
EXECUTIVE SUMMARY

This study assesses the opportunities and challenges posed by trade liberalization to regional producers and exporters of goods and services within the Appalachian Region. Utilizing a number of manufacturing industry clusters for case study research, the study analyzes the export potential of regional manufacturing industries and evaluates the transportation infrastructure needs for expanded trade operations and shipments.

The six industry clusters were selected based on findings from prior Appalachian Regional Commission (ARC) studies, analysis of production and trade data, and discussions with representatives of the Export Trade Advisory Council (ETAC). These industry clusters include: auto parts, electronic components, wooden household furniture, upholstered household furniture, food processing machinery and packaging machinery. The study analyzed the overall competitiveness of these clusters based on an analysis of each sector's relative labor costs, labor productivity, capital investment trends, capacity utilization, industrial concentration, regional transactions, and environmental costs as they related to trends in foreign direct investment. In addition, the export potential of each sector was assessed based on regional analyses of world markets. A separate analysis was conducted of the export dynamics in the service sector by focusing on the educational services sector in Appalachia.

Competitiveness Analyses

The competitiveness analyses were conducted based largely on statewide data due to the lack of regionally specific data. As a result, readers should be cautious about the inferences they draw from these results. In terms of relative labor costs, Appalachian states were generally competitive across the six industry case studies, although in the case of the food processing industry, labor costs were higher in three of the Appalachian states. Labor productivity trends were particularly positive in food processing, packaging machinery, auto parts and, to a lesser extent, electronic components. By contrast, labor productivity was relatively weak in upholstered and wooden furniture production.

Capital investment trends were generally positive in the electronic components and auto parts sectors, although the lack of consistent data across all states limits the conclusions that can be drawn about the competitive position of these sectors. The upholstered and wooden household furniture industries in a number of Appalachian states had lower gross expenditures on capital investment than the national industry. An industry representative in Pennsylvania cited the increase in the number of domestic firms relocating to foreign countries with lower labor costs as the prime reason for the observed decline in the level of capital investment in the furniture industry within the area. Capacity utilization data is limited to industrial trends for the nation as a whole but the data do show that the two capital goods sectors (food processing and packaging machinery) were the most affected by the business cycle of 2000-2001. As for industrial concentration, the auto parts industry was the most concentrated as measured by the percentage share of shipments by the top four firms.

In terms of the percentage of industry inputs and outputs that are purchased and sold within Appalachia, the upholstered household and wood furniture industries are the most integrated industry clusters within the Appalachian region. Over 50 percent of their inputs are purchased from Appalachian establishments, while more than 80 percent of their outputs are sold within Appalachia. According to a furniture industry representative, this trend can be attributed to the industry's proximity to raw materials and the fact that many of the household furniture establishments in Appalachia are quite specialized and tend to serve specific niche markets within the region. The auto parts and electronic components sectors are the least integrated of the industry clusters, although the supplier links are still relatively strong with nearly 44 percent and 49 percent of intermediate goods purchased regionally. Analysis of the Appalachian states

environmental regulatory context presents a diverse mix, ranging from positive for larger industrial states, to negative for smaller, less wealthy states.

Services & Exports

The Appalachian region higher education network consists of over 250 universities, colleges, and community colleges. The net contribution by international students studying in the states comprising the Appalachian region amounted to \$3.6 billion in the 2001 to 2002 academic year all of which translated to a substantial gain by Appalachian higher education institutions and businesses. On average, an international student studying in Appalachia contributed \$20,500 to the region, mainly from funds generated in their country of origin. The study highlights best practices in recruiting foreign students by detailing the marketing efforts of eight different types of higher educational institutions within Appalachia to attract students from other countries. Overall, the case study finds significant potential in improving the recruitment of foreign students in the Appalachian Region, particularly by marketing the advantages of the community assets of the smaller towns and cities that host many of these colleges and universities. National policy issues, however, have affected the number of visas being issued nationally for incoming foreign students which has dampened the growth in foreign students enrolling in U.S. colleges and universities and these trends are affecting Appalachian institutions.

Manufacturing & Exports

For Appalachian exporters of automotive parts, NAFTA economies (Canada and Mexico) present the largest export market. Established Western European markets (Germany and Sweden), Asia/Pacific (Korea), and Latin American markets (Argentina) also offer good prospects for future growth.

