APPENDIX A: REGIONAL INDUSTRIAL ANALYSIS

The first section of Appendix A conducts a growth and shift share analysis of major industry groups in each of the 13 Appalachian States for the period 1986 to 2000. By comparing the growth trends in the regional industry to the national industry, this analysis helps us identify Appalachian industries with strong growth records.

The second section narrows the analysis and focuses more on individual industries within the Appalachian region. Here, we review industry output intensity ratios, employment trends and export intensity ratios.

The average annual growth rate for each industry was calculated utilizing real 1996 GSP (Gross State Product) data from the Bureau of Economic Analysis of the Department of Commerce. Industries were classified based on their two-digit SIC code.

A-1: Review of Regional Production Trends

Alabama

During the 15-year period spanning from 1986 to 2000, the industrial machinery and electronic equipment industries in Alabama recorded double-digit average annual growth rates of 10.24 percent and 10.53 percent respectively. The manufacture of primary metals and motor vehicles also grew at average annual rates of 6.09 percent and 7.09 percent respectively. The apparel industry is the only industry that experienced a negative growth rate during the 15-year period. Table A-1 below presents average annual growth rates for major two-digit industries in the State of Alabama.

Table A-1. Two-Digit Analysis for Major Industry Sectors in Alabama

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	5.33%	3.68%	1.55
Metal mining	9.90%	7.41%	1.43
Coal mining	4.22%	5.35%	0.84
Lumber & wood	1.72%	0.13%	13.55
Furniture & Fixtures	3.03%	2.27%	1.33
Primary metals	6.09%	2.08%	3.14
Fabricated metals	2.98%	2.38%	1.34
Industrial machinery	10.24%	10.59%	1.04
Electronic equipment	10.53%	13.84%	0.81
Motor vehicles	7.09%	2.82%	2.69
Textile mill products	1.84%	1.13%	1.75
Apparel & other prod.	-1.26%	-0.87%	1.55
Paper products	0.28%	0.31%	0.98
Chemicals	1.64%	4.28%	0.41
Rubber & plastics	1.53%	6.16%	0.27

Source: Bureau of Economic Analysis of the Department of Commerce.

Georgia

During the period 1986 to2000, the industrial machinery and electronic equipment industries also had the highest average annual growth in Georgia. The manufacture of electronic equipments grew at an average annual rate of 12.63 percent while the manufacture of industrial machinery grew at an average annual rate of 11.71 percent. The average annual growth rate of industrial machinery in Georgia exceeded the national average while the average annual growth rate of electronic equipment was less than the national average.

In Georgia, the manufacture of rubber and plastics also recorded a strong average annual growth rate of 7.22 percent and exceeded the national average. The manufacture of motor vehicles and farm production also posted strong average annual growth rates. Table A-2 below presents average annual growth rates for major two-digit industries in the state of Georgia.

Table A-2. Two-Digit Analysis for Major Industry Sectors in Georgia

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	5.24%	3.68%	1.52
Lumber & wood	3.92%	0.13%	30.99
Furniture & Fixtures	2.44%	2.27%	1.07
Primary metals	1.17%	2.08%	0.61
Fabricated metals	2.11%	2.38%	0.95
Industrial machinery	11.71%	10.59%	1.18
Electronic equipment	12.63%	13.84%	0.98
Motor vehicles	4.53%	2.82%	1.72
Textile mill products	2.70%	1.13%	2.57
Apparel & other prod.	0.24%	-0.87%	-0.29
Paper products	1.44%	0.31%	4.99
Chemicals	3.79%	4.28%	0.95
Rubber & plastics	7.22%	6.16%	1.25

Source: Bureau of Economic Analysis of the Department of Commerce.

Kentucky

In a trend similar to that of other Appalachian States, the manufacture of industrial machinery, electronic equipment and motor vehicles recorded high average annual growth rates in Kentucky. The manufacture of industrial machinery grew at an average annual rate of 8.20 percent, while the manufacture of electronic equipment and motor vehicles grew at an average annual rate of 7.01 percent and 8.47 percent respectively.

Two of these industries, industrial machinery and electronic equipment, however grew at average annual rates that were less than the national average annual growth rate. The manufacture of motor vehicles however grew at a rate three times faster than the national average.

Kentucky industries focusing on the manufacture of primary metals, fabricated metals, lumber and wood products and agricultural produce, all posted strong growth rates. Table A-3 below presents average annual growth rates for major two-digit industries in the state of Kentucky.

Table A-3. Two-Digit Analysis for Major Industry Sectors in Kentucky

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	4.65%	3.68%	1.35
Coal mining	4.63%	5.35%	0.93
Lumber & wood	5.15%	0.13%	40.70
Furniture & Fixtures	4.58%	2.27%	2.01
Primary metals	6.70%	2.08%	3.46
Fabricated metals	6.66%	2.38%	2.99
Industrial machinery	8.20%	10.59%	0.83
Electronic equipment	7.01%	13.84%	0.54
Motor vehicles	8.47%	2.82%	3.21
Textile mill products	6.24%	1.13%	5.93
Apparel & other prod.	1.75%	-0.87%	-2.15
Paper products	3.98%	0.31%	13.77
Chemicals	3.76%	4.28%	0.94
Rubber & plastics	5.97%	6.16%	1.04

Source: Bureau of Economic Analysis of the Department of Commerce.

Maryland

In Maryland, the average annual growth rates of industrial machinery and electronic equipment continued to dominate the manufacturing scene. The manufacture of electronic equipment grew at an annual average rate of 9.67 percent while the manufacture of industrial machinery grew at an average annual rate of 8.33 percent. However, both industries grew at average annual rates that were less than their corresponding national average. The manufacture of motor vehicles, apparel and paper products recorded negative average annual growth rates during the 1986 to 2000 period.

Unlike the other states considered thus far, textile mill products recorded a strong average annual growth rate in Maryland (7.98 percent). Textile mill products also grew at an average annual rate that was at least seven times more than the national average annual growth rate for textile mill products. The manufacture of chemicals and plastic products also recorded strong growth rates that exceed the national average annual growth rate. Table A-4 below presents average annual growth rates for major two-digit industries in the state of Maryland.

Table A-4. Two-Digit Analysis for Major Industry Sectors in Maryland

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	2.56%	3.68%	0.74
Coal mining	8.23%	5.35%	1.65
Lumber & wood	0.10%	0.13%	0.81
Furniture & Fixtures	1.23%	2.27%	0.54
Primary metals	0.24%	2.08%	0.13
Fabricated metals	2.92%	2.38%	1.31
Industrial machinery	8.33%	10.59%	0.84
Electronic equipment	9.67%	13.84%	0.75
Motor vehicles	-4.60%	2.82%	-1.75
Textile mill products	7.98%	1.13%	7.59
Apparel & other prod.	-2.22%	-0.87%	2.72
Paper products	-2.24%	0.31%	-7.75
Chemicals	5.17%	4.28%	1.29
Rubber & plastics	5.85%	6.16%	1.02

Source: Bureau of Economic Analysis of the Department of Commerce.

Mississippi

During the 1986 to 2000 period, the manufacture of industrial machinery had the highest average annual growth rate in the state of Mississippi—11.7 percent. The electronic equipment and motor vehicle industries also recorded strong average annual growth rates of 8.95 percent and 6.83 percent respectively. The manufacture of lumber and wood products in Mississippi grew twelve times faster than the national, while the apparel industry experienced a negative average annual growth. Table A-5 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of Mississippi.

Table A-5. Two-Digit Analysis for Major Industry Sectors in Mississippi

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	5.55%	3.68%	1.62
Lumber & wood	1.56%	0.13%	12.33
Furniture & Fixtures	4.26%	2.27%	1.87
Primary metals	4.47%	2.08%	2.30
Fabricated metals	1.88%	2.38%	0.84
Industrial machinery	11.70%	10.59%	1.18
Electronic equipment	8.95%	13.84%	0.69
Motor vehicles	6.83%	2.82%	2.59
Textile mill products	2.71%	1.13%	2.57
Apparel & other prod.	-1.46%	-0.87%	1.79
Paper products	1.42%	0.31%	4.91
Chemicals	5.79%	4.28%	1.45
Rubber & plastics	7.51%	6.16%	1.30

Source: Bureau of Economic Analysis of the Department of Commerce.

New York

The manufacture of industrial machinery and electronic equipment again had the highest average annual growth rates (8.06 percent and 10.11 percent respectively). Both industries however grew at average annual rates that were less than the national average. The chemical industry and the rubber and plastics industry experienced positive growth rates (2.17 percent and 4.34 percent respectively) but grew at considerably lesser rates than the national average.

During the 1986 to 2000 period, seven industries including the manufacture of lumber and wood, furniture and fixtures, primary metals, motor vehicles, apparel, textile and paper products experienced negative average annual growth rates. Table A-6 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of New York.

Table A-6. Two-Digit Analysis for Major Industry Sectors in New York

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	2.29%	3.68%	0.67
Metal mining	0.30%	7.41%	0.04
Lumber & wood	-0.72%	0.13%	-5.72
Furniture & Fixtures	-0.37%	2.27%	-0.16
Primary metals	-1.55%	2.08%	-0.80
Fabricated metals	0.55%	2.38%	0.25
Industrial machinery	8.06%	10.59%	0.82
Electronic equipment	10.11%	13.84%	0.78
Motor vehicles	-0.10%	2.82%	-0.04
Textile mill products	-2.19%	1.13%	-2.08
Apparel & other prod.	-2.93%	-0.87%	3.60
Paper products	-0.47%	0.31%	-1.62
Chemicals	2.17%	4.28%	0.54
Rubber & plastics	4.34%	6.16%	0.75

Source: Bureau of Economic Analysis of the Department of Commerce.

