various stages as the project progressed.

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