For Appalachian wooden household and upholstered furniture manufacturers, NAFTA markets (Canada & Mexico), Germany, Korea, Saudi Arabia, and the United Arab Emirates represent leading export markets.

Canada, Mexico, China, Poland, Argentina, Brazil and Thailand are leading markets for Appalachian exports of food processing and packaging machinery.

China and Eastern European markets open many dynamic growth opportunities for exporting microelectronic components for Appalachian manufacturers. Asian economies such as Taiwan also offer opportunities for growth in future demand for U.S.-made microelectronics.

In the manufacturing industry sector, exports represent over \$5 billion annually to Appalachian manufacturers in auto parts, electronic components, food processing machinery, packaging machinery and wood furniture industries. The auto parts industry accounts for more than 65 percent of the value of total exports from Appalachia among the six target industries, followed by electronic components, which account for 30 percent.

NAFTA economies (Canada and Mexico) present the largest export market for Appalachian exporters of automotive parts. Established Western European markets (Germany and Sweden), Asia/Pacific (Korea), and the Latin America (Argentina) markets also offer good prospects for future growth. Europe, Canada, and Asia are leading destinations for U.S. exports of food processing machinery and packaging machinery. China and Eastern European markets open many dynamic growth opportunities for exporting microelectronic components for Appalachian manufacturers. Asian economies such as Taiwan also offer opportunities for growth in future demand for U.S.-made microelectronics.

Detroit MI, New York, NY (the port and JFK Airport) and Miami (the port and Miami International Airport) are the most import ports of export from Appalachia. For Detroit, this is expected in auto parts, but is also among the top four ports for electronic components, packaging machinery, upholstered furniture, and wood furniture. For food processing machinery, Detroit and New York City represent the top two ports and Miami is eighth. The port of Buffalo-Niagara Falls, NY, also is the point of export of significant value of goods in all six industries.

New York City and Buffalo-Niagara Falls are the most important ports in states that include Appalachian counties for exporting commodities in the six target industries originating in the Region. Other important ports in ARC states for these six commodities, though the ports are not located in the Appalachian Region, are Charleston SC (electronic components, food processing machinery, packaging machinery, wood furniture), Norfolk VA (auto parts, food processing machinery, wood furniture), Baltimore, MD (auto parts, food processing machinery), Atlanta GA (electronic components) and Champlain-Rousse Point, NY food processing machinery). In addition to the ARC states, exports from Appalachian counties are routed though Texas (Laredo and Dallas-Fort Worth) and Jacksonville, Florida, and to a lesser extent, California (discovered from interviews).

**Regional Trade Flow:
Export of Auto Parts Originating from Alabama (1998)**



For these six industries, transportation of goods from Appalachia to ports of landing is primarily by truck to seaports and airports for international export. Trucking volume in tonnage ranges from 86 percent of all volume in auto parts to 95 percent in wood and upholstered furniture. Rail transportation is relevant only in the auto parts industry and air transportation is significant when assessing the value of electronic components shipped.

Rail is important in the auto parts industry, accounting for 7 percent of tonnage shipped within the United States shipped from states with Appalachian counties (but just 2% of the value shipped from ARC states). If the Appalachian average of 2.4 percent based on value is applicable to products shipped for export as

well as general commodity flows, then rail is responsible for roughly \$87 million of the \$3.6 billion of auto parts exported by Appalachian companies.

Air transportation is important in the electronic components industry. Nationally over 19 percent of the value in this sector is shipped within the U.S by air. About 4 percent of shipments from ARC states are shipped by air, but more than 28 percent of the value of electronic components report using parcel delivery services (which includes truck and air). If the Appalachian average of 4.1 percent based on value is applicable to products shipped for export as well as general commodity flows, then air transportation accounts for roughly \$69 million of the \$1.76 billion of electronic components sent to ports by Appalachian companies. In addition, \$473 million corresponds to the 28.3 percent of the regional value of electronic components shipped by parcel services, and a portion of these millions is attributable to air cargo.

Relationships Between Firm Location and Export Patterns

Based on interviews with manufacturing, trucking, and logistics firms, we developed four working hypotheses regarding the relationship between access to transportation and patterns of exports within the ARC. These hypotheses reflect one of the key findings of the interviews conducted, namely, that firms are more likely to export to those markets more easily reached given the location of the firm. To the extent these hypotheses are true, firms are more likely to report that transportation infrastructure is adequate. Because they focus on foreign markets with easy access, they have little experience and hence we received few reports of difficulties in accessing ports for international sales.