North Carolina

In a trend that is becoming quite consistent amongst Appalachian states, the manufacture of industrial machinery and electronic equipment again experienced the highest average annual growth rates in North Carolina. The industrial machinery industry grew at an average annual rate of 13.09 percent, exceeding the national average by more than three percent. The manufacture of electronic equipment grew at an average annual rate of 12.06 percent but it did not exceed the national average rate.

Agricultural production, chemical production and motor vehicle production all recorded strong average annual growth rates in North Carolina. Table A-7 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of North Carolina.

Table A-7. Two-Digit Analysis for Major Industry Sectors in North Carolina

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	6.42%	3.68%	1.87
Lumber & wood	0.67%	0.13%	5.28
Furniture & Fixtures	1.15%	2.27%	0.50
Primary metals	4.45%	2.08%	2.30
Fabricated metals	4.06%	2.38%	1.83
Industrial machinery	13.09%	10.59%	1.32
Electronic equipment	12.06%	13.84%	0.93
Motor vehicles	5.85%	2.82%	2.22
Textile mill products	0.10%	1.13%	0.10
Apparel & other prod.	-0.83%	-0.87%	1.01
Paper products	0.02%	0.31%	0.08
Chemicals	6.77%	4.28%	1.70
Rubber & plastics	5.48%	6.16%	0.95

Source: Bureau of Economic Analysis of the Department of Commerce.

Ohio

In Ohio, all major two-digit industries experienced positive average annual growth rates with the exception of the apparel industry. As observed in previous states examined, the manufacture of industrial machinery and electronic equipment witnessed the highest average annual growth rates. Both industries however grew at rates less than the national average. The average annual growth rate for lumber and wood production was 30 times higher than the national average. Table A-8 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of Ohio.

Table A-8. Two-Digit Analysis for Major Industry Sectors in Ohio

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	3.85%	3.68%	1.12
Coal mining	4.31%	5.35%	0.86
Lumber & wood	4.79%	0.13%	37.84
Furniture & Fixtures	3.49%	2.27%	1.53
Primary metals	1.34%	2.08%	0.69
Fabricated metals	1.77%	2.38%	0.79
Industrial machinery	8.45%	10.59%	0.85
Electronic equipment	9.61%	13.84%	0.74
Motor vehicles	1.80%	2.82%	0.68
Textile mill products	3.71%	1.13%	3.53
Apparel & other prod.	-3.35%	-0.87%	4.11
Paper products	0.48%	0.31%	1.68
Chemicals	3.48%	4.28%	0.87
Rubber & plastics	4.19%	6.16%	0.73

Source: Bureau of Economic Analysis of the Department of Commerce.

Pennsylvania

The manufacturers of industrial machinery and electronic equipment also recorded strong growth rates in Pennsylvania. The manufacture of industrial machinery grew at an average annual rate of 8.06 percent but did not exceed the national average for industrial machinery. The manufacture of electronic equipment grew at an average annual rate of 13.17 percent and exceeded the national average for electronic equipments.

Coal mining, chemical production and plastics production also recorded strong average annual growth rates that exceeded the corresponding national average. Table A-9 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of Pennsylvania.

Table A-9. Two-Digit Analysis for Major Industry Sectors in Pennsylvania

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	3.16%	3.68%	0.92
Coal mining	5.54%	5.35%	1.11
Lumber & wood	1.89%	0.13%	14.92
Furniture & Fixtures	1.04%	2.27%	0.46
Primary metals	1.15%	2.08%	0.59
Fabricated metals	1.88%	2.38%	0.84
Industrial machinery	8.60%	10.59%	0.87
Electronic equipment	13.17%	13.84%	1.02
Motor vehicles	-0.42%	2.82%	-0.16
Textile mill products	1.96%	1.13%	1.86
Apparel & other prod.	-2.63%	-0.87%	3.22
Paper products	0.92%	0.31%	3.17
Chemicals	6.93%	4.28%	1.73
Rubber & plastics	6.85%	6.16%	1.19

Source: Bureau of Economic Analysis of the Department of Commerce.

South Carolina

Metal mining grew at an annual average rate of 47.2 percent in South Carolina. This is six times higher than the national average annual growth rate for metal mining. The manufacture of industrial machinery, electronic equipment and motor vehicles also recorded double digit average annual growth rates in South Carolina. The motor vehicle industry grew at an average annual rate of 17.16 percent, growing eight times faster than the national industry. The manufacture of lumber and wood products and textile products all recorded negative growth rates. Table A-10 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of South Carolina.

Table A-10. Two-Digit Analysis for Major Industry Sectors in South Carolina

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	6.93%	3.68%	2.02
Metal mining	47.20%	7.41%	6.83
Lumber & wood	-0.27%	0.13%	-2.13
Furniture & Fixtures	1.84%	2.27%	0.81
Primary metals	2.37%	2.08%	1.22
Fabricated metals	3.86%	2.38%	1.74
Industrial machinery	13.54%	10.59%	1.37
Electronic equipment	12.03%	13.84%	0.93
Motor vehicles	17.16%	2.82%	6.52
Textile mill products	-0.06%	1.13%	-0.06
Apparel & other prod.	-3.54%	-0.87%	4.34
Paper products	1.58%	0.31%	5.48
Chemicals	0.15%	4.28%	0.04
Rubber & plastics	8.21%	6.16%	1.43

Source: Bureau of Economic Analysis of the Department of Commerce.

Tennessee

During the period 1986 to 2000, the manufacture of primary metals increased by an average annual rate of 9.21 percent in Tennessee, while the manufacture of rubber and plastics grew at an average annual rate of 5.74 percent. Again, as observed in other Appalachian states, the manufacture of industrial machinery and electronic equipment recorded the highest growth rates. Table A-11 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of Tennessee.

Table A-11. Two-Digit Analysis for Major Industry Sectors in Tennessee

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	2.58%	3.68%	0.75
Metal mining	5.19%	7.41%	0.75
Coal mining	0.03%	5.35%	0.01
Lumber & wood	1.62%	0.13%	12.79
Furniture & Fixtures	0.89%	2.27%	0.39
Primary metals	9.21%	2.08%	4.75
Fabricated metals	1.95%	2.38%	0.88
Industrial machinery	10.67%	10.59%	1.08
Electronic equipment	11.87%	13.84%	0.92
Motor vehicles	10.79%	2.82%	4.10
Textile mill products	1.59%	1.13%	1.51
Apparel & other prod.	-3.74%	-0.87%	4.58
Paper products	0.08%	0.31%	0.26
Chemicals	2.35%	4.28%	0.59
Rubber & plastics	5.74%	6.16%	1.00

Source: Bureau of Economic Analysis of the Department of Commerce.

Virginia

The manufacture of industrial machinery and motor vehicles had the highest average annual growth rates in Virginia. The manufacture of industrial machinery grew at an average annual rate of 12.65 percent and exceeded the national average for industrial machinery. The manufacture of motor vehicles increased at an average annual rate of 10.97 percent, which was four times higher than the national average. The manufacture of rubber and plastics also grew at an impressive average annual rate of seven percent and exceeded the national average annual growth rate for rubber and plastics by 21 percent. With the exception of apparel manufacturers and textile mill products, no industry in Virginia experienced a negative growth rate. Table A-12 below presents average annual growth rates and shift share estimates for major two-digit industries in the State of Virginia.

Table A-12. Two-Digit Analysis for Major Industry Sectors in Virginia

Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	3.59%	3.68%	1.04
Metal mining	8.89%	7.41%	1.29
Coal mining	3.26%	5.35%	0.65
Lumber & wood	0.52%	0.13%	4.11
Furniture & Fixtures	-0.45%	2.27%	-0.20
Primary metals	4.45%	2.08%	2.30
Fabricated metals	1.27%	2.38%	0.57
Industrial machinery	12.65%	10.59%	1.28
Electronic equipment	6.11%	13.84%	0.47
Motor vehicles	10.97%	2.82%	4.17
Textile mill products	-1.12%	1.13%	-1.07
Apparel & other prod.	-4.07%	-0.87%	4.99
Paper products	0.07%	0.31%	0.25
Chemicals	1.56%	4.28%	0.39
Rubber & plastics	7.00%	6.16%	1.22

Source: Bureau of Economic Analysis of the Department of Commerce.

West Virginia

West Virginia is the only state in Appalachia where the manufacture of industrial machinery and electronic equipment did not record the highest average annual growth rates. Metal mining, motor vehicle and rubber and plastics recorded the highest average annual growth rates. Metal mining grew at an average annual rate of 15 percent while motor vehicles and rubber and plastics grew at an average annual rate of 13.29 percent and 11.02 percent respectively. The average annual growth rate in all three West Virginia industries exceeded their corresponding national average growth rate. The manufacture of lumber and wood products also recorded a strong average annual growth rate. The manufacture of wood and lumber products grew at an average annual rate of 6.26 percent, and grew 40 times faster than the national average annual growth rate for lumber and wood products. Again, the manufacture of apparel recorded a negative growth rate. Table A-13 below presents average annual growth rates and shift share estimates for major two-digit industries in the state of West Virginia.

Table A-13. Two-Digit Analysis for Major Industry Sectors in West Virginia

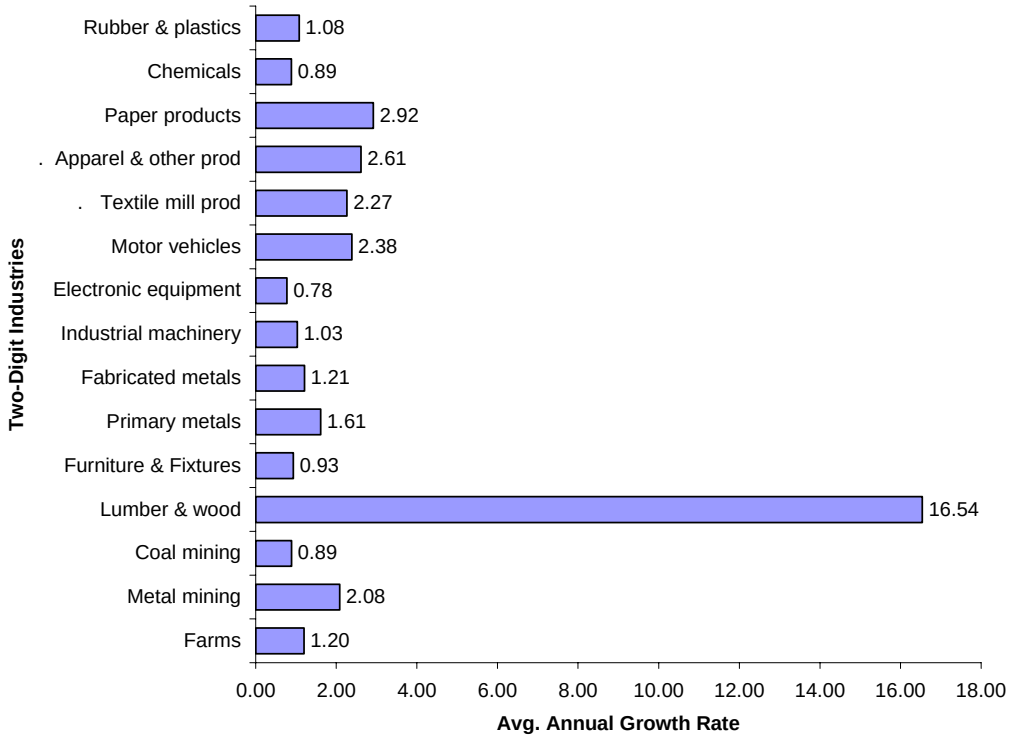
Two-Digit Industry	State Avg Annual Growth Rate (1986 - 2000)	U.S. Avg Annual Growth Rate (1986 - 2000)	Shift Share %State / %U.S.
Farms	1.43%	3.68%	0.42
Metal mining	15.00%	7.41%	2.17
Coal mining	5.46%	5.35%	1.09
Lumber & wood	6.26%	0.13%	49.50
Furniture & Fixtures	4.46%	2.27%	1.96
Primary metals	0.57%	2.08%	0.30
Fabricated metals	3.21%	2.38%	1.44
Industrial machinery	7.68%	10.59%	0.78
Electronic equipment	6.71%	13.84%	0.52
Motor vehicles	13.29%	2.82%	5.04
Textile mill products	5.51%	1.13%	5.24
Apparel & other prod.	-3.69%	-0.87%	4.53
Paper products	3.40%	0.31%	11.76
Chemicals	2.57%	4.28%	0.64
Rubber & plastics	11.02%	6.16%	1.92

Source: Bureau of Economic Analysis of the Department of Commerce.

Appalachian States

Chart A-1 below presents a shift share analysis for major industries in all 13 Appalachian states combined. Industries with positive growth rates, but shift share ratios below one, have more opportunities for future growth since they are currently performing below the national average. Examples of such industries include electronic equipment, chemicals, coal mining and furniture and fixtures.

Chart A-1. Shift Share Analysis for Major Industries in Appalachia



Source: Bureau of Economic Analysis of the Department of Commerce.

A-2: Industry Analysis

This section conducts an analysis of major industry groups in the Appalachian region. The analysis will assist in identifying key industry sectors that will serve as the focal point in later analyses. The Gross State Product data used were obtained from the Bureau of Economic Analysis of the Department of Commerce while import/export/ trade data were obtained from the International Trade and Economic Statistics segment of Export.Gov (the U.S. Government Export Portal).[67]

Industrial Machinery

Industry Overview

The industrial machinery industry is a major industrial group defined by the two-digit SIC code 35. It includes a diverse body of establishments engaged in manufacturing engines and turbines; farm and garden machinery; elevators and conveying equipment; construction, mining and oil field machinery; manufacture of metalworking, textile, woodworking, paper and printing machinery; pumps, roller bearings, compressors and power transmissions for industrial machines; computer and peripheral equipment and office machinery.[68] Within the Appalachian region, manufacturers of industrial machinery are clustered in the Greeneville-Spartanburg metropolitan area of South Carolina in the Johnstown and Pittsburgh, Pennsylvania area.

The industrial machinery industry in Appalachia is a well-established, technology intensive sector that is dominated by small and mid-size firms. A study commissioned by the Appalachian Regional Commission (ARC) identified the industrial machinery sector as one of the three industries (value-chains) with the strongest evidence of localized clustering within the Appalachian region.

Output Intensity Analysis

While the industrial machinery industry is a leading and important element of the Appalachian region's manufacturing sector, the contribution of the industry to the economies of Appalachian states is still below the national average—implying that there is room for expansion. Table A-14 presents output intensity indices for the industrial machinery sector in Appalachian states. It compares the industry's impact on the local economy to the industry's impact on the national economy.

Relative to the national economy, the industrial machinery sector has had a greater impact on the economies of Kentucky, North Carolina, Ohio, Pennsylvania, South Carolina and Tennessee. The output intensity index for all Appalachian states however shows that the region is performing well below the national average.

[67] http://www.export.gov/trandestatistics.html
[68] *Standard Industrial Classification Manual*, U.S. Office of Management and Budget, 1987.

Table A-14. Machinery Industry Output Intensity Indices

Output Intensity Analysis for the Industral Machinery Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Output Intensity
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	1.31%	1.64%	0.80
Georgia	0.76%	1.64%	0.47
Kentucky	1.94%	1.64%	1.18
Maryland	0.59%	1.64%	0.36
Mississippi	1.40%	1.64%	0.85
New York	1.06%	1.64%	0.64
North Carolina	2.17%	1.64%	1.32
Ohio	2.82%	1.64%	1.72
Pennsylvania	1.66%	1.64%	1.01
South Carolina	2.53%	1.64%	1.54
Tennessee	1.68%	1.64%	1.03
Virginia	0.62%	1.64%	0.38
West Virginia	0.57%	1.64%	0.35
Appalachia	0.01%	1.64%	0.01

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Export Growth Trends

Machinery exports from Appalachian states decreased from $22.1 billion in 1997 to $22.0 billion in 2001 (see Table A-15). The observed decline in national and regional export sales has been attributed to the recession in many foreign markets and a weak global demand. For example, U.S. cutting tool exports to Japan declined by 62 percent from 1997 to 1999. Despite the decline in exports, Appalachian states maintained their share of national industrial machinery exports.

Table A-15. Industrial Machinery Exports from Appalachian States

Industrial Machinery Exports (000,dollars)					
	1997	1998	1999	2000	2001
Appalachia States Exports	22,126,177	20,566,075	20,063,677	22,013,743	21,278,642
United States Exports	82,874,444	79,444,590	76,388,334	89,842,641	81,512,646
App Exports. / U.S. Exports	26.70%	25.89%	26.27%	24.50%	26.10%

Source: International Trade and Economic Statistics (Export.Gov).

As the global economy recovers and import demand improves, industrial machinery export sales are expected to rebound. Especially since prior to the recession in the late 1990s, foreign demand grew much faster than domestic demand. China's admittance into the WTO could create an opportunity for increased U.S. industrial machinery exports over the medium- and long-term, while exports to Canada and Mexico should wax stronger as the economic integration of the three NAFTA markets continues.

Appalachian states are particularly strong in the following industry sub-sectors: food processing machinery, packaging machinery, textile machinery, metal working machinery, wood working, machine tools and the general components industry. However, Appalachian firms would need to incorporate new production techniques and develop higher valued products in order to penetrate new markets and expand sales to existing markets.

Traditional markets for U.S. exports are Japan, Canada, Europe, and Mexico. The Department of Commerce projects that Argentina, Brazil, India, and Turkey offer the greatest potentials for future export growth.

Growth and Export Prospects for Industrial Machinery

The industrial machinery sector in Appalachia appears to have good potential for further export development.

Lumber and Wood Products

Industry Overview

The lumber and wood products industry group is defined by the two-digit SIC code 24. It includes establishments engaged in cutting timber and pulpwood; merchant sawmills, lath mills, shingle mills, veneer mills and plywood mills engaged in producing lumber and wood related products; and establishments engaged in manufacturing mainly wood or wood related finished products.[69] Establishments producing furniture and fixtures are not included in this group.

The Appalachian region is one of the leading production areas of lumber and hardwood products in the U.S. On average, the lumber and wood industry in Appalachian states account for 39 percent of total national production. Table A-16 presents national and regional data for the lumber and wood products industry. Industry average annual growth rates are particularly strong in the states of Georgia, Kentucky, Ohio and West Virginia.

Table A-16. Lumber and Wood Manufacturing Industry Data

Manufacture of Wood Products, GSP Data (Millions of dollars)						
	1995	1996	1997	1998	1999	2000
Appalachia States Prod.	15,810	15,601	15,498	15,914	16,812	17,024
United States Prod.	41,588	39,922	39,532	40,096	42,969	44,130
Appalachia GSP	2,477,567	2,559,208	2,665,176	2,802,466	2,913,662	3,036,268
App Prod. / U.S. Prod.	38%	39%	39%	40%	39%	39%

Source: Bureau of Economic Analysis of the Department of Commerce.

Output Intensity Analysis

Table A-17 presents the lumber and wood products output intensity indices for Appalachian states and the U.S. When compared to the impact of the industry on the national economy, the output intensity index for the region (1.56) indicates that the wood and lumber products industry is more important to the economies of Appalachian states.

[69] *Standard Industrial Classification Manual*, U.S. Office of Management and Budget, 1987.