Hypothesis 1: Because of the cost and time required to traverse the Appalachian Range, i.e., moving goods east to west in the Appalachian region, export patterns are shaped by whether states lie on the east or west side of the range. That is, we expect different trade patterns for states in the eastern and western portions of the ARC.

Hypothesis 2: States in the eastern portion of the ARC will export more to Europe because of easier access to east coast ports.

Hypothesis 3: States in the western portion of the ARC will export more within North America because of better direct access to key industrial areas in Canada and Mexico.

Hypothesis 4: There will be little difference in eastern and western patterns of exports to Asia. Although the eastern ARC has more direct access to seaports, western ARC firms can more easily access West Coast ports, which have shorter travel times to Asia.

Hypothesis 5: Differences in export patterns from Appalachia are minimized with a greater reliance on air transportation. This hypothesis could not be validated by available data.

Methodology

To test these hypotheses, recent export data were compiled for selected states lying east and west of the Appalachian Range. The states in the eastern portion (ARC-EAST) include New Jersey, Delaware, Maryland, North Carolina and South Carolina and Virginia. The states in the western portion (ARC-WEST) include New York, Ohio, Kentucky, Tennessee, and West Virginia. Data were gathered on 2002 exports of the following products: Computer and Electronic Products (NAICS 334); Electrical

Equipment, Appliances, and Components (NAICS 335); Transportation Equipment (NAICS 336); and Furniture and Fixtures (NAICS 337); and for comparison purposes, all manufactured products (NAICS 311-339).

Results

Data confirms each of the first four hypotheses. As shown in Table 1, export patterns differ significantly between ARC-EAST and ARC-WEST for each of the four sectors, as well as for all manufacturing. This confirms Hypothesis 1.

There is also strong evidence for Hypothesis 2. As shown in Table 1, exports to Europe account for a greater proportion of ARC-EAST than ARC-WEST exports for each of the four individual sectors. Across the four sectors, exports to Europe accounted for 31 percent of ARC-EAST but only 22 percent of ARC-WEST exports. This differential is slightly greater than for all manufacturing as a whole, where the respective ratios were 31 percent and 25 percent.

Table 1: Export Patterns from Selected RC region States (2002)		
NAICS 334 – Computer & electronic products	<u>ARC-EAST</u>	<u>ARC-WEST</u>
EUROPE	37%	29%
ASIA	31%	28%
NAFTA	20%	33%
NAICS 335 – Elect. Equip., & components	<u>ARC-EAST</u>	<u>ARC-WEST</u>
EUROPE	28%	24%
ASIA	18%	19%
NAFTA	35%	45%
NAICS 336 – Transportation Equip.	<u>ARC-EAST</u>	<u>ARC-WEST</u>
EUROPE	43%	23%
ASIA	9%	12%
NAFTA	32%	59%
NAICS 337 – Furniture & fixtures	<u>ARC-EAST</u>	<u>ARC-WEST</u>
EUROPE	18%	14%
ASIA	17%	7%
NAFTA	36%	64%
Average of Sectors 334-337	<u>ARC-EAST</u>	<u>ARC-WEST</u>
EUROPE	31%	22%
ASIA	19%	16%
NAFTA	31%	50%
ALL MANUFACTURING	<u>ARC-EAST</u>	<u>ARC-WEST</u>
EUROPE	31%	25%
ASIA	22%	19%
NAFTA	30%	44%
<i>Source: MISER. Calculations by EDR Group</i>		

The evidence for Hypothesis 3 is very strong. ARC-WEST exports to NAFTA accounted for a much higher proportion of exports in each of the four sectors than in ARC-EAST. On average across the four sectors, exports to NAFTA accounted for 50 percent of all ARC-WEST exports compared to just 31 percent for ARC-EAST. The differences in the four study sectors were greater than in manufacturing as a

whole. However, the differential was greater even in all manufacturing, where NAFTA accounted for 44 percent of all ARC-WEST but only 30 percent of all ARC-EAST exports.