Table A-17. Lumber and Wood Products Output Intensity Indices

Output Intensity Analysis for the Lumber and Wood Products Industry Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Location Quotient
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	1.86%	0.60%	3.08
Georgia	1.07%	0.60%	1.77
Kentucky	0.59%	0.60%	0.98
Maryland	0.14%	0.60%	0.24
Mississippi	2.88%	0.60%	4.77
New York	0.12%	0.60%	0.20
North Carolina	1.04%	0.60%	1.72
Ohio	0.46%	0.60%	0.77
Pennsylvania	0.55%	0.60%	0.92
South Carolina	0.98%	0.60%	1.63
Tennessee	0.75%	0.60%	1.24
Virginia	0.72%	0.60%	1.19
West Virginia	1.10%	0.60%	1.82
Appalachia	0.94%	0.60%	1.56

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Export Growth Trends

Table A-18 below shows the trend in lumber and wood product exports for Appalachian states and the U.S. For all Appalachian states, lumber and wood product exports declined from $1.7 billion in 1997 to $1.4 billion in 2001—a 21 percent decline. The southern Appalachian states of Georgia, Mississippi, and South Carolina experienced the greatest decline in lumber and wood products exports. Canada and Western Europe have traditionally been the leading market for U.S. wood products. New markets are been exploited in Mexico and the Far East.

Growth and Export Prospects for Lumber and Wood Products

The lumber and wood products industry appears to offer good potentials for future export development.

Table A-18. Lumber and Wood Products Exports from Appalachian States

Lumber and Wood Product Exports from Appalachia States						
States	$ Value 000, 1997	$ Value 000, 1998	$ Value 000, 1999	$ Value 000, 2000	$ Value 000, 2001	% change % Change 1997 to 2001
Alabama	134,658	123,464	133,420	135,597	84,434	-37.3
Georgia	252,725	175,832	148,587	144,888	112,296	-55.57
Kentucky	49,870	44,301	54,466	45,901	45,957	-7.85
Maryland	28,296	24,927	27,596	28,481	25,842	-8.67
Mississippi	52,229	42,308	27,786	32,997	23,467	-55.07
New York	283,097	256,395	370,826	327,202	246,026	-13.09
North Carolina	190,853	182,267	197,340	183,939	154,011	-19.3
Ohio	145,475	146,668	170,204	194,944	167,046	14.83
Pennsylvania	294,085	267,259	290,349	294,266	226,094	-23.12
South Carolina	52,553	52,399	45,194	37,780	29,594	-43.69
Tennessee	70,554	59,240	63,637	69,017	57,290	-18.8
Virginia	108,708	92,220	108,634	121,759	109,929	1.12
West Virginia	57,381	54,151	73,507	83,882	71,822	25.17
Appalachia	1,720,484	1,521,431	1,711,546	1,700,653	1,353,808	-21.31
U.S.	5,522,914	4,651,097	4,858,671	5,021,876	4,099,436	-25.77

Source: International Trade and Economic Statistics (Export.Gov).

Chemicals and Plastics

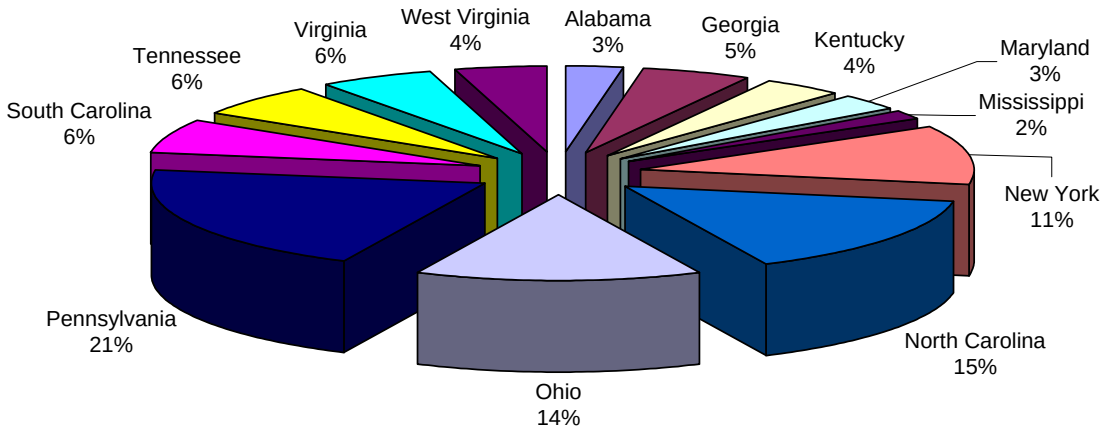
Industry Overview

The chemical and plastics industry group is defined by the two-digit SIC codes 28 and 30. It includes establishments manufacturing basic chemicals such as acids, alkalies, salts, and organic chemicals; chemical products such as synthetic fibers, plastics materials, dry colors and pigments; and finished chemical products such as drugs, cosmetics, fertilizers, explosives and soaps.

The U.S. chemical industry is the world's largest, accounting for 23 percent of world production. According to the ARC-commissioned study prepared by Feser et al (2002),[70] sub-regional concentrations of chemicals and plastics employment are prevalent in a large number of locations in Appalachia. These include: the Pittsburgh area, central and eastern Pennsylvania, West Virginia and Southern Ohio, northern Tennessee, the Carolinas and central Alabama. The study also identified the chemicals and plastics industry as one of the three industries with the strongest evidence of localized clustering within the Appalachian region. Exhibit A-1 below presents a breakdown of chemical industry employment by Appalachian state.

[70] *Regional Technology Assets and Opportunities: The Geographic Clustering of High-Tech Industry, Science and Innovation in Appalachia*, August 2002, pg. 18.

Exhibit A-1: Distribution of Total Appalachian Chemical Industry Employment (1995 to 2001)



Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

National chemical industry employment increased from 1.052 million in 1995 to 1.054 million in 2000—a marginal increase of 0.26 percent. On the other hand, chemical industry employment in Appalachian states declined from 423,724 in 1995 to 409,181 in 2000—a decrease of three percent. In general, the chemicals industry is not labor intensive and does not generate many new jobs over time. Although some plants employ over a thousand people, most large plants employ between 200 and 500 people. Medium sized plants employ about 200 people, while smaller and specialty chemical plants employ about 50 people.

Output Intensity Analysis

Most manufacturers in Appalachia are concentrated in the plastics industry and manufacture sub-assembly plastic products for large equipment manufacturers. Table A-19 below presents the relative contribution of the chemical and plastics industry to Appalachian state economies. Specifically, the chemicals industry contributes more to the economies of Kentucky, North Carolina, South Carolina, Tennessee and West Virginia. Some of these states were earlier identified as states with evidence of significant chemical and plastics clustering activities.

The output intensity index for all Appalachian states (1.46) implies that the contribution of the chemical industry sector to the local economy exceeds the contribution of the industry to the national economy. As such, the chemicals industry is relatively more important to states in the Appalachian region.

Table A-19. Chemicals and Plastics Output Intensity Indices for Appalachian States

Output Intensity Analysis for the Chemical and Related Products Industry Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Location Quotient
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	1.87%	1.94%	0.96
Georgia	1.35%	1.94%	0.70
Kentucky	2.44%	1.94%	1.26
Maryland	1.18%	1.94%	0.61
Mississippi	1.66%	1.94%	0.85
New York	1.15%	1.94%	0.59
North Carolina	4.19%	1.94%	2.16
Ohio	2.72%	1.94%	1.40
Pennsylvania	3.19%	1.94%	1.65
South Carolina	4.96%	1.94%	2.55
Tennessee	2.97%	1.94%	1.53
Virginia	1.79%	1.94%	0.92
West Virginia	7.44%	1.94%	3.83
Appalachia	2.84%	1.94%	1.46

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Export Growth Trends

The chemicals industry is the largest exporting industrial sector in the U.S. The global chemicals market is fiercely competitive and trade contracts are usually negotiated on a long-term basis. Unlike other industries where foreign markets hold the key to their future, the chemical and plastics industry in Appalachia is made up of small and medium sized firms that are focused on creating niches within the domestic U.S. market. The industry in Appalachia is thus not a vibrant exporting sector. In fact, an ARC-commissioned study found that there is a general lack of interest in exporting among many firms in the region since most firms are able to stay competitive within a 300 mile radius.[71]

Table A-20 below presents trends in industry exports by state. Exports from Pennsylvania and Tennessee declined during the 1997 to 2001 period. Though Erie, Pennsylvania is regarded as one of the nation's leading centers of plastics production, most small and medium sized manufacturers there tend to focus on the manufacture of sub-assembly plastic products for large equipment manufacturers as opposed to final products that are more suited for export markets.

[71] *Exports, Competitiveness, and Synergy in Appalachian Industry Clusters*, February 1997, pg. 15. Prepared by Regional Technology Strategies, Inc. Chapel Hill, North Carolina

Table A-20. Chemicals and Plastics Exports from Appalachian States

Rubber and Plastics Product Exports from Appalachia States						
States	$ Value 000, 1997	$ Value 000, 1998	$ Value 000, 1999	$ Value 000, 2000	$ Value 000, 2001	% change % Change 1997 to 2001
Alabama	83,655	93,720	80,496	80,017	75,609	-9.62
Georgia	213,245	226,767	198,028	275,341	236,170	10.75
Kentucky	149,680	185,626	226,106	271,500	232,619	55.41
Maryland	91,441	99,923	112,073	106,453	110,808	21.18
Mississippi	42,611	50,945	65,711	75,132	50,650	18.87
New York	783,316	651,892	642,682	937,202	798,310	1.91
North Carolina	320,960	340,938	434,164	459,477	493,996	53.91
Ohio	1,260,993	1,412,739	1,493,246	1,973,282	1,647,128	30.62
Pennsylvania	593,984	677,591	694,879	526,815	466,459	-21.47
South Carolina	342,228	391,634	729,759	1,134,452	1,052,955	207.68
Tennessee	357,366	390,780	355,278	356,239	322,226	-9.83
Virginia	255,106	246,487	260,139	332,237	317,563	24.48
West Virginia	8,663	10,615	10,621	11,663	18,727	116.17
Appalachia	4,503,248	4,779,657	5,303,182	6,539,810	5,823,220	29.31
U.S.	14,035,946	14,522,221	15,196,968	17,714,657	16,508,439	17.62

Source: International Trade and Economic Statistics (Export.Gov).

According to ARC, the only way "the only way to increase the export potential of small and medium sized plants may be to offer assistance in developing unique products that can be sold directly overseas" —especially since finished products are more likely to be exported.[72]

Growth and Export Prospects for Plastics and Chemicals

The chemical and plastics industry in Appalachia has some potential that can be developed for future export promotion. But the potential is not very strong.

Automobiles, Auto-parts and Related Products

Industry Overview

The motor vehicles and motor vehicle industry group is defined by the three-digit SIC code 371. It includes establishments engaged in manufacturing or assembling complete passenger automobiles, trucks, commercial cars, buses, motor vehicle parts and accessories, truck and bus bodies and passenger car bodies.

The motor vehicle industry is one of the strongest technology-related sectors in Appalachia. It is classified as a traditional high tech industry with moderate technology-intensity. According to the ARC-sponsored study, the motor vehicle industry's strongest clusters are in counties located in Ohio, Kentucky and Tennessee. Tale A-21 presents national and regional motor vehicle and auto parts production data.

[72] See *Exports, Competitiveness, and Synergy in Appalachian Industry Clusters*, February 1997, pg. vi.

Table A-21. Motor Vehicle and Auto Parts Manufacturing Industry Data

Manufacture of Motor Vehicles and Related Products, GSP Data (Millions of dollars)						
	1995	1996	1997	1998	1999	2000
Appalachia States Prod.	37,846	35,317	38,465	44,989	44,349	45,523
United States Prod.	103,170	92,240	97,068	111,628	114,744	116,879
Appalachia GSP	2,477,567	2,559,208	2,665,176	2,802,466	2,913,662	3,036,268
App Prod. / U.S. Prod.	37%	38%	40%	40%	39%	39%
App Prod. / App GSP.	1.53%	1.38%	1.44%	1.61%	1.52%	1.50%

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

From 1995 to 2000, the value of motor industry production in the U.S. increased from $103.2 billion to $116.9 billion—an increase of 13 percent. For Appalachian states, the value of motor industry production increased from $37.8 billion in 1995 to $45.5 billion in 2000—an increase of 20 percent. During the 1995 to 2000 period, Appalachian states increased their share of total motor vehicle and related products production in the U.S.

Output Intensity Analysis

Table A-22 presents data on the contribution of the motor vehicle industry to respective state economies in Appalachia. Kentucky tops the list, followed by the states of Ohio and Tennessee. These were earlier identified as states with prevalent industry cluster activities. In fact, Ohio is at the center of the motor vehicle industry in North America—with more than 80 percent of North American light vehicle production emanating from within 500 meters of its borders.

More importantly, the output intensity index for each of these states (Kentucky, Ohio and Tennessee) indicates that the contribution of the motor vehicle industry to their respective economies exceeds the national average. Also, the output intensity index for all Appalachian states combined is greater than one —implying that the contribution of the industry to the region exceeds the national average.

Table A-22. Motor Vehicle Industry Output Intensity Indices for Appalachian States

Output Intensity Analysis for the Motor Vehicle and Related Products Industry Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Location Quotient
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	1.04%	1.25%	0.84
Georgia	1.04%	1.25%	0.83
Kentucky	5.47%	1.25%	4.39
Maryland	0.29%	1.25%	0.24
Mississippi	0.56%	1.25%	0.45
New York	0.48%	1.25%	0.39
North Carolina	0.89%	1.25%	0.72
Ohio	4.27%	1.25%	3.43
Pennsylvania	0.47%	1.25%	0.38
South Carolina	0.98%	1.25%	0.79
Tennessee	2.48%	1.25%	1.99
Virginia	0.80%	1.25%	0.64
West Virginia	0.12%	1.25%	0.10
Appalachia	1.46%	1.25%	1.17

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Export Growth Trends

Export data from the Department of Commerce indicates that motor vehicle exports have been on a downward trend. The United States' international trade in road motor vehicles has produced a large and growing deficit, one that has more than doubled in the past ten years. According to experts at the International Trade Commission, the current overall imbalance in motor vehicle trade could be reduced as economic conditions change, but there is little reason to believe that the United States will see a surplus in its motor vehicle trade in the near term.

The top five markets for U.S. motor vehicle exports: Canada, Mexico, Germany, Japan, and Belgium accounted for 85 percent of all outbound shipments in 1999. While motor vehicle manufacturers in Appalachia continue to expand their share of domestic production, weak export markets could limit their export growth potential.

Growth and Export Prospects for Motor Vehicles and Related Products

According to industry experts, the auto parts industry does appear to have strong potential that could be exploited for export promotion.

Furniture, Fixtures and Related Products

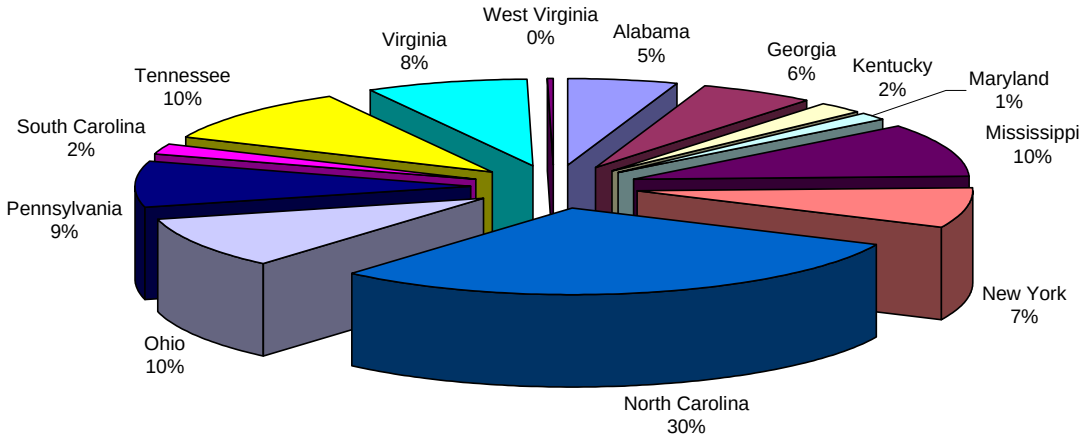
Industry Overview

The furniture and fixtures industry group is defined by the two-digit SIC code 25. It includes establishments engaged in manufacturing office and store fixtures as well as household, office and restaurant furniture. Examples of such items are: wooden, upholstered, and metal furniture commonly used in dwellings, offices, public buildings and restaurants.

An ARC-commissioned study identified major concentrations of the household furniture industry in Appalachia. Major clusters are located in western North Carolina, eastern Tennessee, northeast Mississippi and northern Alabama. The Mississippi cluster focuses on upholstered furniture production while the others take on a more diverse range of household furniture. The clusters are quite distinct and there is very little interaction among producers in different clusters.[73] Exhibit A-2 depicts a breakdown of the furniture and fixtures industry manufacture by Appalachian state.

[73] *Exports, Competitiveness, and Synergy in Appalachian Industry Clusters*, February 1997. Prepared for the Appalachian Regional Commission by Regional Technology Strategies, Inc. Chapel Hill, North Carolina.

Exhibit A-2: Average Share of Appalachian Furniture and Fixtures Manufacture by State



Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Table A-23 below presents production data for the furniture and fixtures industry. The value of U.S. furniture and fixtures manufacturers increased from $20.7 billion in 1995 to $24.4 billion in 2000—an 18 percent increase, while the value of Appalachian states manufacturers of furniture and fixtures increased from $8.9 billion in 1995 to $10 billion in 2000—a 12 percent increase. These figures indicate that during the period spanning from 1995 to 2000, the growth of furniture and fixtures manufacturers in Appalachian states did not exceed the national average. In fact, manufacturers in Appalachian states lost some of their share of national production.

Table A-23. Furniture and Fixtures Manufacturing Industry Data

Manufacture of Furiture and Fixtures, GSP Data (Millions of dollars)						
	1995	1996	1997	1998	1999	2000
Appalachia States Prod.	8,956	8,783	9,149	9,531	9,952	10,008
United States Prod.	20,746	20,713	22,143	22,923	23,888	24,428
Appalachia GSP	2,477,567	2,559,208	2,665,176	2,802,466	2,913,662	3,036,268
App Prod. / U.S. Prod.	43%	42%	41%	42%	42%	41%
App Prod. / App GSP.	0.36%	0.34%	0.34%	0.34%	0.34%	0.33%

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Output Intensity Analysis

Table A-24 provides the output intensity index for each state in Appalachia and all states combined. The furniture and fixtures industry in Appalachian states accounts for 40 percent of total U.S. furniture production. In all but three Appalachian states, the industry share of state GSP was less than one-half percent, but when compared to the national average, the contribution of the industry exceeded the national average in six of the states. The output intensity index for all Appalachian states combined is 1.26. This implies that the industry's impact on the Appalachian region is above the national average.