Finally, the data also confirm Hypothesis 4, namely that there would be no large difference in exports to Asia from the two regions. As the data show, exports to Asia accounted for a higher proportion of ARC-EAST than ARC-WEST exports in two sectors (NAICS 334 AND 337), but a lower proportion in the two other sectors (NAICS 335 and 336). Across manufacturing, there was little difference in proportion of total exports shipped to Asia: these exports accounted for 22 percent of all ARC-EAST and 19 percent of all ARC-WEST exports.

Relatively little activity is seen in east-west traffic across the Appalachian region for exports from the six target industries. Kennedy Airport in New York and Miami International Airport is much more heavily used than airports in Pittsburgh and Atlanta. Similarly, the ports of Detroit, New York, Buffalo and Miami are used more intensely for exports of commodities from these six industries than the ports of Charleston, Norfolk and Baltimore.

Appalachian Exports by Industry and Destination						
(Percent of Appalachian Industry Exports)						
Destination	Motor Vehicle Parts	Food Processing Machinery	Packaging Machinery	Electronic Components	Upholstered Household Furniture	Wooden Household Furniture
Africa	0.6%	2.3%	1.4%	0.8%	0.9%	1.3%
Asia	11.1%	20.8%	12.5%	30.2%	18.0%	28.4%
Australia	1.2%	3.2%	3.9%	1.2%	0.9%	0.5%
Canada	65.6%	20.6%	26.1%	25.6%	48.9%	42.6%
Central America	0.2%	3.3%	3.1%	1.4%	3.4%	7.0%
Europe	10.3%	32.1%	38.1%	25.7%	22.3%	15.3%
Mexico	9.5%	8.5%	9.3%	9.9%	3.4%	3.0%
South America	1.5%	9.3%	5.6%	5.1%	2.2%	1.8%

Companies are located in places from where they can cost-effectively move products to ports that, in turn, can transport these commodities to desired international destinations. Access to various ports is hindered by gaps in the ADHS because the gaps increase time to key interstate routes. Companies prefer to ship through built-up ports which are easily accessible through the federal interstate system, and gaps in the ADHS system hinders access to ports (or effectively reduces cost-effective choices when considering which ports to use). As location is in part chosen by existing access considerations, gaps along ADHS corridors influence business location. Easy and cost effective connections to interstate highways, or the lack of the same, influence where firms locate and the economic development of Appalachian counties.

Summary & Policy Implications

Analysis and interviews with Appalachian companies have revealed two self-evident truths: first, the Interstate Highway System works, as it connects the ARC region with major northeast and Florida ship ports and airports; and second, companies prefer to ship through built-up ports which are easily accessible through the existing highway system at their current location. Very little activity is seen in east-west traffic across the Appalachian region for exports from these six industries. Kennedy Airport in New York and Miami International Airport in Florida are much more heavily used than airports in Pittsburgh and Atlanta. Similarly, the ports of Detroit, New York, Buffalo and Miami are used more intensely for exports of commodities from these six industries than the ports of Charleston, Norfolk and Baltimore.

Roadways are by far the most important transportation facilities in the ARC region for the six target commodities. The importance of the Appalachian Development Highway System (ADHS) is fostering connections to Interstate Highways that in turn are connected to major ports of lading for the target industries. Secondly, ADHS provides access to smaller airports in areas that produce a disproportionate amount of Appalachia's electronic components.

Sixteen ADHS corridors important to international trade in the target industries are in various states of partial completion. Thirteen of these corridors provide connections to interstate highways, which, in turn, connect Appalachia to key ports for export of the target commodities. If trade was the sole criterion for setting priorities among these corridors (and of course it is not) then ARC would need to decide if its priority is to reinforce existing use of ports and strengthen ADHS roadway connections to Florida, Michigan and New York, or encourage use of ports in ARC states, such as Charleston, Baltimore and the Pittsburgh Airport.

In general, the national transportation system serves the region by providing access to external markets and supplies. However, there is some evidence that improving access to the national network through completion of key links in the ADHS would provide additional opportunities in the six industries studied in this research for expanded output and production locations. Such expansion of opportunities could lead to additional employment and a further distribution of economic development within the region.

Discussions with the target industries in the region indicated that development patterns and logistics planning were influenced by the quality and availability of the transportation network. Manufacturers sought to reduce total logistics costs by selecting production locations with good network access, utilizing intermodal connections when available and cost effective, and by taking advantage of international markets. ARC can contribute to this market expansion by identifying and alleviating constraints in the transportation network and by improving the highway, rail and waterway transportation systems.