Table A-24. Furniture and Fixtures Output Intensity Indices for Appalachian States

Output Intensity Analysis for the Furniture and Fixtures MFG Industry Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Location Quotient
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	0.48%	0.27%	1.76
Georgia	0.22%	0.27%	0.81
Kentucky	0.20%	0.27%	0.74
Maryland	0.08%	0.27%	0.30
Mississippi	1.62%	0.27%	6.00
New York	0.10%	0.27%	0.38
North Carolina	1.24%	0.27%	4.58
Ohio	0.28%	0.27%	1.04
Pennsylvania	0.23%	0.27%	0.86
South Carolina	0.20%	0.27%	0.72
Tennessee	0.63%	0.27%	2.32
Virginia	0.34%	0.27%	1.27
West Virginia	0.07%	0.27%	0.27
Appalachia	0.34%	0.27%	1.26

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Export Growth Trends

Table A-25 presents trends in furniture industry exports for Appalachian states and the U.S. Furniture exports from Appalachian states declined from $748.4 million in 1997 to $730 million in 2001 while U.S. exports increased during the same period. Over the course of the period, Appalachian states lost some share of national exports. West Virginia, Tennessee and Georgia were the greatest losers, with each experiencing double-digit losses in the value of furniture exports. Alabama, Kentucky and Ohio were the greatest gainers.

Many firms in Appalachia have not seriously exploited export markets. They have focused more on the U.S. market. The industry in Appalachia however has several export advantages. According to ARC, theses include: proximity to raw materials and other components, a burgeoning reputation overseas for quality work in furniture design and production, and a large number of firms with flexible production capabilities. The top five markets for furniture exports are Canada, Germany, Saudi Arabia, Kuwait and Japan.

Table A-25. Furniture, Fixtures and Related Products Exports from Appalachian States

Furniture, Fixtures and Related Product Exports from Appalachia States						
States	$ Value 000, 1997	$ Value 000, 1998	$ Value 000, 1999	$ Value 000, 2000	$ Value 000, 2001	% change % Change 1997 to 2001
Alabama	24,876	21,280	26,843	36,633	33,222	33.55
Georgia	52,903	44,199	38,931	46,453	37,312	-29.47
Kentucky	20,575	28,824	37,463	74,298	28,293	37.51
Maryland	11,811	19,562	24,645	9,867	11,253	-4.72
Mississippi	59,415	59,512	66,575	64,368	61,655	3.77
New York	100,237	94,175	88,913	113,458	107,783	7.53
North Carolina	174,705	164,886	166,689	158,807	160,698	-8.02
Ohio	98,677	96,897	93,132	110,911	111,859	13.36
Pennsylvania	79,012	66,831	62,236	90,666	84,600	7.07
South Carolina	15,357	19,557	14,105	17,797	15,247	-0.72
Tennessee	57,105	53,779	47,461	52,697	40,595	-28.91
Virginia	50,957	43,451	48,790	52,485	36,689	-28
West Virginia	2,800	6,287	3,629	1,764	779	-72.18
Appalachia	748,430	719,240	719,412	830,204	729,985	-2.46
U.S.	2,496,639	2,612,709	2,562,583	3,024,477	2,588,022	3.66

Source: International Trade and Economic Statistics (Export.Gov).

Growth and Export Prospects for Furniture, Fixtures and Related Products

The furniture industry has some unrealized growth potential that can be exploited for export development.

Textiles and Related Products

Industry Overview

The textiles and related products industry group is defined by the two-digit SIC code 22. It includes establishments engaged in the preparation of fiber and subsequent manufacturing of yarn, thread, braids, twine and cordage; manufacturing broadwoven fabrics, narrow woven fabrics, knit fabrics, and carpets

from yarn; dyeing and finishing fiber, yarn and fabrics; coating, waterproofing or treating fiber; the manufacture of knit apparel and other finished articles from yarn; and the manufacture of felt goods, lace goods, nonwoven fabrics, and miscellaneous textile.

The textile mills industry is one of Appalachia's traditional and most mature industries. Textile mills in Appalachian states account for 83 percent of national textile mills production. The value of textile mills production has however declined in both the national and regional industry, with the share of Appalachian states declining faster. Table A-26 presents production data for the Appalachian and national textile mills industry.

Table A-26. Textile Mills Manufacturing Industry Data

Textile Mills and Related Products, GSP Data (Millions of dollars)						
	1995	1996	1997	1998	1999	2000
Appalachia States Prod.	21,424	21,006	20,638	20,062	19,362	19,755
United States Prod.	25,968	25,335	24,953	24,130	23,598	24,126
Appalachia GSP	2,477,567	2,559,208	2,665,176	2,802,466	2,913,662	3,036,268
App Prod. / U.S. Prod.	83%	83%	83%	83%	82%	82%
App Prod. / App GSP.	0.86%	0.82%	0.77%	0.72%	0.66%	0.65%

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Output Intensity Analysis

The output intensity index for all Appalachian states (1.07) exceeds the output intensity index for the entire U.S.—implying that the contribution of the industry within Appalachian states is above the national average. Table A-27 provides textile mills output intensity index for Appalachian states.

Table A-27. Textile Mills Output Intensity Indices for Appalachian States

Output Intensity Analysis for the Textile Mill Products Industry Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Location Quotient
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	1.60%	0.33%	4.80
Georgia	2.31%	0.33%	6.92
Kentucky	0.36%	0.33%	1.07
Maryland	0.05%	0.33%	0.14
Mississippi	0.45%	0.33%	1.34
New York	0.12%	0.33%	0.37
North Carolina	3.57%	0.33%	10.69
Ohio	0.06%	0.33%	0.19
Pennsylvania	0.28%	0.33%	0.83
South Carolina	3.84%	0.33%	11.51
Tennessee	0.52%	0.33%	1.56
Virginia	0.69%	0.33%	2.08
West Virginia	0.10%	0.33%	0.29
Appalachia	1.07%	0.33%	3.21

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Export Growth Trends

On average, Appalachian states account for 53 percent of U.S. textile mills' exports. From 1997 to 2001, U.S exports of textile mill products increased from $5.6 billion to $7.4 billion—an increase of 32 percent. In the same period, Appalachian state exports increased from $3.2 billion in 1997 to $3.9 billion in 2001—an increase of 24 percent. Table A-28 presents trends in textile industry exports for Appalachian states and the U.S.

Though the regional industry grew less than the national industry during 1997 to 2001 period, most Appalachian states recorded very strong growth figures during the period. The states of Alabama, Kentucky, Ohio and Pennsylvania experienced at least a 90 percent increase in textile mill product exports. The region has a whole appears to have benefited immensely from sales to foreign markets. The only Appalachian states to experience a decline in exports during the period are the states of New York and Virginia.

The textile mills industry however faces stiff competition from cheap foreign imports with lower labor costs. As less developed countries with lower labor costs expand their activities and with the phasing out of import quota restrictions under WTO rules, the textile mills industry will become more susceptible to foreign competition

Despite this competition, U.S. textile mill industries have a competitive advantage in the production of high value-added textile products that are less labor intensive. The future of the industry in Appalachia depends on the ability of manufacturers to exploit higher value-added textile goods and offer niche products.

Table A-28. Textile Mills' Exports from Appalachian States

Textile Mill Product Exports from Appalachia States						
States	$ Value 000, 1997	$ Value 000, 1998	$ Value 000, 1999	$ Value 000, 2000	$ Value 000, 2001	% Change 1997 to 2001
Alabama	99,550	115,100	126,377	209,572	235,095	136.16
Georgia	231,857	230,325	240,876	322,394	328,370	41.63
Kentucky	53,154	67,546	72,474	206,141	304,285	472.46
Maryland	98,077	107,557	110,972	110,612	117,359	19.66
Mississippi	78,433	72,365	60,493	83,118	85,385	8.86
New York	715,974	612,155	510,538	498,548	469,607	-34.41
North Carolina	894,890	947,965	927,583	1,051,604	911,881	1.9
Ohio	130,863	103,821	112,660	283,564	252,450	92.91
Pennsylvania	143,688	117,318	133,438	174,845	287,191	99.87
South Carolina	331,725	313,899	312,971	420,333	495,792	49.46
Tennessee	178,925	193,078	173,016	212,459	230,840	29.01
Virginia	101,906	99,349	110,043	93,335	70,802	-30.52
West Virginia	6,648	5,459	7,256	7,934	9,954	49.73
Appalachia	3,065,690	2,985,937	2,898,697	3,674,459	3,799,011	23.92
U.S.	5,587,281	5,672,308	6,055,009	7,284,162	7,365,202	31.82

Source: International Trade and Economic Statistics (Export.Gov).

Growth and Export Prospects for Textile Mills and Related Products

The industry offers some potential for continued export growth through continuous product innovation.

Apparel and Related Products

Industry Overview

The apparel and related products industry group is defined by the two-digit SIC code 23. It includes establishments producing clothing by cutting and sewing purchased woven or knit textile fabrics, leather, rubberized fabrics, plastics and furs.

During the six-year period from 1995 to 2000, both the regional and national apparel and related products industry experienced a significant decline in production. In the U.S., the value of apparel and related products production declined from $28.0 billion in 1995 to $22.5 billion in 2000—a decrease of 20 percent. In Appalachian states, the value of apparel and related products production declined from $14.3 billion in 1995 to $9.9 billion in 2000—a decrease of 31percent. The decline has been attributed mainly to increased competition from foreign producers. Table A-29 presents production data for the Appalachian and national apparel and related products industry.

Table A-29. Apparel and Related Products Manufacturing Industry Data

Apparel and Related Products, GSP Data (Millions of dollars)						
	1995	1996	1997	1998	1999	2000
Appalachia States Prod.	14,309	13,248	12,838	11,855	10,178	9,882
United States Prod.	28,019	26,958	26,461	25,233	22,573	22,451
Appalachia GSP	2,477,567	2,559,208	2,665,176	2,802,466	2,913,662	3,036,268
App Prod. / U.S. Prod.	51%	49%	49%	47%	45%	44%
App Prod. / App GSP.	0.58%	0.52%	0.48%	0.42%	0.35%	0.33%

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Output Intensity Analysis

The importance of the apparel industry varies for respective Appalachian states. Alabama and Mississippi are the only states with an output intensity index greater than one—implying that the contribution of the apparel and textile industry to their local economies exceeds the national average. North Carolina, South Carolina and Tennessee also have output intensity indices that are almost equal to the national average. As a whole, the contribution of the industry to the GSP of Appalachian states exceeded the national average. Table A-30 provides apparel and related products output intensity index for Appalachian states.

Export Growth Trends

Apparel exports from most Appalachian states declined significantly during the 1997 to 2001 period. Most states experienced double-digit negative growth in exports. The industry's woes can be attributed to intense competition from foreign producers with access to relatively cheaper labor. The major gainers were Alabama, Ohio, Virginia, Pennsylvania and North Carolina. Alabama and Ohio recorded a 100 percent increase in the value of their apparel exports. Table A-31 presents trends in apparel and related products industry exports for Appalachian states and the U.S.

Table A-30. Apparel and Related Products Output Intensity Indices for Appalachian States

Output Intensity Analysis for the Apparel and Related Products Industry Group			
Two-Digit Industry	State Industry / State GSP	U.S. Industry / U.S. GSP	Location Quotient
	(1986 - 2000)	(1986 - 2000)	%State / %U.S.
Alabama	1.16%	0.37%	3.11
Georgia	0.64%	0.37%	1.73
Kentucky	0.79%	0.37%	2.11
Maryland	0.14%	0.37%	0.39
Mississippi	1.33%	0.37%	3.56
New York	0.64%	0.37%	1.72
North Carolina	0.90%	0.37%	2.40
Ohio	0.15%	0.37%	0.41
Pennsylvania	0.47%	0.37%	1.26
South Carolina	0.94%	0.37%	2.52
Tennessee	0.99%	0.37%	2.66
Virginia	0.27%	0.37%	0.73
West Virginia	0.14%	0.37%	0.37
Appalachia	0.66%	0.37%	1.77

Source: Bureau of Economic Analysis of the U.S. Department of Commerce.

Table A-31. Apparel and Related Products Exports from Appalachian States

Apparel and Related Products Exports from Appalachia States						
States	**$ Value 000, 1997**	**$ Value 000, 1998**	**$ Value 000, 1999**	**$ Value 000, 2000**	**$ Value 000, 2001**	**% Change 1997 to 2001**
Alabama	160,202	210,179	262,568	409,791	311,456	94.41
Georgia	412,819	492,524	303,786	285,063	193,628	-53.1
Kentucky	389,328	662,240	587,972	588,943	319,175	-18.02
Maryland	20,468	17,114	11,050	7,424	7,021	-65.7
Mississippi	106,243	107,923	103,702	149,292	85,731	-19.31
New York	628,397	614,556	589,372	595,716	533,201	-15.15
North Carolina	1,466,590	1,355,406	1,518,108	1,727,157	1,680,939	14.62
Ohio	48,128	58,660	66,841	87,485	93,943	95.19
Pennsylvania	147,791	140,717	144,157	191,329	191,603	29.64
South Carolina	186,513	310,820	299,976	229,262	103,079	-44.73
Tennessee	194,842	231,595	170,231	199,196	159,967	-17.9
Virginia	115,746	128,044	87,625	61,594	163,297	41.08
West Virginia	4,330	1,803	1,301	917	653	-84.92
Appalachia	3,881,397	4,331,581	4,146,689	4,533,169	3,843,693	-0.97
U.S.	8,551,110	8,707,823	8,193,870	8,557,864	6,956,292	-18.65

Source: International Trade and Economic Statistics (Export.Gov).

Growth and Export Prospects for Apparel and Related Products

The industry does not offer much potential for continued export through export promotion.

Environmental Technologies

Industry Overview

The environmental technologies industry includes establishments engaged in the manufacturing of industrial air pollution control equipment, water and waste water systems, solid waste recycling, and hazardous and toxic waste technologies. It is a relatively new industry whose activities are quite diverse and encompass many SIC classifications. As pointed out in the ARC-commissioned study, it is quite difficult to estimate market size and employment information using the SIC classification.

However, the Environmental Technologies Industries (ETI) office within the U.S. Department of Commerce provides some information on estimated industry trends. According to ITA, in 1999, there was continued growth in the production and sales of U.S. environmental goods and services. Total revenues for the industry increased by five percent to $196.5 billion; the number of jobs in the industry increased by 44,815 to 1,389,638, while the U.S. industry exported almost 11 percent of the total goods and services that it produced in 1999.

Export Growth Trends

Based on the data obtained from ITA for 1999, Pennsylvania and New York had the highest number of jobs and were the highest-ranking export states for environmental technologies. Table A-32 presents employment and exports from Appalachian states and the U.S.

Table A-32. Environmental Technology Employment and Exports from Appalachian States

Environmental Technologies Industry (1999)				
States	Jobs	Companies	Exports	National Export Rank
Alabama	21,047	1,734	264	23
Kentucky	17,500	1,712	176	30
Mississippi	9,992	1,090	65	42
New York	91,262	6,518	1,136	5
North Carolina	33,790	2,611	346	17
Ohio	60,745	5,022	957	8
Pennsylvania	72,667	6,125	1,538	2
South Carolina	20,007	1,616	146	32
Tennessee	25,261	2,021	205	27
Virginia	30,172	2,602	504	14
West Virginia	11,255	1,215	58	44
Total U.S.	1,389,638	115,030	21,310	

Source: International Trade Administration.

As concern with curbing environmental pollution grows, environmental technologies, goods, and services will constitute an important and growing sector within the global economy. According to ITA, it is projected that the global market will grow to $545 billion by the year 2004.

Within Appalachia, an ARC-commissioned study identified a major environmental technologies cluster in east Tennessee (Oak Ridge, Knoxville and Chattanooga). Establishments in this cluster have access to a highly skilled labor force and excellent support services from federal research labs and agencies and state universities. This feature increases their capacity to access and exploit export opportunities. Currently, establishments located within this cluster are not major exporters because they view government as their primary contractor. As global markets for environmental technologies expand, industry clusters within

Appalachia have an excellent opportunity to position themselves at the forefront. Germany, Mexico, Korea, Brazil, China and India are expected to be prime future export markets.[74]

Growth and Export Prospects for Environmental Technologies

The environmental technologies industry will be a good candidate for export promotion in Appalachia.

Coal Mining

The Appalachian region is one of the three major coal-producing regions in the U.S. Coal production in the Appalachian Region was 428.9 million short tons in 2001 and this represents 38 percent of total U.S. coal production. Within Appalachia, the Central region (composed of counties in eastern Kentucky, Virginia, and southern West Virginia) is the leading producer of coal. On average, the Central region accounts for 61 percent of total Appalachian coal production. The Central region contains some of the most coal-dependent counties in Appalachia.[75] The Northern region (made up of counties in Pennsylvania, Ohio, Maryland, and northern West Virginia) accounts for 33 percent of total Appalachian coal production while the Southern region (composed of counties in Tennessee and Alabama) accounts for an annual average of six percent of total Appalachian coal production. Table A-33 presents the distribution of coal production amongst the major regions in Appalachian.

Table A-33. Appalachian Region - Coal Production

Year	Percentages and Quantity (1,000 Short Tons)					
	Northern	Central	Southern	Total App	Total U.S.	% of Total U.S.
1996	32%	61%	6%	451,869	1,063,856	42%
1997	33%	62%	6%	467,778	1,089,932	43%
1998	34%	60%	6%	460,399	1,117,535	41%
1999	33%	61%	5%	425,573	1,100,431	39%
2000	33%	62%	5%	419,419	1,073,612	39%
2001	34%	61%	5%	428,900	1,121,300	38%

Source: Energy Information Administration - Coal Industry Annual 2000 Data Tables

Northern Appalachia: Counties in Pennsylvania, Ohio, Maryland, and northern West Virginia
Central Appalachia: Counties in Eastern Kentucky, Virginia, and Southern West Virginia
Southern Appalachia: Counties in Tennessee and Alabama.

Appalachian mines produce primarily bituminous coal (soft coal) from both surface and underground mines. Approximately 65 percent of the region's coal comes from underground mines while the remaining 35 percent comes from surface mines. The Northern Appalachian region produces significant amounts of high sulfur bituminous coal and some lignite coal. The Central Appalachian region is rich in medium sulfur bituminous coal and significant quantities of low sulphur bituminous coal. The Southern region has the least coal deposits but it produces significant quantities of low sulphur bituminous coal. Tables A-34 and A-35 present production data on the types of coal produced in Appalachia.

[74] *Exports, Competitiveness, and Synergy in Appalachian Industry Clusters*, February 1997. Prepared for the Appalachian Regional Commission by Regional Technology Strategies, Inc. Chapel Hill, North Carolina.
[75] Berger et (2001). *A Study on the Current Economic Impacts of the Appalachian Coal Industry and its Future in the Region*. A Report commissioned by the Appalachian Regional Commission, March 2001.

Table A-34. Appalachian Region - Coal Production by Rank, 2000

Sub-Region	Quantity (1,000 Short Tons)			
	Bituminous	Subbituminous	Lignite	Anthracite
Northern	134,462	0	0	4572
Central	258,391	0	0	0
Southern	21,993	0	0	0
Total	414,846	0	0	4,572

Source: Energy Information Administration - Coal Industry Annual 2000 Data Tables.

Table A-35. Coal Production and Number of Mines by Region and Mine Type, 2000 (1,000 Short Tons)

Coal-Producing State and Region	Underground		Surface		Total	
	Number of Mines	Production	Number of Mines	Production	Number of Mines	Production
Northern Region	29%	76%	71%	24%	451	139035
Central Region	65%	58%	35%	42%	767	258391
Southern Region	32%	79%	68%	21%	62	21993
Appalachian Total	51%	65%	49%	35%	**1,280**	**419,419**
U.S. Total	707	373,659	746	699,953	1,453	1,073,612

Source: Energy Information Administration, Coal Industry Annual 2000 Data Tables.

Trends in Appalachian Coal Exports

Coal exports from the major Appalachian states declined by 37 percent from 1996 to 2000. During this period, all the major coal exporting states within Appalachia experienced a decline in coal exports. This was due to a number of factors including the availability of cheaper priced coal from competitors such as South Africa and Australia, higher production costs due to industry compliance with new environmental laws and regulations, and the expansion of new steel-making technologies requiring less high-grade coking coal. Kentucky and West Virginia experienced the greatest decline in coal exports (16.8 and 13.8 percent respectively). Virginia also experienced an 8.5 percent decline while coal exports from Alabama and Pennsylvania declined by 0.3 and 4.1 percent respectively. Table A-36 presents the distribution of Appalachian coal by major exporting states.

Table A-36. Major Appalachian Coal Exporting States

Coal-Exporting State and Destination	1996	1997	1998	1999	2000	Percent Change 1999-2000	Average Annual Percent Change 1996-2000
Alabama	4,864	5,813	4,801	3,307	4,807	45.3	-0.3
Kentucky	9,143	7,220	6,931	4,636	4,382	-5.5	-16.8
Pennsylvania	9,246	8,698	7,908	6,966	7,823	12.3	-4.1
Virginia	13,432	12,841	12,810	8,770	9,406	7.3	-8.5
West Virginia	42,044	38,459	37,531	22,848	23,212	1.6	-13.8
Total	78,729	73,031	69,981	46,527	49,630	6.7	-37.0

Source: International Trade Administration.

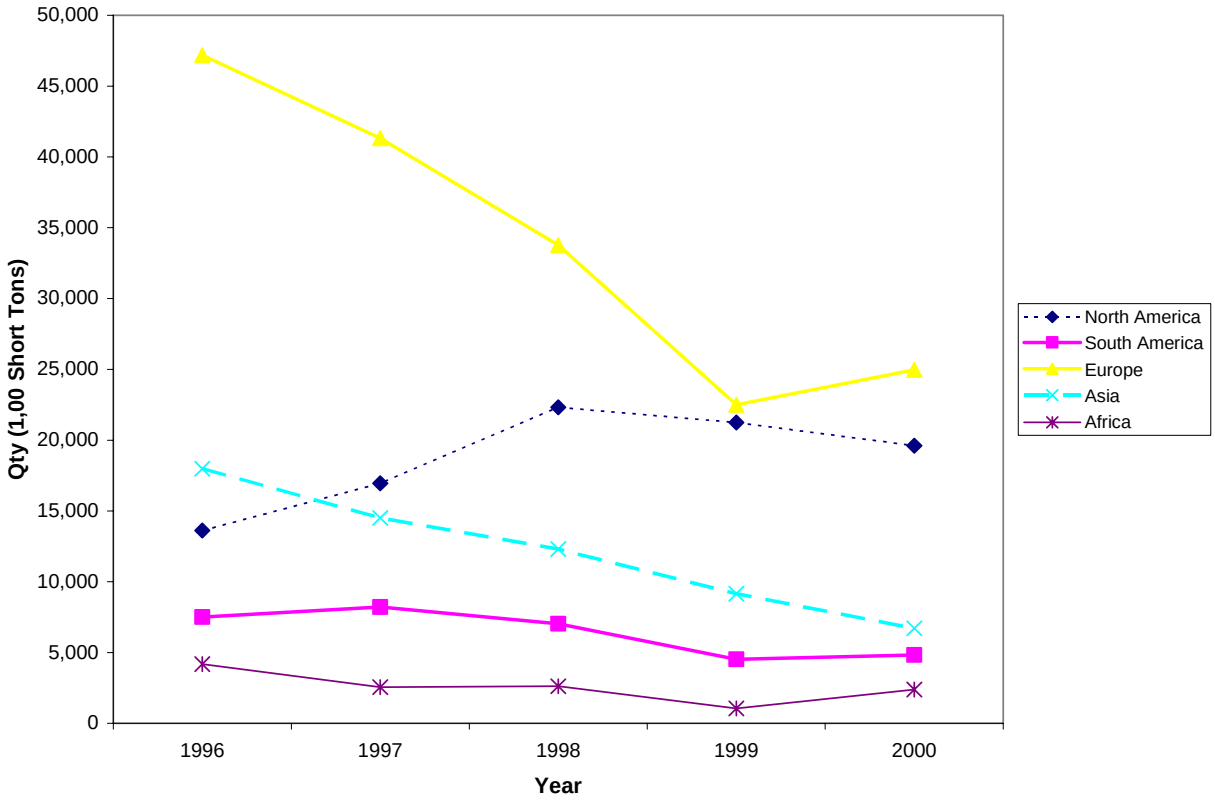
While Europe has remained the major market for Appalachian coal, coal exports to Europe declined greatly during the mid to late 1990s (See Exhibit A-3 below). In 1997, steam coal shipments to Europe decreased by six million tons due to increased competition from lower-cost producers and the substitution of natural gas for coal in the European utility sector. However, coal exports to Canada increased by four million tons while exports to Africa, Asia and South America declined.

From 1997 to 1998, coal shipments to Europe continued to fall as the Asian financial crisis stimulated the availability of cheap imports from Australia. During this period, bituminous coal exports to Canada continued to increase while exports to coal markets in Africa, Asia and South America continued to fall.

In 1999, U.S. coal exports to Europe fell to a record low level. U.S. Coal shipments to Europe decreased as lower-cost Australian and South African production continued to displace U.S. coal. South African and Australian production also displaced U.S. coal in other foreign markets such as the Japanese, Brazilian, and Korean markets.

From 1999 to 2000, coal exports increased as worldwide steel production began to rebound. There was an increase in bituminous coal shipments to Spain, Germany, Turkey, Egypt, Bulgaria, Romania, Mexico and Argentina.

Exhibit A-3-Trends in Foreign Markets for Appalachian Coal



Source: International Trade Administration.

Growth and Export Prospects for Coal Mining

The coal mining industry appears to be a good candidate for future export promotion in Appalachia.

Electronic Components

The U.S. is highly competitive in the manufacture of high quality, sophisticated electronic components and related accessories. Under the electronic components major industry group, the focus for the Appalachian region will be on the microelectronics industry. The products covered under the microelectronics industry include the following: semiconductor manufacturing equipment, printed circuit boards, electronic tubes, semiconductors, capacitors, resistors, coils, transformers, inductors, connectors, and printed circuit assemblies.

The total value of U.S. shipments of microelectronics products increased by 21 percent from 1997 to 2000. The number of people employed nationally in the microelectronics industry also increased from 587,313 in 1997 to 620,927 in 2000—an increase of six percent. The upward swing in national industry shipments and employment was also reflected in the Appalachian region. The value of microelectronic products shipments from Appalachian states increased by 12 percent from 1997 to 2000. Microelectronics industry employment in Appalachian states also increased from 122,513 people in 1997 to 133,438 people in 2000—an increase of nine percent.

On the international trade front, the performance of Appalachian states exceeded that of the U.S. While U.S. exports of electronic equipment increased by 8.75 percent from 1997 to 2001, exports from Appalachian states increased by 23 percent from 1997 to 2001. The contribution of Appalachian states to U.S. electronics exports increased from 27 percent in 1997 to 30 percent in 2001.

New York, Ohio and Pennsylvania are the largest exporters of electronic equipments from Appalachia. Specifically, the electronic components industry is concentrated in nine counties that comprise the southern tier of New York and some counties in Pennsylvania. Combined, they account for 48 percent of electronics exports from Appalachian states and 13 percent of U.S. electronics exports. The industry cluster in the counties are backed by a strong research and development base which include a number of federal and state funded research and development facilities. These include Cornell University, Alfred University, and the State University of New York at Binghamton.

Medical Devices and Surgical Instruments

The medical instruments and supplies industry is defined by the three-digit SIC code 384. It consists of establishments primarily engaged in manufacturing medical, surgical, ophthalmic, and veterinary instruments and apparatus. According to the ARC-commissioned study, the medical devices industry is concentrated in seven counties around the Pittsburgh area.

The Medical devices and surgical instruments sector is one of the nation's strongest and fastest growing sectors. Available data from the ITA shows that the value of U.S. shipments of medical devices increased from $51.7 billion in 1997 to $57.3 billion in 1999—an increase of 11 percent. U.S. exports of medical devices and other related products increased from $10.3 billion in 1995 to $15.4 billion in 2000—a 50 percent increase. On average, exports accounted for 21 percent of total domestic production while the U.S. controls 59 percent of the world market.

The ARC region is however not particularly strong in the manufacturing of medical devices and related instruments. The output intensity index for Appalachian states (0.58) indicates that the contribution of the industry to the economy of Appalachian states is significantly below the national average. According to an ARC-commissioned study, the region has below-average concentration of firms and employees

compared to the U.S. [76] In fact, the industry did not meet the requirements generally associated with a cluster because of its low firm concentration and lack of interdependence amongst firms.

In Appalachia, the industry is dominated by small and medium sized firms that manufacture surgical supplies and instruments targeted towards specific domestic customers. Such products are quite specialized and unsuitable for export. The few large companies that are exporting actively in the area tend to focus on the production of high quality, technologically intensive products with special export market niches. As such, most firms in the region that want to export are already doing so. Even if ARC were to concentrate on promoting exports within the region, the cluster is currently too small with little collaboration amongst existing firms.

Most promising markets for medical devices and related instruments are in Latin America, Japan, and the rest of Asia. Pittsburgh is home to two large research universities and an excellent medical facility. These resources play a crucial role in the development of medical devices and related products within the Pittsburg cluster. The industry does have some potential for growth and development within Appalachia, however this potential is however hinged on the ability to boost and diversify the supply base of the cluster.

[76] *Exports, Competitiveness, and Synergy in Appalachian Industry Clusters*, February 1997. Prepared for the Appalachian Regional Commission by Regional Technology Strategies, Inc. Chapel Hill, North Carolina.